

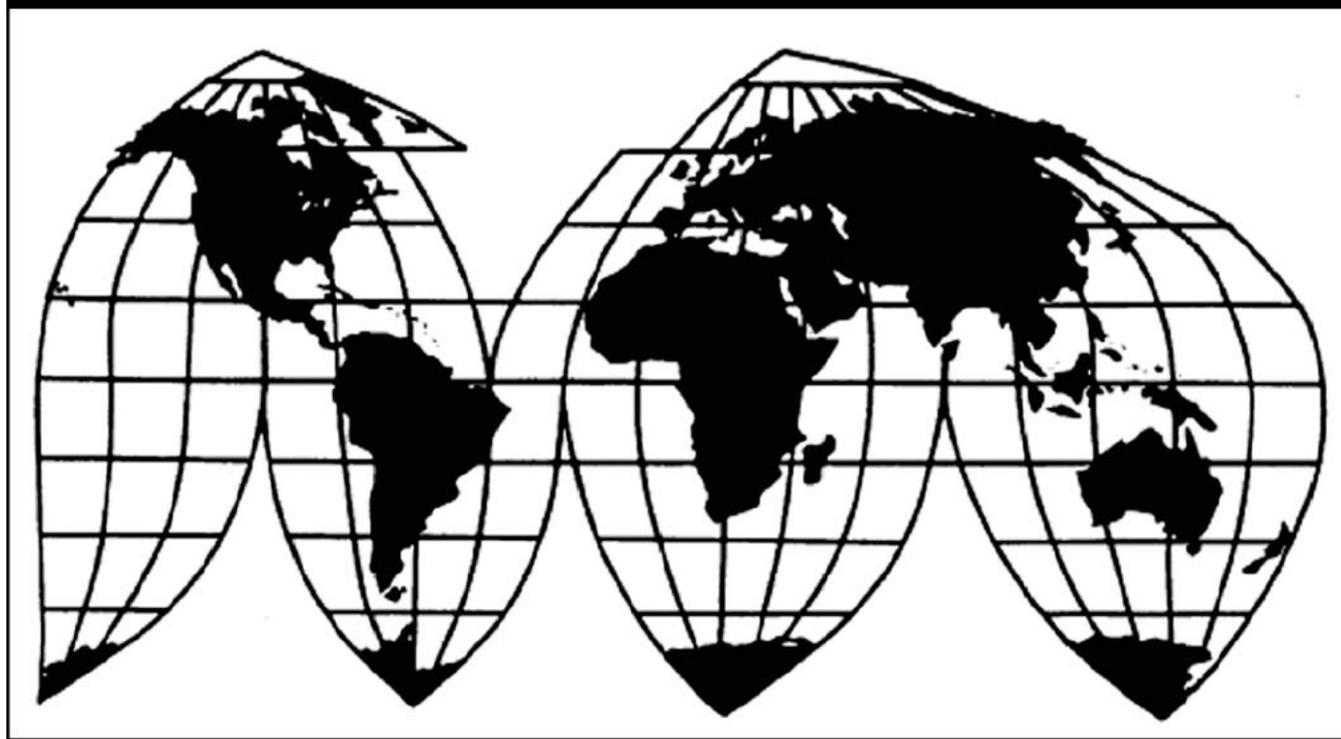
*In the Matter of*  
**Certain Silicon Microphone Packages and  
Products Containing the Same**

Investigation No. 337-TA-695

Publication 4293

November 2011

**U.S. International Trade Commission**



Washington, DC 20436

# **U.S. International Trade Commission**

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Washington, DC 20436**

# **U.S. International Trade Commission**

Washington, DC 20436  
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*In the Matter of*

## **Certain Silicon Microphone Packages and Products Containing the Same**

Investigation No. 337-TA-695





UNITED STATES INTERNATIONAL TRADE COMMISSION  
Washington D.C. 20436

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In the Matter of )

CERTAIN SILICON MICROPHONE PACKAGES )  
AND PRODUCTS CONTAINING THE SAME )

---

Inv. No. 337-TA-695

**NOTICE OF COMMISSION DETERMINATION  
TO REVIEW IN PART AN INITIAL DETERMINATION;  
ON REVIEW TAKING NO POSITION ON TWO ISSUES AND  
VACATING THE CONCLUSION OF NO DOMESTIC INDUSTRY;  
TERMINATION OF THE INVESTIGATION WITH  
A FINDING OF NO VIOLATION**

**AGENCY:** U.S. International Trade Commission.

**ACTION:** Notice.

**SUMMARY:** Notice is hereby given that the U.S. International Trade Commission has determined to review in part the initial determination (“ID”) issued by the presiding administrative law judge (“ALJ”) on November 22, 2010, finding no violation of section 337 of the Tariff Act of 1930, 19 U.S.C. § 1337, in this investigation. On review, the Commission has determined to take no position on two issues, to vacate the finding of no domestic industry, and to terminate this investigation with a finding of no violation.

**FOR FURTHER INFORMATION CONTACT:** Sidney A. Rosenzweig, Office of the General Counsel, U.S. International Trade Commission, 500 E Street, S.W., Washington, D.C. 20436, telephone (202) 708-2532. Copies of non-confidential documents filed in connection with this investigation are or will be available for inspection during official business hours (8:45 a.m. to 5:15 p.m.) in the Office of the Secretary, U.S. International Trade Commission, 500 E Street, S.W., Washington, D.C. 20436, telephone (202) 205-2000. General information concerning the Commission may also be obtained by accessing its Internet server (<http://www.usitc.gov>). The public record for this investigation may be viewed on the Commission's electronic docket (EDIS) at <http://edis.usitc.gov>. Hearing-impaired persons are advised that information on this matter can be obtained by contacting the Commission’s TDD terminal on (202) 205-1810.

**SUPPLEMENTARY INFORMATION:** The Commission voted to institute this investigation on December 16, 2009, based on a complaint filed by Knowles Electronics LLC of Itasca, Illinois (“Knowles”). 74 *Fed. Reg.* 68,077 (Dec. 22, 2009). The complaint named as the sole respondent

Analog Devices Inc. of Norwood, Massachusetts (“Analog”). The accused products are certain microphone packages. Knowles asserts claim 1 of U.S. Patent No. 6,781,231, and claims 1, 2, 7, 16-18, and 20 of U.S. Patent No. 7,242,089.

Knowles filed with its complaint in this investigation a motion for temporary relief that requested that the Commission issue a temporary limited exclusion order and temporary cease and desist order. The ALJ denied Knowles’ request for temporary relief in an initial determination (“TEO ID”). Initial Determination on Complainant's Motion for Temporary Relief (Mar. 24, 2010). In the TEO ID, the ALJ found that all but one of the asserted patent claims were likely anticipated by U.S. Patent No. 6,324,907 to Halteren. (Some of these same claims were also found to be likely anticipated by U.S. Patent No. 6,594,369 to Une.) The remaining claim, while not invalid, was held not likely infringed. For these reasons, there was no patent claim for which Knowles demonstrated a likelihood of success on the merits (i.e., as to both validity and infringement).

The TEO ID also found that Knowles had not demonstrated irreparable harm. In particular, the ID found that Analog’s sales of accused microphone packages had not caused Knowles lost sales, had not damaged Knowles’ relationships with its customers, and otherwise had no proven detrimental effect on Knowles. The ALJ found, *inter alia*, that these two factors (likelihood of success and irreparable harm) precluded temporary relief here.

On review of the TEO ID to the Commission, the Commission noted that the absence of irreparable harm was dispositive, and determined to review the TEO ID in order simultaneously to take no position on the ALJ's findings of likelihood of success. 75 Fed. Reg. 30,430 (June 1, 2010). The Commission's decision enabled “the ALJ to assess the merits” at the final ID stage “unburdened by Commission impressions that may have been formed on a limited temporary-relief record.” *Id.* at 30,431.

On November 22, 2010, the ALJ issued his final Initial Determination (“ID”). The ID found that all of the asserted patent claims are invalid under 35 U.S.C. §§ 102 and 103. More specifically, the ID found claim 1 of the ’231 patent to be anticipated under 35 U.S.C. § 102(a) by Halteren. In the alternative, the ID found claim 1 of the ’231 patent to be obvious under 35 U.S.C. § 103(a) over Halteren in view of U.S. Patent No. 7,003,127 (Sjursen), or in the alternative over U.S. Patent No. 4,533,795 (Baumhauer) in view of Sjursen. The ALJ found claims 1, 2, 7, 16, 17, 18 and 20 of the ’089 patent to be obvious over Halteren in view of Une, or in the alternative over Halteren in view of U.S. Patent No. 7,080,442 (Kawamura).

The ID found that Analog infringed all of the asserted patent claims. The ID further found that if any of the patent claims had been valid that Knowles had demonstrated the existence of a domestic industry relating to the articles protected by the patents. 19 U.S.C. § 1337(a)(1)(B), (a)(2). However, the ID concluded that because Knowles had not demonstrated the existence of a valid patent claim that there could be no domestic industry.

On December 6, 2010, Knowles petitioned for review of the ID. The petition challenged certain of the ALJ's claim constructions, and based substantially on those claim constructions argued, *inter alia*, that the prior art did not anticipate or render obvious any of the asserted patent claims. That same day, Analog filed a contingent petition for review. Analog's petition raised theories of anticipation and obviousness that the ALJ rejected, and made, *inter alia*, noninfringement arguments based on disputed claim constructions. The Commission investigative attorney filed a response in support of the ID, and each of the private parties opposed the other's petition in its entirety.

Having examined the record of this investigation, including the ALJ's ID, the petitions for review, and the responses thereto, the Commission has determined to review the ID in part. In particular the Commission has determined to review and take no position on the construction of the term "attached" in claims 1 and 7 of the '089 patent. The only dispute, raised by Knowles in its petition, is whether the ALJ was correct to find that the prosecution history requires a certain meaning for "attached" and whether that meaning is narrower than the ordinary meaning of the term. Construction of the term is not now necessary because the infringement, invalidity, and domestic industry arguments do not turn on the difference between the ALJ's construction and Knowles' proposed construction.

The Commission also has determined to review and take no position on whether a certain journal article by Premachandran, *Si-based Microphone Testing Methodology & Noise Reduction*, Proceedings of SPIE, vol. 4019, at 588-92 (2000), is prior art under 35 U.S.C. § 102 for either of the asserted patents. The ID did not rule any patent claim invalid as a result of this article.

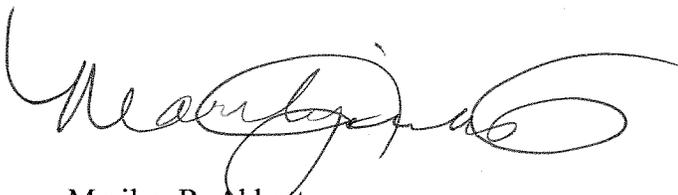
The Commission has determined to review and vacate the ID's conclusion that the technical prong of the domestic industry requirement, 35 U.S.C. § 1337(a)(2) & (a)(3), is not met where all the asserted patent claims are found invalid. It is Commission practice not to couple an analysis of domestic industry to a validity analysis. See, e.g., *Certain Removable Electronic Cards and Electronic Card Reader Devices and Products Containing Same*, Inv. No. 337-TA-396, Comm'n Op. at 17 (Aug. 13, 1998) ("before considering the validity of claim 8 of the '464 patent and possible infringement of it, we address whether the required domestic industry exists or is in the process of being established"); *Certain Encapsulated Integrated Circuit Devices and Products Containing Same*, Inv. No. 337-TA-501 (remand), Initial Determination at 104-105 (Nov. 9, 2005), *review denied*, Notice, 75 Fed. Reg. 43553, 43554 (July 26, 2010). The only instance in which the Commission has recognized such a connection involved invalidity for indefiniteness, 35 U.S.C. § 112 ¶ 2, and the Commission did so in that context because indefiniteness there made it impossible for the complainant to demonstrate whether a patent claim was practiced. Notice, *Certain Video Graphics Display Controllers and Products Containing Same*, Inv. No. 337-TA-412, 64 Fed. Reg. 40042, 40043 (July 23, 1999). There is no such difficulty with regard to invalidity under 35 U.S.C. §§ 102 and 103. Thus, under the technical prong, the complainant bears the burden of proving that its domestic industry practices a claim of each asserted patent. The Commission has determined not to review the remainder of the ID's domestic industry

analysis, which found the existence of a domestic industry without regard to the validity of the asserted patent claims.

The Commission has determined not to review the remainder of the ID. Accordingly, the Commission has terminated this investigation with a finding of no violation.

The authority for the Commission's determination is contained in section 337 of the Tariff Act of 1930, as amended (19 U.S.C. § 1337), and in sections 210.42-46 of the Commission's Rules of Practice and Procedure (19 C.F.R. §§ 210.42-46).

By order of the Commission.

A handwritten signature in black ink, appearing to read "Marilyn R. Abbott", with a large, stylized flourish at the end.

Marilyn R. Abbott  
Secretary to the Commission

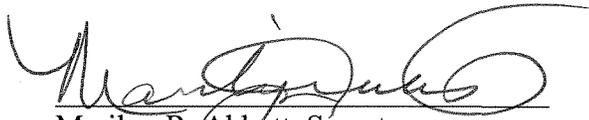
Issued: January 21, 2011

**CERTAIN SILICON MICROPHONE PACKAGES AND  
PRODUCTS CONTAINING THE SAME**

**337-TA-695**

**CERTIFICATE OF SERVICE**

I, Marilyn R. Abbott, hereby certify that the attached **NOTICE OF COMMISSION DETERMINATION TO REVIEW IN PART AN INITIAL DETERMINATION; ON REVIEW TAKING NO POSITION ON TWO ISSUES AND VACATING THE CONCLUSION OF NO DOMESTIC INDUSTRY; TERMINATION OF THE INVESTIGATION WITH A FINDING OF NO VIOLATION** has been served by hand upon the Commission Investigative Attorney, Mareesa A. Frederick, Esq., and the following parties as indicated, on January 24, 2011.



Marilyn R. Abbott, Secretary  
U.S. International Trade Commission  
500 E Street, SW  
Washington, DC 20436

**On Behalf of Complainant Knowles Electronics  
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- Via Overnight Mail
- Via First Class Mail
- Other: \_\_\_\_\_



**PUBLIC VERSION**

**UNITED STATES INTERNATIONAL TRADE COMMISSION  
Washington, D.C.**

**In the Matter of**

**CERTAIN SILICON MICROPHONE  
PACKAGES AND PRODUCTS CONTAINING  
THE SAME**

**Inv. Nos. 337-TA-695**

**INITIAL DETERMINATION ON VIOLATION OF SECTION 337 AND  
RECOMMENDED DETERMINATION ON REMEDY AND BOND**

Administrative Law Judge Robert K. Rogers, Jr.

(November 22, 2010)

**Appearances:**

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*For the Commission Investigative Staff:*

Lynn I. Levine, Esq., Director; Thomas S. Fusco, Esq., Supervisory Attorney; Mareesa A.  
Frederick, Esq., Investigative Attorney; of the Office of Unfair Import Investigations, U.S.  
International Trade Commission, of Washington, DC

PUBLIC VERSION

TABLE OF CONTENTS

<b>I. BACKGROUND</b> .....	1
<b>A. Procedural History</b> .....	1
<b>B. The Private Parties</b> .....	3
1. Knowles .....	3
2. Analog .....	3
<b>C. Overview Of The Patents At Issue</b> .....	3
<b>D. Products At Issue</b> .....	5
<b>E. The Knowles-MemsTech Investigation</b> .....	5
<b>II. JURISDICTION</b> .....	6
<b>A. Subject Matter Jurisdiction</b> .....	6
<b>B. Personal Jurisdiction</b> .....	6
<b>C. In Rem Jurisdiction</b> .....	6
<b>III. CLAIM CONSTRUCTION</b> .....	6
<b>A. Applicable Law</b> .....	6
<b>B. The ‘231 Patent</b> .....	9
1. “Package” .....	9
2. “Acoustic Port” .....	30
<b>C. The ‘089 Patent</b> .....	34
1. “Surface Mountable Package” .....	34
2. “Attached” .....	52
3. “Surface”/“Surface Formed On One Of The First Member Or Second Member”	59
4. “Patterned Conductive Layer” .....	71
5. “Volume” .....	74
<b>IV. INVALIDITY</b> .....	84
<b>A. Applicable Law</b> .....	84
1. Anticipation .....	85
2. Obviousness .....	85
<b>B. The ‘231 Patent</b> .....	87
1. Anticipation .....	87
a. Halteren .....	87
b. Premachandran .....	95
c. Baumhauer .....	106
2. Obviousness .....	110
a. Level of Ordinary Skill in the Art .....	110
b. Halteren in View of Sjursen .....	112
c. Baumhauer in View of Sjursen .....	121
d. Premachandran .....	124
e. Secondary Considerations .....	127
<b>C. The ‘089 Patent</b> .....	140
1. Anticipation .....	140
a. Halteren .....	140
b. Une .....	161
c. Kawamura .....	177

PUBLIC VERSION

d. Premachandran.....	190
2. Obviousness .....	204
a. Level of Ordinary Skill in the Art .....	204
b. Halteren in View of Sjursen .....	205
c. Halteren in View of Une or Kawamura .....	213
d. Ohta in View of Une, Premachandran, & Bashir .....	221
e. Secondary Considerations.....	240
3. Written Description & Enablement .....	244
V. INFRINGEMENT.....	259
A. Applicable Law.....	259
B. The '231 Patent .....	260
C. The '089 Patent .....	267
1. Claim 1 .....	267
2. Claim 2 .....	289
3. Claim 7 .....	290
4. Claim 16 .....	291
5. Claim 17 .....	292
6. Claim 18 .....	293
7. Claim 20 .....	294
VI. DOMESTIC INDUSTRY .....	296
A. Applicable Law.....	296
B. Economic Prong .....	297
C. Technical Prong .....	299
1. The '231 Patent .....	299
2. The '089 Patent .....	306
a. Claim 1 .....	306
b. Claims 2, 7, 16, 18 & 20 .....	314
VII. REMEDY & BONDING .....	316
A. Limited Exclusion Order.....	316
B. Cease & Desist Order .....	319
C. Bonding.....	322
VIII. MATTERS NOT DISCUSSED.....	324
IX. CONCLUSIONS OF LAW .....	325
XI. ORDER.....	325

## PUBLIC VERSION

Pursuant to the Notice of Investigation and Rule 210.42 of the Rules of Practice and Procedure of the United States International Trade Commission, this is the Administrative Law Judge's Final Initial Determination in the matter of Certain Silicon Microphone Packages and Products Containing the Same, Investigation No. 337-TA-695.

The Administrative Law Judge hereby determines that a violation of Section 337 of the Tariff Act of 1930, as amended, has not been found in the importation into the United States, the sale for importation, or the sale within the United States after importation of certain silicon microphone packages and products containing the same, in connection with U.S. Patent No. 6,781,231. Furthermore, the Administrative Law Judge hereby determines that a domestic industry in the United States does not exist that practices U.S. Patent No. 6,781,231.

The Administrative Law Judge hereby determines that a violation of Section 337 of the Tariff Act of 1930, as amended, has not been found in the importation into the United States, the sale for importation, or the sale within the United States after importation of certain silicon microphone packages and products containing the same, in connection with U.S. Patent No. 7,242,089. Furthermore, the Administrative Law Judge hereby determines that a domestic industry in the United States does not exist that practices U.S. Patent No. 7,242,089.

**PUBLIC VERSION**

The following abbreviations may be used in this Initial Determination:

<b>CDX</b>	Complainant's demonstrative exhibit
<b>CIB</b>	Complainant's initial post-hearing brief
<b>CPX</b>	Complainant's physical exhibit
<b>CRB</b>	Complainant's reply post-hearing brief
<b>CX</b>	Complainant's exhibit
<b>Dep.</b>	Deposition
<b>JSRCC</b>	Joint Statement Regarding Claim Construction
<b>JX</b>	Joint Exhibit
<b>RDX</b>	Respondent's demonstrative exhibit
<b>RIB</b>	Respondent's initial post-hearing brief
<b>RPX</b>	Respondent's physical exhibit
<b>RRB</b>	Respondent's reply post-hearing brief
<b>RX</b>	Respondent's exhibit
<b>SIB</b>	Staff's initial post-hearing brief
<b>SRB</b>	Staff's reply post-hearing brief
<b>Tr.</b>	Transcript
<b>CPHB</b>	Complainants' pre-hearing brief
<b>RPHB</b>	Respondent's pre-hearing brief
<b>SPHB</b>	Staff's pre-hearing brief

## PUBLIC VERSION

### I. BACKGROUND

#### A. Procedural History

On December 16, 2009, the Commission issued a Notice of Investigation in this matter to determine:

[W]hether there is a violation of subsection (a)(1)(B) of section 337 in the importation into the United States, the sale for importation, or the sale within the United States after importation of silicon microphone packages and products containing the same that infringe one or more of claim 1 of U.S. Patent No. 6,781,231<sup>1</sup> and claims 1, 2, 7, 15, 16, 17, 18, and 20 of U.S. Patent No. 7,242,089,<sup>2</sup> and whether an industry in the United States exists as required by subsection (a)(2) of section 337.

(See Notice of Investigation.) The investigation was instituted upon publication of the Notice of Investigation in the *Federal Register* on December 22, 2009. See 74 Fed. Reg. 68077 (2009). 19 CFR § 210.10(b).

The complainant is Knowles Electronics LLC of Itasca, Illinois (“Knowles”). The respondent is Analog Devices Inc. of Norwood, Massachusetts (“Analog”). The Commission Investigative Staff of the Office of Unfair Import Investigations (“Staff”) is also a party in this investigation.

When filing the complaint, Knowles moved for temporary relief under subsection (e) of section 337 of the Tariff Act of 1930. In the Notice of Investigation, the Commission provisionally accepted Knowles’ motion and referred it to the presiding administrative law judge.

Pursuant to Commission Rule 210.60, I designated the investigation “more complicated.” (See Order No. 4.) Notice of this designation was published in the *Federal Register* on

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<sup>1</sup> U.S. Patent No. 6,781,231 will be referred to as “the ‘231 patent.”

<sup>2</sup> U.S. Patent No. 7,242,089 will be referred to as “the ‘089 patent.”

## PUBLIC VERSION

December 30, 2009. *See* 74 Fed. Reg. 69145-69146 (2009).

An evidentiary hearing regarding Knowles' motion for temporary relief was conducted before me from February 17-19, 2010. Knowles, Analog and Staff participated in the hearing. On March 24, 2010, I issued an Initial Determination regarding Knowles' motion for temporary relief ("the TEO ID"). In the TEO ID, I denied Knowles' request for temporary relief, finding that Knowles had not demonstrated a likelihood of success on the merits or irreparable harm. On May 21, 2010, the Commission issued a notice stating that it determined to review my findings on the likelihood of success on the merits and take no position on the issue. The Commission let stand my findings on the issue of irreparable harm.

An evidentiary hearing was conducted before me from July 7, 2010 through July 13, 2010. Knowles, Analog, and Staff participated in the hearing. In support of its case-in-chief and rebuttal case, Knowles called the following witnesses:

- Dr. Peter Loeppert (Vice President of Research & Development for Knowles Acoustics);
- Dr. Charles Bauer (expert witness);
- Dr. Kenneth Gilleo (expert witness);
- Dr. David Egolf (expert witness);
- Kieren Harney (Product Line Manager for MEMS Microphones at Analog); and
- Jefferey Niew (President & CEO of Knowles Electronics).

In support of its case-in-chief and rebuttal case, Analog called the following witnesses:

- Kieren Harney (Product Line Manager for MEMS Microphones at Analog);
- Dr. Rao Tummala (expert witness); and
- Dr. Michael Pecht (expert witness).

In addition, various deposition transcripts were received into evidence in lieu of direct

## PUBLIC VERSION

witness statements or live testimony.

After the hearing, post-hearing briefs and reply briefs were filed on July 30, 2010 and August 11, 2010, respectively.

### **B. The Private Parties**

#### **1. Knowles**

Knowles is a limited liability company organized under the laws of the State of Delaware. (JX-19C at ¶ 13.) Knowles' principal offices are located in Itasca, Illinois. (*Id.*)

#### **2. Analog**

Analog is a publicly-traded corporation organized and existing under the laws of the Commonwealth of Massachusetts. (JX-19C at ¶ 25; RX-355C at Q. 7.) Analog's principal offices are located in Norwood, Massachusetts. (JX-19C at ¶ 25.)

### **C. Overview Of The Patents At Issue**

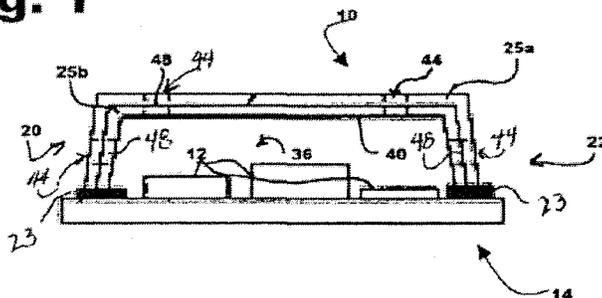
At issue in this investigation are two patents relating to silicon microphone packages and products containing same. The '231 patent is entitled "Microelectromechanical System Package With Environmental and Interface Shield" and was issued on August 24, 2004, based on Application No. 10/238,256 filed on September 10, 2002. (JX-1.) The named inventor of the '231 patent is Anthony D. Minervini and the patent was assigned to Knowles. (*Id.*) The '231 patent has a total of 22 claims. (*Id.*)

The '231 patent relates to packaging for a microelectromechanical system ("MEMS") microphone. As stated in the specification, the package "provides a shield for a MEMS microphone from an interference signal and/or environmental condition." (JX-1 at 1:38-40.) The package includes a cover, substrate, and microphone. The package is formed by connecting the cover to the substrate, and the microphone is found in the housing created by the connection

PUBLIC VERSION

of the cover to the substrate. Figure 1 of the '231 patent depicts a preferred embodiment of the invention:

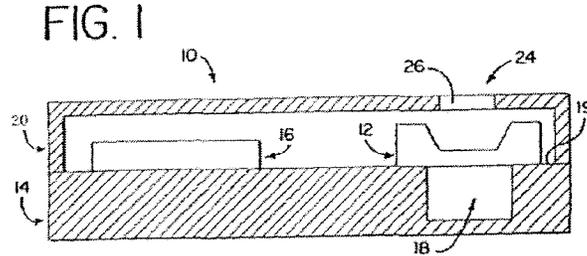
**Fig. 1**



(JX-1 at Fig. 1.) In Figure 1, element 20 is the cover and element 14 is the substrate. (*Id.* at 3:25-27.) The cover and substrate form a housing wherein surface mountable components may be mounted. (*Id.*)

The '089 patent is entitled "Miniature Silicon Condenser Microphone" and was issued on July 10, 2007, based on Application No. 11/112,043 filed on April 22, 2005. (JX-2.) The named inventor of the '089 patent is Anthony D. Minervini and the patent was assigned to Knowles. (*Id.*) The '089 patent has a total of 29 claims. (*Id.*)

The '089 patent relates to a surface mountable package for a silicon condenser microphone. As stated in the Summary of the Invention, the package "allows acoustic energy to contact a transducer" and "protects the transducer from light, electromagnetic interference, and physical damage." (JX-2 at 1:44-49.) The package includes a cover, substrate, and microphone. The package further includes a volume defined by the transducer and one of the cover or the substrate. The package is formed by connecting the cover to the substrate, and the microphone is located in the chamber created by the connection of the cover to the substrate. Figure 1 of the '089 patent depicts a preferred embodiment of the invention:



(JX-2 at Fig. 1.) In Figure 1, element 20 is the cover and element 14 is the substrate. (*Id.* at 3:36-48.) Element 12 is a transducer, while element 16 is an amplifier. This embodiment includes a back volume 18 formed by drilling a recess in the substrate. (*Id.* at 3:46-52.)

#### **D. Products At Issue**

Knowles accuses the following Analog products of infringing the asserted patents: ADMP401, ADMP402, ADMP403, ADMP404, ADMP405, and ADMP421. (CX-462C at Q. 21.) These products will be referred to as the “accused products” or “accused devices” throughout the Initial Determination.

Knowles alleges that its SiSonic microphone products satisfy the technical prong of the domestic industry requirement. Knowles states that some SiSonic models have an aperture in the cover, while other models have an aperture located in the substrate. (CIB at 4.)

#### **E. The Knowles-MemsTech Investigation**

Knowles asserted the ‘231 patent and ‘089 patent against a company named MEMS Technology Berhad (“MemsTech”) in Investigation No. 337-TA-629 (“the 629 investigation”). I presided over the 629 investigation, and on January 12, 2009, I issued an Initial Determination finding a violation of Section 337. On June 12, 2009, the Commission issued an opinion affirming my Initial Determination with some modifications. On August 21, 2009, the Commission issued a corrected revised version of its opinion. I hereby incorporate by reference

## PUBLIC VERSION

my Initial Determination as modified by the corrected revised version of the Commission's Opinion.

### II. JURISDICTION

#### A. Subject Matter Jurisdiction

The complaint alleges that Analog has violated Subsection 337(a)(1)(B) by the importation and sale of products that infringe the asserted patents. I find that Analog imports into the United States, sells for importation, or sells within the United States after importation products that Knowles has accused of infringement in this investigation. (JX-19C at ¶ 26.) Thus, I find that the Commission has subject matter jurisdiction over this investigation under Section 337 of the Tariff Act of 1930. *See Amgen, Inc. v. United States Int'l Trade Comm'n*, 902 F.2d 1532, 1536 (Fed. Cir. 1990).

#### B. Personal Jurisdiction

Analog responded to the complaint and notice of investigation, participated in the investigation, made an appearance at the hearing, and submitted post-hearing briefs. Thus, I find that Analog submitted to the personal jurisdiction of the Commission. *See Certain Miniature Hacksaws*, Inv. No. 337-TA-237, Initial Determination, 1986 WL 379287 (October 15, 1986).

#### C. In Rem Jurisdiction

The Commission has *in rem* jurisdiction over the products at issue by virtue of the finding that accused products have been imported into the United States. *See Sealed Air Corp. v. United States Int'l Trade Comm'n*, 645 F.2d 976, 985 (C.C.P.A. 1981).

### III. CLAIM CONSTRUCTION

#### A. Applicable Law

“An infringement analysis entails two steps. The first step is determining the meaning

## PUBLIC VERSION

and scope of the patent claims asserted to be infringed. The second step is comparing the properly construed claims to the device accused of infringing.” *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 976 (Fed. Cir. 1995) (*en banc*), *aff’d*, 517 U.S. 370 (1996) (citation omitted). Claim construction “is a matter of law exclusively for the court.” *Id.* at 970-71. “The construction of claims is simply a way of elaborating the normally terse claim language in order to understand and explain, but not to change, the scope of the claims.” *Embrex, Inc. v. Serv. Eng’g Corp.*, 216 F.3d 1343, 1347 (Fed. Cir. 2000). “[O]nly those [claim] terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy.” *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999).

Claim construction focuses on the intrinsic evidence, which consists of the claims themselves, the specification, and the prosecution history. *See generally Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (*en banc*). The Federal Circuit in *Phillips* explained that in construing terms, courts must analyze each of these components to determine the “ordinary and customary meaning of a claim term,” which is “the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention.” *Id.* at 1313.

“It is a ‘bedrock principle’ of patent law that ‘the claims of a patent define the invention to which the patentee is entitled the right to exclude.’” *Id.* at 1312 (citations omitted). “Quite apart from the written description and the prosecution history, the claims themselves provide substantial guidance as to the meaning of particular claim terms.” *Id.* at 1314. For example, “the context in which a term is used in the asserted claim can be highly instructive,” and “[o]ther claims of the patent in question, both asserted and unasserted, can also be valuable sources of enlightenment as to the meaning of a claim term.” *Id.*

“[T]he specification ‘is always highly relevant to the claim construction analysis.

## PUBLIC VERSION

Usually, it is dispositive; it is the single best guide to the meaning of a disputed term.” *Id.* (citation omitted). “The longstanding difficulty is the contrasting nature of the axioms that (a) a claim must be read in view of the specification and (b) a court may not read a limitation into a claim from the specification.” *Innova/Pure Water, Inc. v. Safari Water Filtration Sys., Inc.*, 381 F.3d 1111, 1117 (Fed. Cir. 2004). The Federal Circuit has explained that there are certain instances when the specification may limit the meaning of the claim language:

[O]ur cases recognize that the specification may reveal a special definition given to a claim term by the patentee that differs from the meaning it would otherwise possess. In such cases, the inventor’s lexicography governs. In other cases, the specification may reveal an intentional disclaimer, or disavowal, of claim scope by the inventor. In that instance as well, the inventor has dictated the correct claim scope, and the inventor’s intention, as expressed in the specification, is regarded as dispositive.

*Phillips*, 415 F.3d at 1316.

In addition to the claims and the specification, the prosecution history should be examined if in evidence. “The prosecution history...consists of the complete record of the proceedings before the PTO and includes the prior art cited during the examination of the patent. Like the specification, the prosecution history provides evidence of how the PTO and the inventor understood the patent.” *Id.* at 1317 (citation omitted). “[T]he prosecution history can often inform the meaning of the claim language by demonstrating how the inventor understood the invention and whether the inventor limited the invention in the course of prosecution, making the claim scope narrower than it would otherwise be.” *Id.*

If the intrinsic evidence does not establish the meaning of a claim, then extrinsic evidence may be considered. Extrinsic evidence consists of all evidence external to the patent and the prosecution history, including dictionaries, inventor testimony, expert testimony and learned treatises. *Id.* at 1317. Extrinsic evidence is generally viewed “as less reliable than the patent and

## PUBLIC VERSION

its prosecution history in determining how to read claim terms[.]” *Id.* at 1318. “The court may receive extrinsic evidence to educate itself about the invention and the relevant technology, but the court may not use extrinsic evidence to arrive at a claim construction that is clearly at odds with the construction mandated by the intrinsic evidence.” *Elkay Mfg. Co. v. Ebc Co.*, 192 F.3d 973, 977 (Fed. Cir. 1999).

### **B. The ‘231 Patent**

#### **1. “Package”**

The term “package” appears in asserted claim 1.

**Knowles’ Position:** Knowles contends that “package” is a claim limitation and should be construed to mean “an enclosure for a microelectronics device or circuit that protects the device or circuit from mechanical and environmental stress and provides a first-level connection for connecting the device or circuit and the package and a second level electrical connection for connecting the package to a printed circuit board or other substrate. Such second level connection is one that cannot be made at a distant location from or not directly under the device.”

Knowles argues that “package” is a claim limitation because it gives life, meaning, and vitality to the collection of claim elements following the preamble. Knowles notes that the Summary of the Invention lays out five “objects” of the invention, each of which involves the provision of a package. (Citing JX-1 at 1:43-45, 1:55-57, 1:66-67, 2:13-15, 2:25-27.) Knowles relies on the expert testimony of Dr. Bauer, who testified that the term “package” provides context to the collection of elements in the remainder of claim 1. (citing CX-461 at Q. 16.)

Knowles claims that because the intrinsic evidence does not define “package,” it is appropriate to look to extrinsic sources to understand the meaning of the term to one of ordinary skill in the art. Knowles states that it relies on a number of textbooks for support, including

## PUBLIC VERSION

textbooks that were written by three of the experts that testified in this investigation.

Knowles claims that these textbook references show that a package is an enclosure for electronic devices. (Citing CX-582; CX-584; CX-585; CX-586; CX-588; RX-353; RX-354; Tr. at 198:22-200:5.) Knowles claims that the references show that a package provides protection against mechanical and environmental stress. (Citing CX-580; CX-582; CX-584; CX-585; CX-586; CX-587; RX-353; RX-354; Tr. at 196:11-198:5, 387:9-389:24; CX-610 at Q. 81.)

Next, Knowles claims that a package provides a mechanical and electrical connection between the electrical device and the package, and a mechanical and electrical connection between the package and the printed circuit board to which, or upon which, the package is attached. Knowles argues that these characteristics are part of what is known as the “packaging hierarchy,” where there are first, second, and third level connections. Knowles claims that the evidence supports the concept of the “packaging hierarchy.” (Citing CX-581; CX-582; CX-580; CX-585; CX-584; CDX-8.1 through CDX-8.4.) Knowles states that the first level connection refers to the connection between the device and the package, while the second level connection refers to the connection between the package and the printed wiring board. (Citing CX-580; CX-581; CX-582; CX-582; CX-584; CX-585.)

Knowles asserts that the second level connection is made in one of two ways, either (1) by inserting the leads of the first level package into plated holes in the board and soldering them into place; or (2) by placing the first level package onto pads, which have been covered in solder paste, on the top surface of the printed circuit board. (Citing CX-580; CX-581; CX-582; CX-583; CX-584; CX-585; Tr. at 204:21-206:1.) Knowles claims that packages are categorized into package families according to the second level connections, either as “through hole packages,” or “surface mount packages.” (Citing CX-580; CX-581; CX-582; CX-583; CX-585; Tr. at

## PUBLIC VERSION

203:5-204:20.)

Knowles argues that for the second level connection, the package is usually mounted to a printed circuit board or other substrate. Knowles claims that every description of the packaging hierarchy in the record makes this clear. (Citing CX-581; CX-583; CX-584; CX-585; Tr. at 195:25-196:10.)

Knowles argues that the location and length of the second level connection is particularly notable. Knowles cites to Dr. Bauer's testimony that "the leads are either on the edge of the package body or directly under the package body, thus minimizing the amount of space required on the printed circuit board." (Citing CX-582 at Q. 36.) Knowles states that Dr. Bauer "explained that the location of the second level connection was a function of translating the geometries of the packaged device(s) and the geometries of the printed circuit board upon which, or to which, the first level package was electrically and mechanically attached." (Citing Tr. at 1031:13-1033:10; RX-69 at Fig. 1; CX-610 at Q. 53.) Knowles notes that there is additional extrinsic evidence supporting the concept that the second level connection provides "geometric translation" and a way to "fan out" the leads. (Citing CX-584; CX-585; CX-583.)

Finally, Knowles asserts that the second level connection provides mechanical stability to the package. Knowles claims that a purpose of soldering the package to a printed circuit board is to allow the package to be firmly connected to the board. (Citing CX-580; Tr. at 420:8-422:12, 323:15-326:4.) Knowles asserts that its proposed construction of package is consistent with the ordinary and customary meaning of the term in the art, as evidenced by the extrinsic sources cited by Knowles.

Knowles argues that the claim language of claim 1 is consistent with Knowles' construction of package. Knowles notes that the microphone of claim 1 sits on the surface of a

## PUBLIC VERSION

substrate. (Citing JX-1 at 5:12-15.) Knowles states that the microphone is enclosed within a housing formed by connecting a cover and a substrate. (Citing JX-1 at 5:18-22.) Knowles states that the housing includes an acoustic port, and the housing provides protection from an interference signal. (Citing JX-1 at 5:22-25.) Knowles states that other, non-asserted claims include other variations and features of a package. Knowles concludes that the claim language of the '231 patent supports a finding that the package is an enclosure containing, protecting, and electrically connected to a MEMS microphone.

Knowles claims that the specification supports its proposed construction. According to Knowles, the specification makes clear that the package provides protection for the MEMS microphone from an interference signal and environmental conditions, because MEMS microphones are fragile and susceptible to physical damage. (Citing JX-1 at 1:21-23, 1:36-41.) Knowles claims that the specification indicates that the package is intended to be attached to an end user's printed circuit board via solder pads on the substrate. (Citing JX-1 at 3:4-14, 4:2-4.) Knowles states that the specification explains that the package uses solder pads instead of "gull wing" leads to reduce the size of the package's "foot print." (Citing JX-1 at 3:10-16.)

In its reply brief, Knowles states that it appears that the parties agree that it is proper to look to extrinsic sources for the meaning of "package." Knowles asserts that it relied heavily on the textbooks that persons of ordinary skill in the art would have had access to in the year 2000. (Citing Tr. at 219:16-223:9.)

Knowles claims that the dispute between the parties centers around the second level packaging interconnect – where it is located, what it is connected to, and what functions it provides. Knowles argues that every diagram, drawing, and table in the extrinsic evidence shows that the second level interconnect is either on the perimeter of the package body or

## PUBLIC VERSION

underneath the package body. (Citing CX-580; CX-582; CX-585.) Knowles claims that Analog has not identified any evidence showing a second level interconnect that is not either on the perimeter of the package body or underneath the package body. Knowles states that the extrinsic evidence supports the assertion that the second level packaging interconnect extends only as far as necessary to provide the translation between the geometries of an integrated circuit and the geometries of a printed circuit board. (Citing Tr. at 1031:13-1033:10; CX-584; CX-585; CX-583; CX-580.)

Knowles argues that Analog misrepresents Knowles' experts in an attempt to support its position. Knowles claims that its experts did not testify that the location limitation does not make any sense and is unnecessary. Knowles asserts that if the experts' testimony is examined in its full context, it becomes apparent that the testimony supports Knowles' construction and does not say what Analog claims it says. (Citing Tr. at 261:4-9, 170:1-171:13, 1001:14-18, 140:7-23; CX-462 at Q. 32; RX-386 at 174:7-13.)

Knowles argues that its proposed construction would not render claim 1 indefinite. Knowles points to Dr. Bauer's testimony that a person having ordinary skill in the art would understand that the second level interconnect is only as distant from the device as is necessary to achieve the transition between the geometries of the die and the geometries of the printed circuit board. (Citing Tr. at 1031:13-1033:10.) Knowles claims that this un rebutted testimony demonstrates that claim 1, as construed by Knowles, is not indefinite.

Knowles argues that every diagram, drawing, and description in the extrinsic evidence shows that the second level interconnect is always made to a printed circuit board or other substrate. (Citing CX-581; CX-583; CX-585; CX-584.) Knowles claims that the only extrinsic evidence that supports Analog's position is the unsubstantiated testimony of Analog's expert.

## PUBLIC VERSION

(Citing Tr. at 796:7-16.) Knowles reiterates that the second level connection must be made either using through hole technology or surface mount technology. (Citing CX-580; CX-581; CX-582; CX-583; CX-584; CX-585.) Knowles argues that, contrary to Analog's assertions, Dr. Bauer's testimony supports the conclusion that a person of ordinary skill in the art would understand that a package of claim 1 is intended to be mounted on a printed circuit board or other substrate. (Citing CX-610 at Q. 81.)

Knowles claims that Dr. Tummala's textbook provides support for the assertion that a package must provide mechanical stability. (Citing CX-580.) Knowles states the testimony of Mr. Harney and Dr. Gilleo both corroborate the claim that the soldered pins or pads mechanically affix the package to the board. (Citing Tr. at 420:8-422:12, 323:15-326:4.)

**Analog's Position:** Analog contends that "package" is not a claim limitation. Analog contends that if "package" is a claim limitation, it should be construed to mean "a structure that provides a connection between a die and a substrate; a connection between a substrate and another circuit; and protection from the environment." Analog contends that it would accept the construction of "package" adopted in the TEO ID as well.

Analog argues that the term "package" does not recite essential structure or breathe life into the claim. Analog asserts that the structure and the elements of the claimed apparatus are all well laid out in the body of the claim. Analog argues that the specification thought that "MEMS package" means a housing for the microphone, and nothing more. (Citing JX-1 at 3:18-21, 3:25-27, 5:18-22, Fig. 1; Tr. at 178:16-21; JX-2 at Figs. 7-10, 23-26, 4:13-15.) Because claim 1 already requires a "housing" in the body of the claim, Analog argues that "package" adds no essential structure. Analog asserts that even dictionary definitions explicitly state that a "package" is merely a "container," an "enclosure," a "structure," a "carrier," or a housing.

## PUBLIC VERSION

(Citing RX-362; RX-342; RX-70; RX-347.)

Analog states that if the term is deemed a limitation, its proposed construction is most appropriate. Analog claims that its construction is consistent with all of the third-party published definitions that both parties have presented in this investigation. (Citing RX-353C at Q74; RX-362; RX-342; RX-70; RX-347; RX-66; RX-64; RX-65.) Analog states that Dr. Bauer agreed that the definition proposed during the Memstech investigation was a “fair” definition of “package,” even though it does not include the added limitations proposed by Knowles. (Citing Tr. at 140:7-23.)

Analog claims that Knowles seeks an overly narrow construction to avoid the prior art asserted by Analog. Analog claims that it is improper to find “implicit” limitations in the proposed claim construction, as Knowles has done. (Citing CX-461 at Q. 19.)

Analog argues that Dr. Bauer can provide no support for his testimony that a package must protect a device from “uncontrolled movement.” (Citing CX-610 at Q. 81.) Analog asserts that the evidence of record is contrary to this testimony. (Citing Tr. at 162:5-8, 192:6-9; CX-610 at Q. 81.) Analog claims that Knowles’ experts do not even agree on what satisfies the protection requirement. (Citing Tr. at 247:20-248:16; CX-462C at Q. 36; RX-385 at 110:21-111:1.) Analog states that its experts opined that a package must provide some degree of protection, but that providing protection against shock is not an absolute requirement of a package. (Citing Tr. at 803:22-804:9, 839:10-840:6; RX-353C at Q. 97-99; RX-354C at Q. 83.)

Analog argues that there is nothing in the intrinsic evidence that restricts the second level connection between the package and the outside world to one made between the package and a printed circuit board or other substrate. Analog states that even Dr. Bauer agrees that a package does not have to be attached to a printed circuit board. (Citing CX-610 at Q. 81; Tr. at 161:22-

**PUBLIC VERSION**

24, 201:5-8.) Analog offers testimony from Dr. Pecht that a package may be attached to many different things, or that a package does not have to be physically attached to anything. (Citing Tr. at 796:7-10, 796:12-16, 837:16-838:9.) Analog claims that one of the books cited by Knowles only states that the function of a package is to connect it to the “outside world.” (Citing CX-580.)

Analog argues that Knowles’ limitation requiring that the second level connection provide mechanical support finds no support in anything outside of the testimony of Knowles’ experts. (Citing Tr. at 158:23-25; CX-461 at Q. 32.) Analog argues that the ‘231 patent does not mention mechanical support at all. Analog notes that both Dr. Pecht and Dr. Tummala provided testimony that a mechanical support limitation would not be consistent with the ordinary meaning of “package.” (Citing RX-353C at Q. 74; Tr. at 257:10-15.)

Analog argues that the location-based restriction was added to the construction by Knowles to avoid the prior art offered by Analog. (Citing Tr. at 179:7-11; CX-461 at Q. 32.) Analog claims that even Knowles’ experts do not think that this limitation makes any sense. (Citing Tr. at 261:4-9, 170:1-6, 1001:14-18.) Analog notes that Dr. Bauer agreed that definitions without the location limitation were fair definitions of “package.” (Citing Tr. at 140:7-23; RX-386 at 174:7-13.)

Analog states that Dr. Bauer repeatedly stated at the hearing that the length of the second level connection, or lead, is indeterminate without reference to the geometry of the second level substrate to which the package is attached. (Citing Tr. at 164:23-165:3, 166:15-19, 167:1-11.) Analog argues that because the distance cannot be determined without reference to what the package is attached to, it cannot possibly define “package.”

In its reply brief, Analog argues that Knowles’ construction of “package” adds new

## PUBLIC VERSION

elements that were not disclosed in Knowles' pre-hearing brief. Analog claims that Knowles' arguments regarding the new limitations including the "package" construction have been waived pursuant to Ground Rule 8.2.

Analog argues that the '231 patent specification describes the electrical connection between the substrate and the end user's board, but it says nothing about a mechanical connection. (Citing JX-1 at 4:2-4.) Analog argues that there is no support for requiring that the second level connection be between the package and a printed circuit board. (Citing CX-581; RX-470 at Q. 16; CX-583.) Analog states that Knowles' argument even ignores Dr. Bauer's testimony. (Citing Tr. at 161:22-24.)

Analog argues that Knowles is wrong that there are only two varieties of packages – pin through hole and surface mount. (Citing CIB at 15.) Analog claims that Knowles' expert testified that these are only two common ways of attaching to a circuit board. (Citing Tr. at 205:-206:1.) Analog asserts that the evidence demonstrates that there are more than two ways to attach a package. (Citing Tr. at 192:4-15, 590:22-591:1, 906:1-907:4; RX-386 at 110:8-111:3; RX-353C at Q. 115; RX-354C at Q. 164; RX-365 at ADI00863333-97; RX-390C at 641:9-11; RX-385 at 146:16-147:5.)

Analog argues that Knowles has changed its location-based limitation to require the package leads to be either on the edge of the package or directly under the package body. (Citing CIB at 17.) Analog claims that this change is a violation of Ground Rule 8.2. Analog argues that while a purpose of a package may be to translate the geometry of a chip to the geometry of the outside circuit, it does not follow that that imposes a requirement as to where the second level connection is made. (Citing RX-354C at Q. 91.)

**Staff's Position:** Staff contends that "package" is a claim limitation and requires (1) a

## PUBLIC VERSION

connection between a die and a circuit; (2) a connection between a substrate and another circuit; and (3) protection from the environment.

Staff states that with respect to the second requirement, the parties disagree as to how the package substrate can be connected and to what it can be connected to. Staff argues that while the '231 patent specification provides one example of this connection, it does not resolve the issue.

Staff asserts that the extrinsic evidence supports its position. Staff cites to various textbooks to support its construction, including a textbook from Dr. Gilleo. (Citing RX-347; RX-66; RX-353C.)

Staff argues that the additional limitations imposed by Knowles are improper. Staff claims that while the specification describes an embodiment where the package is connected to a printed circuit board, there is no indication from the intrinsic evidence that the claims should be so limited. (Citing RX-470 at Q. 16; JX-1 at 3:4-8, 3:66-4:4.) Staff argues that a package must provide an interface between the device and the outside world, and a connection to a printed circuit board does not define a package. (Citing CX-580; RX-470 at Q. 16.)

Staff argues that Knowles' location-based limitation should be rejected. Staff claims that Knowles' inclusion of this limitation is based on nothing more than unsupported expert testimony. (Citing RX-470 at Q. 13.) Staff argues that the location-based limitation would render claim 1 indefinite. Staff states that if the claim required that the second level connection that is not made at a distant location from the device, one ordinary skill in the art would have no idea how far that connection would need to be to avoid infringement. Staff claims that even Knowles' expert acknowledged that he has no idea how long or short the second level connection could be. (Citing Tr. at 164:10-165:3.) Staff states that there is nothing in the

## PUBLIC VERSION

intrinsic evidence that assists in determining the maximum distance from the package that the claims cover. (Citing RX-470 at Q. 16.) Staff notes that another Knowles patent calls a device a “package,” yet the second level connection is neither directly under nor near the device. (Citing JX-11 at 1:6-11, Fig. 1.)

Staff states that the specification makes clear that the package must provide protection. (Citing JX-1 at 1:7-12, 1:36-40; CX-461 at Q. 34.) Staff argues that it is unnecessary to state that a package provides “mechanical protection,” as Knowles asserts. Staff claims that Dr. Gilleo agreed that any protection, including mechanical protection, is met by the use of a cover affixed to the substrate. (Citing Tr. at 250:2-23.)

In its reply brief, Staff states that one of the textbooks relied upon by Knowles shows that a second level connection can be connected to an intermediate vehicle, such as a hybrid circuit or a multichip module. (Citing CX-585.) Thus, Staff contends that this reference does not support Knowles’ claim that a second level connection must be between the package and a printed circuit board. Staff states that evidence showing that the connection is “traditionally” made between a package and a printed circuit board is not enough to impose such a limitation. (Citing CX-584.)

Staff asserts that Knowles now claims that the second level connection must be either on the edges or directly under the package body. Staff argues that this construction is inconsistent with Knowles’ construction found in the Joint Claim Construction Statement. Staff claims that Knowles’ location-based arguments are based solely on unsupported expert testimony. Staff argues that Knowles is using expert testimony to read a limitation from the embodiment into the claims.

Staff argues that the mechanical stability requirement appears nowhere in Knowles’ proposed construction. Staff claims that there is no support in the extrinsic record for inclusion

## PUBLIC VERSION

of this requirement. Staff notes that none of the dictionaries of record mention this requirement. (Citing RX-353C at Q. 75.) Staff claims that the testimony of Dr. Tummala and Mr. Harney do not support including a “mechanical stability” requirement in the construction. (Citing RX-353C at Q. 126; CIB at 19.)

**Construction to be applied:** “a single, self-contained unit which fully encloses a device, and which provides: (1) protection for the device from the external environment, (2) an electrical connection between the device and the package, and (3) an electrical connection between the package and another circuit outside of the package.”<sup>3</sup>

The first point of dispute among the parties is whether or not the preamble is a claim limitation. The preamble of claim 1 recites: “[a] microelectromechanical system package comprising...”

Whether to treat a claim preamble as a limitation is a determination made after a review of the entire patent. *Catalina Mktg. Int’l, Inc. v. Coolsavings.com, Inc.*, 289 F.3d 801, 808 (Fed. Cir. 2002). In *Catalina*, the Federal Circuit stated:

In general, a preamble limits the invention if it recites essential structure or steps, or if it is “necessary to give life, meaning, and vitality” to the claim. Conversely, a preamble is not limiting “where a patentee defines a structurally complete invention in the claim body and uses the preamble only to state a purpose or intended use for the invention.”

*Id.* (citations omitted). The court went on to explain that “a preamble generally is not limiting when the claim body describes a structurally complete invention such that deletion of the preamble phrase does not affect the structure or steps of the claimed invention.” *Id.* at 809.

The invention at issue in *Catalina* was a system for distributing coupons to consumers

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<sup>3</sup> While the definition of “package” used in the TEO ID includes the term “encapsulates” instead of “fully encloses,” the evidence offered at the hearing indicates that “encapsulates” has a specific meaning in the art related to immersing the assembly in a mold compound of some sort. (Tr. at 199:13-200:5.) In such a situation, a MEMS microphone device would not function. (*Id.*) Therefore, I have omitted “encapsulates” from the construction to avoid any reference to the special meaning of the term used in the packaging field.

## PUBLIC VERSION

through kiosks. The court had to determine whether the phrase “located at predesignated sites such as consumer stores” was a limitation when it appeared in the preamble. *Id.* at 807-808. The court found that the phrase was not a claim limitation. The court examined the specification and found that the location of the kiosks was not an essential feature of the invention. *Id.* at 810. The applicants did not rely on the preamble to distinguish the invention from the prior art during prosecution. *Id.* Importantly, the court found that the claim was complete without the preamble:

Moreover, deletion of the disputed phrase from the preamble of Claim 1 does not affect the structural definition or operation of the terminal itself. The claim body defines a structurally complete invention. The location of the terminals in stores merely gives an intended use for the claimed terminals.

*Id.*

In *Corning Glass Works v. Sumitomo Electric U.S.A., Inc.*, 868 F.2d 1251, 1256 (Fed. Cir. 1989), the claim preamble was “[a]n optical waveguide comprising.” The court found that the preamble served as a limitation because the specification was clear that the invention was limited to fibers working as waveguides. As the court explained: “[t]he invention is restricted to those fibers that work as waveguides as defined in the specification, which is not true with respect to fibers constructed with the limitations of paragraphs (a) and (b) only.” *Id.* at 1257.

I find that the situation before me is closer to *Corning Glass* than *Catalina*. Here, the term “microelectromechanical system package” is necessary to give meaning to the claims. The entire ‘231 patent is clearly devoted to packaging for a MEMS microphone. (*See generally* JX-1.) The term makes clear that all of the components listed in the claim body must come together and form a “package.” This term adds a limitation that is not otherwise present in the claim body. This is supported by the specification, which discusses mounting the package on an end-user’s PCB. (JX-1 at 3:3-16.)

Based on the foregoing, I find that the term “microelectromechanical system package” in

## PUBLIC VERSION

the preamble is a limitation.<sup>4</sup> I must, therefore, construe the term “package,” as the parties dispute its meaning. Neither my Initial Determination nor the Commission Opinion in the 629 investigation expressly defined the term “package.” While the Commission did not adopt an express definition of the term “package,” it provided guidance on the meaning of the term, as follows:

To be protected from the outside environment, including light and electromagnetic interference, MEMS devices must be encapsulated, i.e., in a package. ‘231 patent, 1:15-26. A package also allows a MEMS device to be connected to a printed circuit board (or printed wiring board), which carries all the electrical components for a given system. CX-392C, Gilleo Witness Statement, page 4; RX-035, MEMS231961.

(CX-411 at 2.)

We agree with the ALJ that Baumhauer fails to anticipate claims 1 and 2 of the ‘231 patent because it does not disclose a “microelectromechanical package.” ID at 65. The ALJ’s finding is based inter alia, on the testimony of Dr. Gilleo that Baumhauer does not disclose a “package” because it does not disclose the ability to connect the microphone to another circuit. (Gilleo Tr., p. 727 lines 4-8; p. 729, lines 16-22).

(CX-411 at 8-9.)

Claims 1 and 2 of the ‘231 patent do not require that the substrate be exclusive to the transducer or not extend beyond the cover.

(CX-411 at 9.)

We adopt the ALJ’s finding that the term “package” makes clear that all of the components listed in the claim body must come together and form a “package,” i.e., the elements cannot simply be found on a printed circuit board, but must be provided as a single, self-contained unit. See ID at 15.

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<sup>4</sup> I note that my finding that “microelectromechanical system package” is a claim limitation is consistent with my Initial Determination in the 629 investigation. In that investigation, the Commission did not review my conclusion that “microelectromechanical system package” constituted a limitation, and subsequently treated “microelectromechanical system package” as a claim limitation. *Certain Silicon Microphone Packages & Products Containing the Same*, Inv. No. 337-TA-629, Comm’n Op. (Aug. 21, 2009). This finding is also consistent with my decision in the TEO ID, where “microelectromechanical system package” was treated as a claim limitation.

## PUBLIC VERSION

(CX-411 at 14.)<sup>5</sup>

Turning to the intrinsic evidence, the specification provides the following descriptions of a “package:”

The present invention relates generally to microelectromechanical systems microphones. More particularly, this invention relates to a microelectromechanical system package for providing an environmental and interference shield to a microelectromechanical system microphone.

(JX-1 at 1:7-11.)

The present invention is related to a packaging for a microelectromechanical system (MEMS) microphone. The MEMS microphone package provides a shield for a MEMS microphone from an interference signal and/or environmental condition. The package generally comprises a MEMS microphone, a substrate and a cover.

(JX-1 at 1:36-41.)

From the specification, it becomes clear that one requirement of a “package” is that it must provide protection from such things as interference signals and/or environmental conditions. A review of the ‘231 patent prosecution history provides no additional insight into the meaning of “package.” Because the intrinsic evidence is unclear as to the proper meaning of “package,” I find that it is appropriate to examine extrinsic evidence for further insight into the proper claim construction. *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1584 (Fed. Cir. 1996) (“No doubt there will be instances in which intrinsic evidence is insufficient to enable the court to determine the meaning of the asserted claims, and in those instances, extrinsic evidence...may also properly be relied on to understand the technology and to construe the claims.”)

I find that there is credible, contemporaneous extrinsic evidence that supports the construction of “package” recited *supra*. The definition of “package” in the May 2000 “Terms,

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<sup>5</sup> While this passage came in the context of discussing the ‘089 patent, no party asserts that the meaning of “package” in the ‘089 patent differs in any way from the meaning of “package” in the ‘231 patent.

## PUBLIC VERSION

Definitions, and Letter Symbols for Microelectronic Devices” document from the JEDEC Solid State Technology Association is:

**package (of a semiconductor device):** An enclosure for one or more semiconductor chips (dice), film elements, or other components, that allows electrical connection and provides mechanical and environmental protection.

(RX-362 at ADI00861887.)

The definition of “package” in the IEEE 100: THE AUTHORITATIVE DICTIONARY OF IEEE STANDARDS TERMS, 7<sup>th</sup> ed. is, “an external container, substrate, or platform used to hold a semiconductor or circuit.” (RX-342 at ADI00853852.) *The Handbook of Flexible Circuits* defines a “package” as “the container for an electronic component(s) with terminals to provide electrical access to the inside of the container. In addition, the container usually provides hermetic and environmental protection for, and a particular form factor to, the assembly of electronic components.” (RX-70 at ADI00843172.)

Both *Ball Grid Array Technology* and *Electronic Materials Handbook* define a “package” as

**package** In the electronics/microelectronics industry, an enclosure for a single element, an integrated circuit, or a hybrid circuit. It provides hermetic or nonhermetic protection, determines the form factor, and serves as the first-level interconnection externally for the device by means of package terminals. A package generally consists of a bottom part, called the case or header, and a top part, called the cover or lid. These are sealed into one unit. Passive parts may be enclosed in an encapsulant or molded package.

(RX-64 at ADI00842928-29; RX-65 at ADI00842964.) *The Handbook of Electronic Package Design* defines “package” as:

**PACKAGE:** The container for an electronic component(s) with terminals to provide electrical access to the inside of the container. In addition, the container usually provides hermetic and environmental protection for, and a particular form factor to, the assembly of electronic components.

(RX-348 at ADI00853872-73.)

## PUBLIC VERSION

The *Electronic Packaging & Interconnection Handbook*, 3<sup>rd</sup> ed. explains that “[w]e can think of the package as a structure consisting of a semiconductor device, a first-level interconnect system, a wiring structure, a second-level interconnection platform, and an enclosure that protects the system and provides the mechanical platform for the sublevel.” (RX-347 at ADI00853867.)

In an article in the 1999 International Symposium on Advanced Packaging Materials entitled “Challenges in the Packaging of MEMS,” the authors make the following statement:

The role of the package is to provide the interface between the chip and the world. It should protect the chip, while letting it perform its intended function cleanly with very little attenuation or distortion of the signal in the given environment and do so at a low cost.

(CX-310 at KE1603251.)

Based on the intrinsic and extrinsic evidence cited *supra*, I find that “package” means “a single, self-contained unit which fully encloses a device, and which provides: (1) protection for the device from the external environment, (2) an electrical connection between the device and the package, and (3) an electrical connection between the package and another circuit outside of the package.”

Knowles seeks to add numerous limitations to the meaning of “package,” yet it has failed to demonstrate that these limitations are necessary. Knowles argues that the second level connection must be made between a package and a printed circuit board, or printed wiring board. The ‘231 patent specification depicts an embodiment where the package is connected to a printed circuit board, but it makes no indication that the invention shall be limited to such an embodiment. (JX-1 at 3:3-16, 4:2-4.) Knowles’ argument is contrary to its proposed construction, which requires “a second level electrical connection for connecting the package to *a printed circuit board or other substrate.*” (JSRCC at 3.) (Emphasis added.)

## PUBLIC VERSION

I find that the extrinsic evidence does not conclusively state that the second level connection of all packages must be made to a printed circuit board or printed wiring board. Knowles cites a reference that explains that at the second level of connection “the individual chip carriers are mounted on a common base, *usually* a printed wiring board (PWB).” (CX-581 at KE1663472) (Emphasis added.) Knowles cites another reference that states that “[s]ingle-chip and multichip packages are *typically* mounted on printed wiring boards to establish the next level in the interconnect hierarchy.” (CX-583 at KE1660853) (Emphasis added.) Another Knowles exhibit states that “[o]ne element of electronic packaging that influences the overall packaging strategy is the structure and the joining process used to interconnect packaged electronic devices to higher-level assemblies, e.g., boards, cards, or flexible substrates.” (CX-582 at KX1666869.) These references do not support Knowles’ assertion that a package must always be connected to a printed wiring board or printed circuit board.

Further, testimony from experts on both sides confirms that the definition should not be limited to require a second level connection to a printed circuit board. (Tr. at 161:4-24; 837:7-15.) I find that Knowles has not cited sufficient evidence that demonstrates that the second level connection should be limited to a connection to a printed circuit board or printed wiring board.

Knowles argues that the second level connection can only be made in one of two ways: (1) “by inserting the leads of the first level package into plated holes in the board and soldering them into place” or (2) “by placing the first level package onto pads, which have been covered in solder paste, on the top surface of the printed circuit board.” (CIB at 15.) I find that the evidence of record demonstrates that these are two ways of forming the second level connection, but they are not the *only* two ways, as Knowles asserts. (*See, e.g.*, CX-581 at KE1663472; Tr. at 205:2-206:1, 706:12-21, 590:22-591:8, 837:7-15.) For example, a package may be connected to

## PUBLIC VERSION

a substrate using conductive adhesives instead of solder, or a package may be connected using wiring in a process called breadboarding. (Tr. at 590:22-591:8, 837:7-838:9.) Neither of these alternative methods fit in the narrow definition of the second level connection proposed by Knowles.

Knowles argues that the second level connection must be either underneath the package body or on the perimeter of the package body. (CRB at 14.) This requirement differs from Knowles' proposed construction that requires that the "second level connection is one that cannot be made at a distant location from or not directly under the device." (JSRCC at 3.) Because Knowles did not previously assert a construction that requires that the second level connection be either underneath the package body or on the perimeter of the package body, I find that Knowles has waived its right to assert such a construction. *See* Ground Rule 8.2. Even if Knowles is allowed to offer such a construction, I find that neither of Knowles' location-based limitations are proper parts of the construction of "package."

Claim 1 includes no express statement regarding the connection of the package to the outside world. The substrate of the package is only described as "a substrate comprising a surface for supporting the microelectromechanical microphone." (JX-1 at 5:13-15.) The '231 patent specification depicts an embodiment where the substrate of the package includes solder pads for electrical connection to an end user's board. (*Id.* at 3:66-4:4, Fig. 3.) Such an electrical connection would occur underneath the package body. (*Id.*) Even though the embodiment described in the specification depicts a second level connection underneath the package body, I find no evidence that the claims should be so limited. *Phillips*, 415 F.3d at 1323 ("[W]e have expressly rejected the contention that if a patent describes only a single embodiment, the claims of the patent must be construed as being limited to that embodiment.")

## PUBLIC VERSION

Turning to the extrinsic evidence, Knowles argues that all of the cited references show a second level connection either on the perimeter of the package body or underneath the package body. (See CX-580 at KE1667359; CX-582 at KE1666133; CX-585 at KE1662265.) All of these extrinsic sources include charts showing various package types. (*Id.*) There is no indication from these references that the charts are intended to depict every type of possible package. (*Id.*) The purpose of the charts is to show various types of surface mount and through hole packages. (*Id.*) As explained *supra*, I found that there is no reason to restrict the meaning of “package” to only surface mount or through hole technologies. Therefore, I find that these charts do not succeed in demonstrating that all second level connections must occur below or at the edge of a package body.<sup>6</sup>

Knowles also argues that the second level connection extends only as far as necessary to provide the translation between the geometries of an integrated circuit and the geometries of a printed circuit board. While Knowles has cited to references that discuss the geometric translation needed between the package and a printed circuit board, I see nothing in these references indicating that the second level connection of every package must be underneath or near the package body. (See CX-584 at KE1659770; CX-585 at KE1662221; CX-583 at KE1660876.) In fact, one of the references explains that short wire length (i.e. a second level connection close to the package body) is a typical “design goal,” and not a steadfast package requirement, as Knowles suggests:

As illustrated in Figure 2.1, wire length can sometimes limit the minimum chip size that can fit within a given package cavity and leadcount. ***Normally a design goal is to minimize wire length, both for greater manufacturability or yield and for improved electrical performance.*** Long wires are highly inductive and their use, with high-speed chips, can result in unacceptable noise levels. Shorter wires improve yield because there is less tendency for wire sweep and electrical

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<sup>6</sup> I note that the chart in CX-585 is described as “[a] sampling of commercially available package types,” which makes clear that the chart is not intended to be exhaustive. (CX-585 at KE1662265.)

## PUBLIC VERSION

shorting to adjacent wires. This can be a significant problem in molded plastic packages where the molding process, which comes after wire bonding, can apply considerable force on the wires as molten plastic is injected into the mold press and flows past the wires [Kovac, 1989].

(CX-583 at KE1660876) (Emphasis added.)

I note too that in the 629 investigation, the Commission stated that “[c]laims 1 and 2 of the ‘231 patent do not require that the substrate be exclusive to the transducer or not extend beyond the cover.” (CX-411 at 9.) There has been no evidence presented to counter the Commission’s earlier finding. That earlier finding by the Commission runs counter to Knowles’ argument that the second level connection cannot be at a “distant location” from the device because it follows that if the substrate can extend beyond the cover, the second level connection made through the substrate can extend beyond the cover.

Finally, Knowles seeks to include a limitation requiring that the second level interconnect provides mechanical stability. Knowles relies on an extrinsic textbook for this limitation. The first cited passage in the textbook states that a package must “provide electrical and mechanical connection between the microelectronic part and the outside world.” (CX-580 at KE1667338.) This passage does not support a finding that the second level connection must provide mechanical stability, as Knowles alleges, because it instead explains that the package must provide a mechanical connection between the device in the package and the outside world.

The second cited passage states that “[p]ackages provide semiconductor ICs with signal and power distribution, physical support and chemical protection against the environment.” (CX-580 at KE1667413.) The “physical support” discussed here is in reference to the first level connection – the connection of the IC device to the package – and does not concern the second level connection.

The third cited passage states that a printed wiring board or printed circuit board allows

## PUBLIC VERSION

“electronic components to be electrically interconnected and mechanically supported.” (CX-580 at KE1667899.) As I have already established *supra*, I find no reason to limit the meaning of “package” to require a second level connection to a printed wiring board or printed circuit board. Thus, this passage does not speak for second level connections beyond connections to printed wiring boards or printed circuit boards.

The final cited passage states that “[t]he purpose of soldering is to get an electrical, mechanical and thermal connection between the components and the board.” (CX-580 at KE1667957.) This unremarkable sentence does nothing to demonstrate that a second level connection must provide mechanical stability, as it merely explains that a purpose of soldering is to establish a mechanical connection.

In sum, I find that the intrinsic and extrinsic evidence does not support limiting the meaning of “package” in the manner proposed by Knowles. I conclude that “package” means “a single, self-contained unit which fully encloses a device, and which provides: (1) protection for the device from the external environment, (2) an electrical connection between the device and the package, and (3) an electrical connection between the package and another circuit outside of the package.”

### 2. “Acoustic Port”

The term “acoustic port” appears in asserted claim 1.

**Knowles’ Position:** Knowles contends that “acoustic port” means “an opening which allows the passage of an acoustic signal.”

Knowles claims that in the context of claim 1, the acoustic port is a part of the housing which allows sound to reach the microphone. (Citing JX-1 at 5:23-24.) Knowles notes that the acoustic port is described differently in various unasserted claims. Knowles argues that by

## PUBLIC VERSION

comparing the use of the term in claim 1 to the use of the term in the unasserted claims, it is clear that the features expressly called out in the unasserted claims are not found in claim 1. Knowles argues that the specification supports Knowles' construction. (Citing JX-1 at 1:49-51, 2:37-39.)

In its reply brief, Knowles states that the specification text cited by Analog describes embodiments that are taught in unasserted claims 3 and 4, both which expressly require a "chamber." Knowles notes that claim 1 does not require a "chamber." Knowles argues that Analog's attempt to import limitations into claim 1 should be rejected.

**Analog's Position:** Analog contends that "acoustic port" means a "passage that allows acoustic energy to reach the chamber."

Analog argues that the patentee expressly defined this term when he stated in the specification that "[t]he acoustic port allows acoustic energy to enter the chamber." (Citing JX-1 at 2:11-12, 2:24-25.) Analog claims that in this situation, the inventor chose to be his own lexicographer, requiring an "acoustic port" to allow passage of acoustic energy into the chamber. (*Id.*)

**Staff's Position:** Staff contends that "acoustic port" means "an opening in the housing that allows an acoustic signal to pass."

Staff argues that the plain language of claim 1 supports the construction. (Citing JX-1 at 5:21-25, 6:14-17.) Staff states that the only limitation placed on the acoustic port in claim 1 is that it must allow the acoustic signal to reach the MEMS microphone.

Staff claims that the specification speaks of the acoustic port in broad terms. Staff asserts that the specification in no way restricts the meaning of "acoustic port" in the manner proposed by Analog.

**Construction to be applied:** "an opening that allows the passage of an acoustic signal"

## PUBLIC VERSION

Claim 1 requires a “housing including an acoustic port for allowing an acoustic signal to reach the microelectromechanical system microphone[.]” The parties dispute whether or not this claim language requires that the acoustic port allow an acoustic signal to reach the chamber. The chamber is the space formed by the connection of the substrate to the cover. (JX-1 at 4:20-34, Fig. 1.)

The Summary of the Invention describes multiple embodiments of the claimed invention. In certain embodiments, the acoustic port is described as follows: “[t]he housing includes an acoustic port for allowing an acoustic signal to reach the MEMS microphone[.]” (JX-1 at 1:50-52, 2:37-39.) In other embodiments, the acoustic port is described in a different manner: “[t]he acoustic port allows acoustic energy to enter the chamber.” (*Id.* at 2:11-12, 2:23-24.) Thus, the specification describes two different uses of an acoustic port: (1) to allow an acoustic signal to reach the MEMS microphone; and (2) to allow an acoustic signal to enter the chamber.

The claims reflect the multiple uses of the acoustic port. Independent claims 1 and 5 each require an acoustic port that allows an acoustic signal to reach the MEMS microphone. Independent claims 3 and 4 each require the acoustic port to allow an acoustic signal to enter the chamber.<sup>7</sup>

Claim 1, which is the only asserted claim here, requires “an acoustic port for allowing an acoustic signal to reach the microelectromechanical system microphone[.]” Claim 1 does not mention a chamber, and does not provide any indication that the acoustic port must allow acoustic energy to reach the chamber. Thus, I find that the “acoustic port” is simply an opening that allows the passage of an acoustic signal.

Analog seeks to limit the meaning of “acoustic port” based on one of the uses described

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<sup>7</sup> Claim 4 does not include the exact language used in the specification, but it requires “a plurality of acoustic ports in communication with the chamber.”

## PUBLIC VERSION

in the specification. This would be error for at least two reasons. First, Analog's construction attempts to improperly import a limitation from a preferred embodiment into the claim language. *Innova/Pure Water*, 381 F.3d at 1117. I find that Analog has not offered clear evidence that the patentee acted as his own lexicographer and defined "acoustic port" in the specification, as Analog suggests. *See Mars, Inc. v. H.J. Heinz Co.*, 377 F.3d 1369, 1375 (Fed. Cir. 2004) (noting that the specification must include a "clear definition" of a claim term in order to find that the patentee acted as his own lexicographer); *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1366 (Fed. Cir. 2002) ("[T]he claim term will not receive its ordinary meaning if the patentee acted as his own lexicographer and clearly set forth a definition of the disputed claim term in either the specification or prosecution history.") The portion of the specification upon which Analog relies only describes a single embodiment of the acoustic port, and, as described *supra*, there are two different embodiments of the acoustic port described in the specification. Therefore, the passage cited by Analog does not serve to define the meaning of "acoustic port" for the '231 patent as a whole.

Second, construing "acoustic port" to require the port to allow an acoustic signal to enter the chamber would render the claim language in claims 3 and 4 redundant and superfluous. Claim 3 requires "a plurality of acoustic ports for allowing acoustic energy to enter the chamber," while claim 4 requires "a plurality of acoustic ports in communication with the chamber." If I adopted Analog's proposed construction, there would be no need for claims 3 and 4 to specify that the acoustic port allows acoustic energy to reach the chamber. Analog's proposed construction therefore renders this claim language superfluous, a result that has been repeatedly rejected by the Federal Circuit. *See, e.g., Mangosoft, Inc. v. Oracle Corp.*, 525 F.3d 1327, 1330 (Fed. Cir. 2008) (rejecting a claim construction that would render claim language

## PUBLIC VERSION

superfluous); *Stumbo v. Eastman Outdoors, Inc.*, 508 F.3d 1358, 1362 (Fed. Cir. 2007) (same).

### C. The '089 Patent

#### 1. "Surface Mountable Package"

The term "surface mountable package" appears in asserted claims 1, 2, 7, 15, 16, 17, 18, and 20.

**Knowles' Position:** Knowles reiterates that "a preamble limits the invention if it recites essential structure or steps, or if it is 'necessary to give life, meaning, and vitality' to the claim," and that "when reciting additional structure or steps underscored as important by the specification, the preamble may operate as a claim limitation." *Catalina*, 289 F.3d at 808.

Knowles says the Patentee's choice of the term "surface mountable package" in the claim preamble is clearly a structural limitation that gives "life, meaning, and vitality" to the collection of claim elements following the preamble; this is evident since the entirety of the specification refers to the invention as a "package."

Knowles says, first, it is clear from the specification that the Patentee was characterizing his invention as a "package." Knowles cites as an example, that the Summary of the Invention states that the "present invention is directed to microphone packages" and proceeds to highlight the benefits of the package. (Citing JX-2 at 3:11-16) Knowles asserts that the 29 drawings included in the specification illustrate various aspects and embodiments of the claimed package. (Citing JX-2 at 3:36-48, and 4:5-7:51 (describing Figs. 4 through 29))

Knowles continues that it is clear that the Patentee was further limiting his invention to a particular type of package, namely a "surface mountable" package. Knowles argues that like "package", the term "surface mountable" also gives "life, meaning, and vitality" to the Claim. Knowles says "surface mountable" provides context to the Claim 1 element "an outside surface

## PUBLIC VERSION

of the surface mountable package comprising a plurality of terminal pads electrically coupled to the patterned conductive layer.” (Citing JX- at 11:33-37) Knowles adds that multiple drawings show the presence of terminal pads on the outside surface of the package. (Citing JX-2 element “70” in Figs. 7-11, 13, 15-18, 23-26) Knowles avers that the specification indicates that the purpose of those terminal pads is to connect the package to the surface of the user’s PC board; for example, in describing the configuration shown in Fig. 15, the specification notes: “The bottom portion further comprises solder pads 70 for electrical connection to an end user’s board.” (*Id.* 6:16-17, 6:55-16 (describing Fig. 23), 7:1-7 (describing Fig. 24), 7:7-14 (describing Fig. 25); and 7:15-28 (describing Fig. 26)) Knowles contends that without the limitation “surface mountable package”, the term “terminal pad” could be interpreted broader than what was disclosed in the specification; however, given the context provided by the “surface mountable package” limitation, “terminal pad” has a specific and finite meaning.

Knowles cites the testimony of its expert Dr. Bauer, to wit:

[A]s I noted in my answer to question 16, the term “package” provides context to the collection of elements in the remainder of Claim 1; that is, these are not just random elements put together, but they are put together in a “package.” Similarly, “surface mountable” is also a term of art, and as such, like “package,” by including the word “surface mountable,” the inventor invoked an entire industry—there are books, seminars, and trade groups all devoted to surface mount technology. By referring to the collection of elements found in the body of the claim as a “surface mountable package,” the inventor put the reader on notice not only that the collection was limited to a “package,” but a type of package compatible with surface mount assembly technology.

(Citing CX-461, Q. 18)

Knowles says that neither of Analog’s experts testified to the contrary, although both were made aware of Dr. Bauer’s position since it appeared in his direct witness statement.

Knowles states that one of Analog’s experts, Dr. Tummala, did not make a rebuttal witness

## PUBLIC VERSION

statement, and Analog's other expert, Dr. Pecht, did not rebut Dr. Bauer's opinion about the role of "surface mountable package" in Claim 1.

Knowles has proposed that "surface mountable" be construed as: "[o]rdinary meaning, namely, the ability to mount electrical components on the surface of a printed circuit board, held in place by soldering the abutting surfaces of the electrical component and the circuit board, and suitable for automated assembly processes." (Citing CX-554 at 3.)

Knowles cites the testimony of its expert, Dr. Bauer, to define surface mountable as a "term of art" to one of ordinary skill in the art. (Citing CX-461 at Q. 18, 45.) Dr. Bauer also testified that by using surface mountable together with package, "the inventor put the reader on notice not only that the collection was limited to a 'package,' but a type of package compatible with surface mount assembly technology." (*Id.*) Knowles asserts that a person having ordinary skill in the art would recognize that there is an ordinary and customary meaning for surface mountable, and upon reading the claims and specification of the '089 patent, would recognize that the inventor was referring to this ordinary and customary meaning rather than a definition that would encompass not only standard surface mount techniques, but also unusual and little-used techniques.

Knowles avers that Dr. Bauer relied upon a number of textbooks in confirming that Knowles' proposed constructions were consistent with what a person having ordinary skill in the art would understand to be its ordinary and customary meaning. Knowles provides a list of the references, including CX-580, CX-581, CX-585, CX-588, CX-589, and CX-591. (Citing Tr. at 219:16-223:9.) Knowles argues that the cited references show that to a person having ordinary skill in the art, the ordinary and customary meaning of "surface mountable", in the context of the package disclosed by the '089 patent, includes at least the following characteristics:

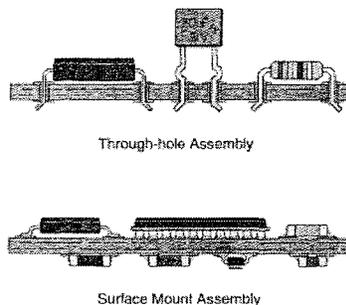
## PUBLIC VERSION

- The package has flat leaded or leadless second-level interconnects
- The second-level connection is made on the flat, metalized surface of a printed circuit board
- Mounting the package on the board utilizes an automated process consisting of applying solder paste on the board, using “pick-and-place” equipment to position the package on the board, and heating the entire board in a “reflow” oven to bond the solder paste on the board to the flat leads or pads on the package

Knowles asserts that “surface mountable” packages are different from through-hole mounted packages, in that with through-hole packages, the leads are inserted into the printed circuit board, but with surface mountable packages, the leads (or pads) are flush against the top surface of the printed circuit board. (Citing as examples CX-580 at p. 67; CX-585 at p. 73; CX-588 at pp. 190-191.)

Knowles argues that it is the second level connection (i.e., a lead or pad), and not just some part of the package, that is connected onto the top surface of the printed circuit board.

Knowles includes a figure out of Dr. Tummala’s Fundamentals book to illustrate its point:



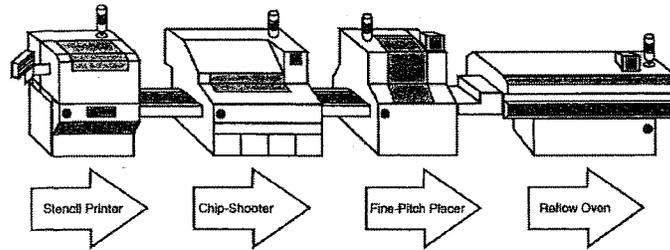
(Citing CX-580 at p. 662.)

Knowles contends that surface mountable packages have advantages over through-hole packages in terms of size, reliability, and usability. (Citing CX-580 at p. 660; CX-589 at pp. 14-15, 17 and 212; CX-591 at p. 1.)

Knowles says that Dr. Tummala’s Fundamentals book describes the process of attaching surface mountable components to a printed circuit board:

## PUBLIC VERSION

The main process steps of surface mount assembly are solder-paste printing, assembly of components and reflow soldering. Figure 17.4 shows a typical surface mount assembly line.



(Citing CX-580 at pp. 660, 663.)

Knowles says the process described in CX-580, describes in detail the application of solder paste to the printed circuit board; the placement of surface mount components, which is described as “almost always automated;” and the creation of the solder joint in a reflow oven.

(Citing CX-580 at pp. 663-679.)

Knowles cites the testimony of Dr. Tummala to say that for the surface mountable package disclosed in the ‘089 patent, standard reflow soldering would be required, and that hot bar soldering, would not work:

Q. Now, you are familiar with the Minervini ‘089 patent, correct?

A. Correct.

Q. And there are solder pads on the outside of the package, right?

A. Right.

Q. And the solder pads are on the bottom side of the package, right?

A. Yes.

Q. And you can’t use hot bar soldering to surface mount the Minervini ‘089 package, can you?

A. No.

Q. You would have to use standard reflow soldering to surface mount the Minervini ‘089 package to a printed circuit board. Isn’t that what you would use?

A. Correct.

(Citing Tr. at 483:15-484:7.)

## PUBLIC VERSION

Knowles refers to CX-589 and says it describes the standard process sequence for surface mount technology, namely, application of solder paste to the printed circuit board, followed by the placement of components, followed by heating in a reflow oven. Knowles asserts that this book devotes an entire chapter to “Component Placement.” Knowles says in the introduction to that paragraph, it notes that automated placement equipment is “almost mandatory,” and that “manual placement of surface mount components, which is neither reliable nor economical, should not be used for production.” Knowles states that the book also devotes an entire chapter to “Soldering of Surface Mounted Components,” specifically concentrating “on the details of commonly used production volume soldering processes for surface mount assemblies of various types.” (Citing CX-589 at pp. 493, 534, 588-591.)

Knowles cites Dr. Bauer’s testimony regarding surface mounting to say:

[T]he normal way or the ordinary way that a person having ordinary skill in the art would do that is to, as I described a moment ago, would be to apply solder paste to the pads on the substrate, typically using a stencil printing process but there are other automated techniques for applying that paste as well. Secondly, they would place the components and this, as I pointed out before, the vast majority of components are far too small to be handled by hand anyway. So an automated pick and place machine would place these components on to the board, making sure that they were in the proper orientation and aligned with the pads. Then the board would be run through a reflow process, which could be an infrared oven, a convection oven, vapor phase reflow, something of that sort. And that’s the way, as I say, well in excess of 95 percent, 90, 95 percent of the products in the world are fabricated that way.

(Citing Tr. at 209:11-210:8, 216:1-25.)

Knowles concludes that it is clear from the extrinsic evidence that surface mountable has an ordinary and customary meaning that is consistent with Knowles’ proposed construction, and it is clear from comparing the extrinsic evidence to what is taught by and disclosed in Minervini ‘089 that the term as used in claim 1 of the ‘089 patent has the meaning it proposes which is in

## PUBLIC VERSION

harmony with the use of surface mountable within the intrinsic record. (Citing *Phillips*, 413 F.3d at 1318.)

Referring to the '089 patent, Knowles asserts that claim 1 uses the term "surface mountable" in a manner consistent with the ordinary and customary meaning of that term. Knowles says that claim 1 requires terminal pads on the outside of the package, and these terminal pads are electrically coupled to the patterned conductive layer. (Citing JX-2 at 11:33-36.) Knowles contends that the terminal pads are where the package is surface mounted to the printed circuit board, and that the use of the suffix "able" does not expand the scope of the claim to encompass any and all manner and method of mounting. (Citing *Abbott Labs v. Sandoz*, 566 F.3d 1282, 1296 (Fed. Cir. 2009).) Knowles' inclusion of the phrase ability to mount means the ability to mount in the manner and method taught and disclosed in the '089 patent, which it says is "on the surface of a printed circuit board, held in place by soldering the abutting surfaces of the electrical component and the circuit board, and suitable for automated assembly processes."

Knowles asserts that the '089 patent's specification uses the term "surface mountable" in a manner consistent with the ordinary and customary meaning of that term. Knowles says that the specification further describes the electrical attributes of the invention and repeatedly states that the package is intended to be attached to an end user circuit board. (Citing JX-2 at 2:3-7, 3:54-60; 4:5-11; 6:16-17; 5:8-9; 5:44-45; 6:55-56; 7:1-2; 7:8-9; 7:15-16.) Knowles continues that the specification notes that the use of FR-4 for building the package would be advantageous because the package and the "end user's PCB" would have a better match of thermal coefficients of expansion. (Citing JX-2 at 3:24-27.) Knowles adds that the specification states that the package "would most likely be attached to a [sic] end user's PCB 28 via a solder reflow process," (citing JX-2 at 4:5-8), and in one embodiment, it includes a sealing ring that will seal

## PUBLIC VERSION

the interior “during surface mounting to a user’s ‘board’ 28 (Figs. 3-5).” (Citing JX-2 at 3:56-59.) Knowles says that the specification refers to the external pads on the package as “solder pads.” (Citing JX-2 at 3:29-33; 6:16-17; 6:65-67.) Knowles concludes that the specification “notes that the inventive package would have a smaller footprint than other surface mount packages”, including packages with “gull” style leads. (Citing JX-2 at 3:29-35.) Knowles says JX-2, Figs. 7-10, 15-18, and 23-26 show the presence of the solder pads 70 on the underside of the package body.

Knowles asserts that the prosecution history does not reveal any further substantive description of the meaning of a surface mountable package, nor does it suggest that the inventor intended to deviate from the ordinary meaning of that term.

In its reply brief, Knowles says that Analog has not argued in its Post-Hearing Brief that the term surface mountable package in the preamble is not a claim limitation. Knowles concludes that, therefore, pursuant to Ground Rule 11, Analog has waived this issue.

Knowles argues that Analog errs by muddling “the distinction between the knowledge possessed by the hypothetical person having ordinary skill in the art and the perspective of that person in understanding and interpreting claim terms in light of that knowledge.” Knowles argues that ordinary meaning means “ordinary” and it is error to incorporate an extraordinary construction into that ordinary meaning. (Citing *Nystrom*, 424 F.3d at 1145-46.) Knowles contends that Analog “muddles the distinction between what is feasible and what is ordinary.” Knowles says that the Federal Circuit has noted, a patentee cannot widen the scope of the claims merely by using a word with the “probabilistic suffix ‘able.’” (Citing *Abbott Labs. v. Sandoz Inc.*, 566 F.3d 1282, 1296 (Fed. Cir. 2009).) Knowles reasons that Analog cannot widen the

## PUBLIC VERSION

scope of “surface mountable” to encompass inapplicable prior art by claiming that in some uncommon application, it could be mountable on some surface.

Knowles states that Analog, in its Pre-Hearing Brief, asserted that *surface mountable package* in the preamble was not a limitation. Knowles asserts that Analog has not raised this defense in its Post-Hearing Brief, and therefore, pursuant to Ground Rule 11, Knowles understands this defense to have been waived.

Knowles asserts that the parties are in agreement that it is proper to look to the extrinsic evidence to determine the ordinary meaning of the term “surface mountable.”<sup>8</sup> Knowles argues that without making a single reference to any extrinsic source beyond a glossary entry for “surface mounting” found in one of Dr. Pecht’s books, Analog proclaims that its construction of “surface mountable” is “consistent with the ordinary meaning of the term.” (Citing RIB at 82.) Knowles asserts that Analog ignores the “vast amount of literature on electronic packaging” that would have been available to a person having ordinary skill in the art in the year 2000. (Citing RX-354C at Q. 49.)

Knowles says that Analog distorts Dr. Bauer’s testimony when, after setting out a glossary definition of “surface mounting,” it claims that “Dr. Bauer takes no substantive issue with this construction, and he thinks it is “fair.” (Citing RIB at 82.) Knowles notes that on redirect, Dr. Bauer testified:

Q. You were asked a couple of times if various definitions were fair. Do you recall that?

A. Yes, I do.

Q. And you said that they were generally fair. Is that correct?

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<sup>8</sup> Knowles states that the parties have identified “package”, “surface mountable”, and “surface mountable package” as disputed terms. Referring to CIB at 75 n. 7, Knowles contends that a surface mountable package is simply the combination of “surface mountable” and “package.” Knowles says the ordinary meaning of “package” has been addressed in the context of the ‘231 patent and is equally applicable here; Knowles notes that its argument in this section will address only the “surface mountable” portion.

## PUBLIC VERSION

- A. Fair, but incomplete.
- Q. Okay. What do you mean by incomplete?
- A. The -- in my opinion, all of the proposed constructions impose either unnecessary restrictions or ambiguities that would clearly in my mind, at least, be understood by a person having ordinary skill in the art when they were reading the patents in question, Minervini '231 and Minervini '089 specifically. And as I tried to express, all of the constructions allow a person having ordinary skill in the art to add their own interpretation based on their understanding of the industry and of those -- their reading of those patents.

(Citing Tr. at 193:18-194:14.)

**Analog's Position:** Analog notes that it has already discussed the construction of “package” in the context of the '231 patent, and asserts that the remaining issue to be addressed is the construction of “surface mountable.”

Analog states that the parties agree that “surface mountable” should be construed consistent with its ordinary meaning. (Citing Tr. at 180:13-22.) Analog asserts that the term is used only in the claim; it is entirely absent from the specification.<sup>9</sup> (Citing JX-2.) Analog alleges that the only window into the meaning of “surface mountable” in the specification is a single passing reference to “surface mounting” in the specification. (Citing JX-2 at 3:58; Tr. at 185:10-185:23.)

Analog contends that Knowles' expert agrees that at least a portion of the ordinary meaning of “surface mountable” is “capable of being mounted to the surface of a printed circuit board,” a construction very similar to Analog's construction (citing Tr. at 181:14-19) and the construction Knowles proposed in the MemTech investigation. (Citing RX-337C at GILLEO000126.)

Analog asserts that Dr. Bauer, Knowles' expert, equates “surface mounting” with

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<sup>9</sup> Analog avers that after an initial rejection by the Patent Office, the applicant modified the claims to add “surface mountable package,” but did not modify the specification to define the term. (Citing RX-377 at ADI00863195-3200.)

## PUBLIC VERSION

“surface mountable.” (Citing Tr. at 210:18-21.) Analog says the only published definition of “surface mounting” in evidence is from one of Dr. Pecht’s books: “the interconnection of components to the top conductive layer of a printed board without the use of through holes.” (Citing RX-368 at ADI00863231.) Analog says Dr. Bauer takes no substantive issue with this construction; he thinks it is fair. (Citing Tr. at 186:17-187:6.) Analog argues that while this definition uses the term “printed board,” “surface mountable packages” may be mounted to substrates other than printed circuit boards. (Citing RX-353C at Q. 112; Tr. at 161:4-24.)

Analog contends that the dispute focuses on whether “surface mountable” limits the definition of “package” to those packages “suitable for automated assembly” and in which the second level connection “is made by soldering the abutting surfaces of the electrical component and the circuit board.” (Citing Tr. at 179:22-180:12.)

Analog argues that no evidence in the record supports Knowles’ restrictive construction of “surface mountable” to require that it be “suitable for automated assembly.” Analog continues that no evidence in the record supports Dr. Bauer’s construction that “suitable for automated assembly” requires “standard mainstream techniques”<sup>10</sup> and “not exotic, non-standard, one-off techniques.” (Citing CX-461 at Q. 43.) Analog says that Knowles’ expert limits his opinion to “what one of ordinary skill would think having read the Minervini patent.” (Citing Tr. at 881:6-14; CX-610 at Q. 23, 81, 87, 93.)

Analog says that Dr. Bauer points to a snippet from specification of the ’089 patent, which states the package “would *most likely* be attached ... via *a* solder reflow process,” and he extrapolates from that statement that the claim *requires* automation. (Citing JX-2 at 4:5-8)

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<sup>10</sup> Analog notes that, in his expert report, Dr. Bauer suggested that “standard mainstream techniques” could include the application of solder paste, use of pick and place robots, and solder reflow. (Citing CX-613 at 11-12; RX-386 at 123:1-18.) Analog says Dr. Tummala and Dr. Pecht have opined that there is no “standard” SMT process. (Citing RX-353C at Q. 115; RX-470 at Q. 17.)

## PUBLIC VERSION

(emphasis added by Analog.) Analog contends that the specification does not use the words “automated,” “automation,” or “automatic” anywhere. Analog asserts that the specification states that “a solder reflow process” could be used to mount a package, not specifying how the process is to be performed. Analog concludes that the specification does not limit the mounting process to an automated one. Analog avers that all of the invalidity experts agree that solder reflow or surface mounting does not require automation. (Citing Tr. at 188:2-5, 592:7-10; RX-354C at Q. 165; RX-386 at 119:11-23, 121:13-122:3; RX-470 at Q. 17.)

Analog continues that Dr. Bauer uses Ray Prasad’s book, Surface Mount Technology, in support of his argument that surface mounting must be automated. Analog contends that Mr. Prasad’s book does not support Knowles’ construction, quoting: “[T]here are many soldering processes available for surface mount devices but none is perfect for all applications...The selection of a process depends on the mix of components to be soldered. Various soldering processes will complement each other instead of replacing them. Even hand soldering is not going to disappear entirely.” (Citing RX-365 at ADI00863395.) Analog says that Dr. Tummala agrees that hand soldering is used in some applications. (Citing Tr. at 592:25-593:8; RX-470 at Q. 17.) Analog concludes that “suitable for automated assembly” should not be adopted as part of the construction of “surface mountable.”

Analog argues that narrowing “surface mountable” to a connection “by soldering” is not supported by the specification; the specification only states that mounting is “likely” done by “solder reflow.” (Citing JX-2 at 4:5-8.) Analog states that by stating that solder reflow was “likely” (rather than required), Mr. Minervini explicitly contemplated other alternatives. Analog says that Knowles admits that Mr. Minervini’s use of “most likely” does not exclude other surface mounting processes, such as using conductive adhesives. (Citing Tr. at 192:4-15,

## PUBLIC VERSION

590:19-591:8; RX-386 at 110:8-111:3; RX-353C at Q. 115; JX-2 at 11:14-19.) Analog adds that Mr. Prasad's book includes conductive adhesive and single point TAB under the umbrella of Surface Mount Technology, neither of which require solder. (Citing RX-354C at Q. 164; RX-365; Tr. at 906:1-907:4.)

**Staff's Position:** Staff argues that, like the definition of "package" for the '231 patent, the construction here requires "a single, self-contained unit which encapsulates a device, and which provides: (1) protection for the device from the external environment, (2) an electrical connection between the device and the package, and (3) an electrical connection between the package and another circuit outside of the package, and which self-encapsulated unit is capable of being physically directly bonded to a separate substrate." Staff refers to its definition for the word "package" with respect to the '231 patent and says the same analysis applies here for the '089 patent

Staff contends that the claims of the '089 patent do not require a second-level connection made by soldering the abutting surfaces of the electrical component and the circuit board. (Citing JX-2 at claim 1.) Staff adds that the '089 patent also does not require the "package" to be suitable for automated assembly processes. Staff concludes that Dr. Bauer, Knowles' expert, agreed with these statements at the hearing. (Citing Tr. at 180:13-23.)

Staff says although the term "surface-mount" is used in the claims and throughout the specification, no explicit definition of this term is given. Staff continues that there is a brief mention of a solder reflow process for attachment; but this is merely a description of a preferred embodiment of the patent:

Referring to FIGS. 4 and 5, the final form of the product (shown without the cover 20) is a silicon condenser microphone package 10 which would most likely be attached to a end user's PCB 28 via a solder reflow process. FIG. 5 illustrates a

## PUBLIC VERSION

method of enlarging the back volume 18 by including a chamber 32 within the end user's circuit board 28.

(Citing JX-2 at 4:5-8.) Staff concurs with Analog that the use of the word “likely” means that the ‘089 patent was not limited to just that one technique and other processes were contemplated by the inventor.

Staff argues that the extrinsic evidence confirms that “surface-mount” is broader than the construction that Knowles proffers. Staff avers that Dr. Bauer testified that the following was a fair definition of the term “surface mount:” “surface mounting is the interconnection of components to the top conductive layer of a printed circuit board -- of a printed board without the use of through holes.” (Citing Tr. at 186:21-187:6.) Staff adds that this definition does not require automation or soldering, as Dr. Bauer testified. (Citing Tr. at 187:7-10; RX-367 at ADI00863318; RX-368 at ADI00863231.) Staff concludes that Dr. Bauer recognizes that the ordinary meaning of “surface-mount” does not impose the additional limitations that Knowles advocates.

Staff argues that other extrinsic evidence also shows that the term “surface mount” does not require a specific type of mounting process, *i.e.* a second level connection made by soldering abutting surfaces and made by an automated assembly process. (Citing RX-355C at Q. 152.) Staff contends that one of ordinary skill in the art would recognize that there are many different techniques for bonding a package to a board which do not include automation or the use of solder. (*Id.*)

Staff asserts that the evidence has shown that, at the time of the invention, one could use non-automated methods to mount a package to a substrate. (Citing RX-355C at Q. 152; RX-365; Tr. at 590:2-18.) Staff continues that it was known at the time of the invention that surface-

## PUBLIC VERSION

mountable packages could be mounted by hand. (Citing RX-470 at Q. 17; CX-589; Tr. at 592:25-593:11.)

Staff adds that the evidence has shown that solder is not a necessary condition to surface-mount a package, and conductive adhesive can be used to surface mount a package. (Citing Tr. at 192:1-19, 590:19-591:8.)

Staff argues that Knowles' construction improperly incorporates limitations that have no extrinsic support, other than its own expert, and says that such a position has been routinely rejected by the Federal Circuit. (Citing *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 981 (Fed. Cir. 1995); *Network Commerce, Inc. v. Microsoft Corp.*, 422 F.3d 1353, 1361 (Fed. Cir. 2005).)

Staff says that in the TEO ID it was noted that Knowles' proposed construction had no support in the record. (Citing TEO ID at p. 25.) Staff contends that the evidence has shown here that Knowles' same construction still has no support in the record in the permanent relief phase of the hearing.

In its reply brief, Staff argues that the only support Knowles cites for its position is "isolated snippets from scientific treatises which do not address the ordinary meaning of the term surface mountable." Staff contends that Knowles has created its own special definition of "surface-mountable package" which has no basis in the record intrinsic to the patent.

Staff says that Knowles seeks to add a limitation to its claim construction by requiring the package to be attached using reflow soldering techniques. Staff contends there is also no basis for importing this limitation.

Staff says Knowles cites to Dr. Tummala's Fundamentals Book (CX-580) which states that the main process steps for surface-mounting are solder paste printing, assembly of

## PUBLIC VERSION

components and reflow soldering. Staff argues that the book, “as Knowles’ acknowledges”, also states that hot-gas soldering, hot-bar soldering, and soft-beam soldering can be used to surface-mount a package. (Citing CX-580 at pp. 677-678.) Staff argues that Knowles’ “newly proposed construction” would exclude these techniques.

Staff contends that the claims of the ‘089 patent do not mention solder pads. (Citing JX-2 at claim 1.) Staff argues that, at best, in a preferred embodiment of the ‘089 patent, the solder pads are surface mounted via the reflow process. (Citing JX-2 at 6:8-11.)

**Construction to be applied:** “a single, self-contained unit which fully encloses a device, and which provides: (1) protection for the device from the external environment, (2) an electrical connection between the device and the package, and (3) an electrical connection between the package and another circuit outside of the package, and which self-contained unit is capable of being physically directly bonded to a separate printed circuit board without the use of through holes.”

First, I note that neither Analog nor Staff have argued that the term “surface mountable package” in the preamble is not a claim limitation; but Knowles has argued that it is. In the 629 investigation, I found that the term is a claim limitation. (CX-411; CX-412.) I will not repeat the discussion and rationale here; but I incorporate that entire discussion herein as though set forth verbatim, and I reaffirm my finding that the term “surface mountable package” in the preamble of claim 1 of the ‘089 patent is a claim limitation.

Second, there is no evidence in the record that the term “package” is defined differently in the ‘231 and ‘089 patents, and I reaffirm the definition of “package” set forth in section III.B.1, *supra*.

While the ‘089 patent refers multiple times to “surface mountable package,” it does not

## PUBLIC VERSION

provide clear guidance on the proper meaning of that term. Therefore, I find that it is appropriate to examine extrinsic evidence for further insight into the proper claim construction. *Key Pharm. v. Hercon Labs. Corp.*, 161 F.3d 709, 716 (Fed. Cir. 1998) (“[A] trial court is quite correct in hearing and relying on expert testimony on an ultimate claim construction question in cases in which the intrinsic evidence ( *i.e.*, the patent and its file history-the ‘patent record’) does not answer the question.”); *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1584 (Fed. Cir. 1996) (“No doubt there will be instances in which intrinsic evidence is insufficient to enable the court to determine the meaning of the asserted claims, and in those instances, extrinsic evidence...may also properly be relied on to understand the technology and to construe the claims.”)

Upon review of the record and having observed the testimony of the witnesses on this matter, I find that the evidence does not support the more narrow definition espoused by Knowles.

Dr. Bauer, Knowles’ expert, testified at the hearing that there are only two common or ordinary ways of attaching to a circuit board. He said they can either be through-hole components or surface mount soldering. He said, “[S]omehow you put solder paste down, you place the component and then you reflow that solder to create a solder joint that provides the connection between the package and the substrate.” (Tr. 205:2-23.) Dr. Bauer referred to the specification of the ‘089 patent, saying that it described that the microphone package would “most likely be attached to an end user’s PCB 28 via a solder reflow process.” (Tr. 211:2-5.) He did not state unequivocally that surface mounting in all cases requires automated mounting or solder reflow process. Dr. Tummala testified credibly that hand soldering is used in some applications. (Tr. 592:25-593:8; and RX-470, Q. 17 at 6-7.)

## PUBLIC VERSION

Dr. Bauer also admitted on cross-examination that the MEMS package substrate can extend beyond the boundaries of the cover, and the pads that make contact can also be beyond the boundaries of the cover. (Tr. 177:6-16.)

Dr. Bauer testified that to a person of ordinary skill in the art, the term “surface mounting” is equivalent to “surface mountable.” (Tr. 210:18-21.) The only actual published definition of the term surface mounting in the record is that of Dr. Michael Pecht, in Handbook of Electronic Package Design, published in 1991, which states: “[t]he interconnection of components to the top conductive layer of a printed board without the use of through holes.” (RX-368 at p. 832) Dr. Bauer agreed that this was a fair definition of the term surface mounting, with the single exception that a person of ordinary skill in the art “would probably not limit it to top.” (Tr. 186:9-187:6.)

The much quoted portion of the specification that treats the method of surface mounting says in relevant part:

Referring to FIGS. 4 and 5, the final form of the product (shown without the cover 20) is a silicon condenser microphone package 10 which would most likely be attached to a end user’s PCB 28 via a solder reflow process. FIG. 5 illustrates a method of enlarging the back volume 18 by including a chamber 32 within the end user’s circuit board 28.

(JX-2 at 4:5-8.) The use of the term “most likely” is a clear indicator that the language quoted is merely illustrative and does not serve to limit the claim.

Based upon the foregoing, I find that the correct construction for the term “surface mountable package” is “a single, self-contained unit which encapsulates a device, and which provides: (1) protection for the device from the external environment, (2) an electrical connection between the device and the package, and (3) an electrical connection between the package and another circuit outside of the package, and which self-contained unit is capable of

## PUBLIC VERSION

being physically directly bonded to a separate printed circuit board without the use of through holes.”

### 2. “Attached”

The term “attached” appears in asserted claims 1 and 7.<sup>11</sup>

**Knowles’ Position:** Knowles contends that the term should be construed as, “[o]rdinary meaning, namely, joined, connected or bound.” (Citing CX-554 at 4.)

Knowles contends that in the context of the claim language, the term “attached” is used to describe the relationship between the microphone<sup>12</sup> and the package body. Knowles says claim 1 indicates that the microphone is “attached to a surface formed on one of the first member or the second member.” (Citing JX-2 at 11:27-29.) Knowles continues that other dependent claims teach that the microphone can be attached to various locations on the surface of the first member or second member. (Citing JX-2 at 11:62-67; 12:1-6; 12:13-19; 12:28-35.) Knowles reasons that the claim language indicates that attached is used in its ordinary sense, that is, to express that two elements are joined, connected, or bound.

Knowles argues that the specification confirms that the plain meaning of “attached” found in the claim language is the proper construction, namely, to express that two elements are joined, connected, or bound. (Citing JX-2 at 1:51-52, 7:22-26.)

Knowles points to the prosecution history, asserting that arguments made by the inventor during the prosecution confirm that the plain meaning of “attached” found in the claim language

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<sup>11</sup> Although the term does not specifically appear in the remaining asserted claims 2, 15, 16, 17, 18 and 20, those claims each depend from claim 1. Therefore all of the elements in claim 1, including the term at issue here, are a part of those remaining asserted claims.

<sup>12</sup> The ‘089 patent consistently uses the term “transducer” rather than “microphone.” In the 629 investigation, I construed the term “transducer” to mean “microphone.” That construction was based upon the language of the preamble to claim 1 that requires, “[a] surface mountable package for containing a transducer, the transducer being responsive to sound pressure levels of an acoustic signal to provide an electrical output representative of the acoustic signals ...” and was further supported by the dictionary definition of the term microphone. The Commission upheld my construction of the term in the 629 investigation, and the parties have not disputed that construction in the instant case. Thus, construction of the term “transducer” remains “microphone.”

## PUBLIC VERSION

is the proper construction, which is to express that “two elements are joined, connected, or bound.” Knowles contends that these arguments make clear that the inventor did not require that “attached” should be limited to a configuration where the two elements must be bonded, glued, or otherwise permanently affixed to each other. Knowles asserts that, during prosecution, the examiner rejected the pending claims as anticipated by U.S. Patent No. 5,101,543 (“Cote”) Knowles says in distinguishing his invention from what was disclosed by Cote, the inventor noted that in his invention, the transducer was mounted or attached either to a surface on the first member or to a surface on the second member; in contrast, the transducer in Cote was mounted or attached to both members, quoting:

The electret transducer taught by Cote is not mounted or ***attached*** to a surface formed on one of first and second members. Instead, Cote teaches an electret microphone that mounts to an upper rim portion of a base (col. 3, line 30) and an annular shoulder of a cap (col. 3, line 58). Thus, Cote does not teach the claimed structure wherein the microphone transducer is ***attached*** to a surface of one of the first and second members.

(Citing CX-433 at p. 9 (emphasis added by Knowles).)

Knowles asserts that in Cote, the microphone components were held in place by pressure; that is, they were not bonded, glued, or otherwise permanently affixed to the cap and base, quoting:

An annual shoulder 61 formed on the inner surface of ***cap 24 presses the diaphragm 60 and spacer 58 against electret 54 and support ring 56*** to sandwich the board 40 between the upper rim of base 22 and spacer 58.

(Citing CX-341 at 3:57-61 (emphasis added by Knowles).)

Knowles concludes that when the inventor used the word “attached” in the context of how the microphone was placed in contact with the package body, he did not require that the attachment use any sort of permanent method. Knowles adds that “joined, connected or bound” accurately conveys the inventor’s intentions.

## PUBLIC VERSION

In its reply brief, Knowles says that Analog argues that “attached” should be construed to require some sort of permanent joining rather than “merely in contact.” (Citing RIB at 86-87.) Knowles says that Analog claims that “Knowles’ construction of mere contact is designed to avoid the prior art.” (Citing RIB at 87.) Knowles says that Analog is half-right in that regard – during prosecution, the applicant used the word “attached” in distinguishing prior art, namely, Cote, quoting: “[t]he electret transducer taught by Cote is not mounted or attached to a surface formed on one of first and second members.” (Citing CX-433 at p. 9 (emphasis added by Knowles).) Knowles refers to its initial brief at § IV.A.4.c, and says the transducer in Cote was sandwiched, but not permanently affixed, between the upper rim of the base and the annular shoulder of the cap. Knowles argues that the prosecution history dictates that “attached” should not be construed as requiring the use of any sort of glue or other adhesive.

Responding to Analog’s argument that in Cote, “[t]he upper and lower housings are attached together with epoxy at element 48,” Knowles counters that what Cote discloses is the use of an “epoxy seal 46.” (Citing CX-341 at 3:33-37; RIB 90.) Knowles cites an extrinsic source, saying “epoxy” refers to an organic chemical containing a group (epoxy group) that consists of an oxygen atom bound to two already connected atoms, usually carbon. (Citing Webster’s College Dictionary (1991).) Knowles contends that epoxies can be polymerized into “epoxy resins” that can be used for adhesives, but there is no suggestion in Cote itself, and Analog has offered no expert opinion, that the “epoxy seal 46” shown in Cote Fig. 1 is any kind of glue.

**Analog’s Position:** Analog says that the crux of the dispute between the parties is whether “attached” is broad enough to encompass terms like “touching,” “connected,” or “contacting,” without any force joining the two items together. Analog contends its construction

## PUBLIC VERSION

of “attached” is consistent with the plain and ordinary meaning of the term and with the use of “attached” in the specification.

Analog notes that the language of claim 1 of the '089 patent reads “the transducer being attached to a surface formed on one of the first member or the second member.” Analog quotes the specification to say, “[s]ome portion of the package fabrication is performed after the transducer 58 has been attached. In particular, the through hole formation, plating, and solder pad definition would be done after the transducer 58 is attached.” (Citing JX-2 at 7:22-26.) Analog asserts that the '089 patent specification discusses drilling a hole in the substrate member, plating, and solder pad definition after the transducer has been “attached” to the member. Analog contends that these steps require manipulation of the substrate member such that if the transducer was not fastened or affixed to the substrate in some way, it would likely get damaged. Analog conclude that the specification suggests that “attached” must mean “fastened or affixed.”

Analog argues that the extrinsic evidence also supports its construction, citing the American Heritage College Dictionary to define “attach” as “to fasten, secure, or join,” Merriam-Webster’s Collegiate Dictionary defines “attach” as “to make fast (as by tying or gluing),” and Oxford American Dictionary of Current English, published in 1999, defines “attach” as “fasten; affix; join.”<sup>13</sup>

Analog argues that Knowles’ construction of mere contact is designed to avoid the prior art. Analog asserts that Knowles’ proposed construction enlarges the scope of the claim language to include a scenario where two objects are merely in contact, but are not fastened, adhered, joined, or otherwise connected.

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<sup>13</sup> Analog avers that I said at the hearing that, if “relevant and material,” I would take judicial notice of the definition of “attached” and “surface.” (Citing Tr. at 641:23-642:5.)

## PUBLIC VERSION

**Staff's Position:** In Staff's view, the parties' constructions appear to be consistent. To the extent, however, that Knowles' construction would merely allow the transducer to touch or contact, the Staff does not agree with Knowles' construction.

Staff refers to the claim language, saying the use of the word "attached" in the context of the other limitations in claim 1 strongly suggests that "attached" means "fastened or affixed." Staff reasons that if "attached" merely meant touching or contacting, the transducer could fall off the substrate which defeats the purpose of having a "package." Staff concludes that the claim language makes clear that the "transducer" must be securely attached in order to have a "package" that can allow the transducer to communicate with the outside world.

Staff says the specification confirms this meaning, citing Figures 27-29, to depict embodiments of the invention where the portion of the surface to which the transducer is mounted includes a retaining ring 84. (Citing JX-2 at 7:29-31.) Staff asserts that the patent states that "[t]he retaining rings 84 prevent the wicking of an epoxy 86 into the transducer 58 from flowing into the acoustic port or aperture." (Citing JX-2 at 7:31-33.) Staff says that the patent further discloses that "the transducer is added so that it overlaps the epoxy 86 and the retaining ring 84." (Citing JX-2 at 7:39-41.) Staff concludes that the use of epoxy, which is a type of glue, demonstrates that the '089 patent contemplates a fixed attachment between the transducer and the surface of the substrate.

Staff argues that the extrinsic evidence is consistent with the Staff's construction. Staff cites "three definitions provided by several dictionaries" include the following: "to fasten, secure, or join;" "to make fast (as by tying or gluing); and "fasten, affix, join." (Citing RX-358;

## PUBLIC VERSION

RX-359; RX-360.)<sup>14</sup> Staff concludes that each of these definitions describe the type of mounting that exists between the transducer and the surface of the substrate.

In its reply brief, Staff reiterates parts of its initial post-hearing brief. Staff says that Knowles contends that the prosecution history suggests that the applicant used the term “attached” to include components held in place by pressure. (Citing CIB at 87.) Staff contends that this interpretation is entirely inconsistent with the specification. (Citing JX-2.)

Staff adds that the prosecution history does not clearly convey that the applicant intended the term “attached” to merely mean held in place by pressure. Staff says Knowles grounds its argument on the fact that Cote, itself, discloses that the microphone is “sandwiched” between the upper rim portion of the base and the annular shoulder of the cap. (Citing CIB at 87.) Staff says the applicant, when distinguishing the invention over the Cote reference “described that ‘sandwiching’ as an attachment.” Staff concludes, in Knowles’ view, “attached” here does not mean a fixed attachment.

Staff argues that the foregoing passage from the prosecution history is ambiguous at best. Staff asserts that when the file history is considered as a whole, the statement relied on by Knowles falls far short of the “clear and unambiguous language, *i.e.* manifest exclusion or express disclaimer” required to depart from the ordinary meaning of “attached.” (Citing *Certain Laser Bar Code Scanners*, Initial Determination at 52 (Jan. 29, 2007).)

Staff adds that the statement on which Knowles relies was not even used by the applicant to distinguish the patented invention from Cote. Staff says the applicant distinguished the claimed invention because Cote taught mounting a transducer to both the cover and the substrate. (Citing JX-4, Amendment dated November 9, 2006 at 8-9.) Staff alleges that the applicant did

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<sup>14</sup> These exhibits were not entered into evidence; but Staff requests that the I take judicial notice of the definitions provided in these exhibits.

## PUBLIC VERSION

not present in argument as to how the transducer was mounted. (*Id.*) Staff concludes that “attached” should be construed to mean “fastened or affixed.”

**Construction to be applied:** “fastened, affixed or joined”

The term “attached” is used in claims 1 and 7 to describe the relationship between the transducer and “a surface formed on one of the first member or the second member” within the chamber of the MEMS package. (JX-2 at 11:27-29, 11:65-67.) The specification describes, in one preferred embodiment, that the “transducer 12 (MEMS device) ... is ‘bumpbonded’ and mounted face down.” (JX-2 at 3:61-63.) In another embodiment, the specification teaches, “the bottom portion 50 is the component of the package to which the transducer 58 is primarily mounted.” (JX-2 at 5:41-43.)

Knowles and Analog differ on whether or not intrinsic evidence is sufficient to establish the construction of this term. Knowles argues that intrinsic evidence is adequate and points, in part, to the prosecution history. Knowles attempts to establish that the applicant distinguished the Cote reference by saying, “[t]he electret transducer taught by Cote is not mounted or **attached** to a surface formed on one of first and second members.” Knowles says the transducer in Cote was sandwiched, but not permanently affixed, between the upper rim of the base and the annular shoulder of the cap.” Assuming Knowles has accurately quoted the applicant’s argument during prosecution, it appears to contradict Knowles’ argument that “attached” should not be construed as requiring the use of any sort of glue or other adhesive.

Nevertheless, Knowles omitted important parts of the argument from its quote. The applicant took the position that, “Cote teaches an electret microphone that mounts to an upper rim portion of a base (col. 3, line 30) and an annular shoulder of a cap (col. 3, line 58). Thus, Cote does not teach the claimed structure wherein the microphone transducer is attached to a

## PUBLIC VERSION

surface of one of the first and second members.” (CX-433 at p. 9.) The language omitted by Knowles clearly shows that the applicant’s issue was not the manner of attaching the transducer to a surface; rather, it was that the invention in Cote was attached to two separate surfaces and, therefore, could not be said to be the same as being attached to a surface of *one* of the first and second members. (*Id.*)

It appears clear to me from the intrinsic evidence that the ‘089 patent’s use of “attached” is intended to mean something more than merely in contact with a surface, as in being placed on a surface without further action to connect the transducer to the surface upon which it rests. Clearly the ‘089 patent uses the word attached to mean somehow affixed, fastened or joined to the surface of one of the first member or the second member.

Assuming *arguendo* that one were to find the intrinsic evidence insufficient, however, three separate references provide support for the foregoing definition. I take notice that *Webster’s Collegiate Dictionary, 10<sup>th</sup> Edition, 1993* defines “attach” to mean “to make fast (as by tying or gluing);” *The American Heritage College Dictionary, 4<sup>th</sup> Edition, 2002*, defines the term as “to fasten, secure or join;” and *The Oxford American Dictionary of Current English, 1999*, states that the term means, “fasten; affix; join.”<sup>15</sup>

### **3. “Surface”/“Surface Formed On One Of The First Member Or Second Member”**

The term “Surface”/“Surface Formed On One Of The First Member Or Second Member” appears in asserted claim 1.<sup>16</sup>

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<sup>15</sup> At the hearing, the parties were notified that I would take notice of dictionary definitions if they were deemed by me to be relevant and material, and that those definitions might include the ones cited herein. There were no objections by the parties. (Tr. at 641:23-643:2.)

<sup>16</sup> Although the term does not specifically appear in the remaining asserted claims 2, 7, 15, 16, 17, 18 and 20, those claims each depend from claim 1. Therefore all of the elements in claim 1, including the term at issue here, are a part of those remaining asserted claims.

## PUBLIC VERSION

**Knowles' Position:** Knowles has proposed that “surface” / “surface formed on one of the first member or the second member” be construed as: “[t]he principal or predominant uppermost layer portion of the first member or second member, which is not an upper rim or annular shoulder.” (Citing CX-554 at 4.)

Knowles argues that in the context of the claim language, the term “surface formed on one of the first member or the second member” is characterized by its placement and location in relationship with other components of the claimed package, quoting:

the transducer being attached to a surface formed on one of the first member or the second member and the transducer residing within the chamber; the surface being formed with at least one patterned conductive layer ...

(Citing JX-2 at 11:28-34.)

Knowles contends that dependent claims use the surface as a reference point for locating the aperture. Knowles cites for example, claim 7, saying it “teaches a configuration where the surface is formed on the same surface as the aperture, while Claim 9 teaches a configuration where the surface is formed on one member and the aperture is formed on the other member.”

(Citing JX-2 at 11:62-67, 12:7-12.)

Knowles argues that, based on the claim language, “the surface formed on one of the first member or the second member” describes a region on one of the package members to which the microphone is attached and upon which a patterned conductive layer is formed.

Knowles asserts that the specification further discloses what the inventor intended by a “surface formed on one of the first member or the second member.” Knowles says in every figure showing attachment of the microphone, the microphone is attached either to the top member or to the bottom member of the package, but never both. Knowles says that in Figs. 1-3, 7-8, and 23-26, the microphone is attached to the bottom member; in Figs. 9-10, the microphone

## PUBLIC VERSION

is attached to the top member. Knowles argues in some embodiments, there is a hole in that portion of the surface directly underneath the microphone; but this does not change the planar nature of the surface.

Knowles asserts that the specification notes that the substrate (referring to the member to which the microphone is attached) can be built out of a panel of printed circuit board material (which Knowles calls “a flat material”), “taking advantage of economies of scale in manufacturing.” (Citing JX-2 at 3:43-46.) Knowles says the specification distinguishes the prior art based on this benefit, quoting: “[t]he typical lead frame for a similarly functioning package would contain between 40 and 100 devices connected together. The present disclosure would have approximately 14,000 devices connected together (as a panel).” (Citing JX-2 at 3:16-19.) Knowles adds, the specification describes the processing steps for building the substrate – which discloses that the substrate is built by laminating flat layers of conductive and non-conductive materials. (Citing JX-2 at 7:56-9:30.)

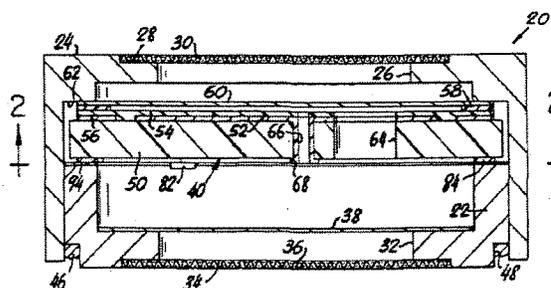
Knowles contends that, because “every embodiment shows the use of a single flat substrate to which the microphone will be attached, and because the specification makes it clear that using a flat substrate has distinct advantages over the prior art”, “the specification read as a whole suggests that the very character of the invention requires [a flat substrate] the limitation be a part of every embodiment.” (Citing *Alloc*, 342 F.3d at 1370.)

Knowles asserts that arguments made by the inventor during prosecution confirm that the inventor considered it an integral part of his invention that (a) the microphone be attached either to the substrate or to the cover, but not both, and (b) the microphone be attached to a flat surface on a flat substrate. Knowles says that during the prosecution of the application that would become the ‘089 patent, the examiner rejected the pending claims as anticipated by Cote.

## PUBLIC VERSION

Knowles states that Cote discloses an electret microphone “sandwiched” between an “upper rim” of the package base and an “annular shoulder” of the package cover:

Cote ‘543 (CX-341) Fig. 1:



Knowles says that in successfully traversing the rejection, the inventor pointed out the distinction between his invention and what was disclosed by Cote, quoting:

The electret transducer taught by Cote is not mounted or attached to a surface formed on one of first and second members. Instead, Cote teaches an electret microphone that mounts to an upper rim portion of a base (col. 3, line 30) and an annular shoulder of a cap (col. 3, line 58). Thus, Cote does not teach the claimed structure wherein the microphone transducer is attached to a surface of one of the first and second members.

(Citing CX-433 at p. 9 (emphasis added by Knowles).)

Knowles argues that the foregoing statement “provides evidence of how the PTO and the inventor understood the patent,” (Citing *Phillips*, 415 F.3d at 1317), and that understanding is that the surface is formed on one member or the other (but not both) and that the member upon which this surface is located is flat.

In its reply brief, Knowles contends that Analog ignores fundamental tenets of claim construction, when it argues that surface, in the context of “surface formed on one of the first member or second member,” should be construed according to its ordinary meaning, fully ignoring the prosecution history. Knowles argues that the court in *Phillips* pointed out that, “the prosecution history can often inform the meaning of the claim language by demonstrating how the inventor understood the invention and whether the inventor limited the invention in the

## PUBLIC VERSION

course of prosecution, making the claim scope narrower than it would otherwise be.” (Citing *Phillips*, 415 F.3d at 1317.) Knowles refers to CIB at § IV.A.5 for a complete discussion of how the applicant purposefully distinguished his invention from the prior art, “making the claim scope narrower than it would otherwise be.” Knowles argues that by distinguishing his invention from a prior art reference that sandwiched the microphone components between a raised rim of the base and an annular shoulder of the cap, the inventor clarified that in his invention, the microphone always sat on a flat surface (as shown in every embodiment of the specification).

Knowles says that Analog argues that Fig. 1 of the ‘089 patent shows a multi-tiered surface; but it does not. Knowles asserts that what is shown is an example of surface where “the principal or predominant layer portion” is flat, that is, “not an upper rim or annular shoulder.” Knowles points to Fig. 6, which, Knowles says, shows the top view of the surface, the back volume is a small portion of the upper surface 19, and that the upper surface 19, where the patterned conductive layer is formed, is the “principal or predominant layer portion.”

**Analog’s Position:** Analog contends that Dr. Bauer admits that Analog’s proposed construction is the ordinary meaning of “surface.” (Citing Tr. at 948:3-8.) Analog says that the American Heritage College Dictionary defines “surface” as “the outer or topmost boundary of an object.” Analog continues that Merriam-Webster’s Collegiate Dictionary defines “surface” as “the exterior or upper boundary of an object or body,” and the Oxford American Dictionary of Current English, published in 1999, defines “surface” as “the outside of a material body” or “the outward aspect of anything.” Analog argues that nothing in the intrinsic evidence further instructs its definition.

Analog contends that Knowles’ proposed construction of “surface” flies in the face of the claim language and the canons of claim construction. Analog says that Knowles construes

## PUBLIC VERSION

“surface” in “surface mountable” differently than “surface” as in “surface formed on one of the first member and the second member” – even though both words are in the same claim. (Citing Tr. at 216:1-12; CX-554 at 4.) Analog alleges that Knowles provides yet another construction for the term in claim 16 (which depends from claim 1). (*Id.*) Analog argues that Knowles’ “three drastically different constructions for the same term within the same claim” does not follow any canon of claim construction. (Citing *Research Plastics, Inc. v. Fed. Packaging Corp.*, 421 F.3d 1290, 1296-97 (Fed. Cir. 2005); *Digital Biometrics, Inc. v. Identix, Inc.*, 149 F.3d 1335, 1345 (Fed. Cir. 1998).)

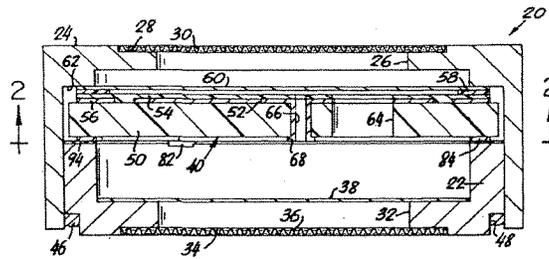
Analog says that Knowles’ proffered construction seems to change depending on whether the “surface” is inside the package (the “surface” in claim 1 and claim 7), outside the package (the “surface” in the dependent limitation of claim 16), or a surface to which the package is bound (“surface mountable”). Analog argues that no person of ordinary skill in the art would understand “surface” to mean three different things. Analog asserts that the dependent limitation of claim 16 states that the “surface” that it refers to is the “outside surface.” Analog says the word “outside” does not change the meaning of “surface” to one of ordinary skill – it only changes the location of the “surface.” Analog adds whether the surface is the “surface” of the first-level connection or the “surface” of the second-level connection does not change the definition.

Analog says that Knowles is willing to adopt Analog’s ordinary meaning construction of “surface” for a dependent claim (claim 16); but is not willing to adopt it for the independent claim (claim 1) and another dependent claim (claim 7). Analog says Knowles justifies its dual definition based on a manipulation of the prosecution history, arguing that when the patentee stated that Cote was not invalidating because the transducer was attached “to an upper rim

PUBLIC VERSION

portion of a base and an annular shoulder of a cap,” the patentee meant “to an upper rim portion of a base or an annular shoulder of a cap.” (Comparing RX-377 at ADI00863202, with CX-554 at 4 (emphasis added by Analog).) Analog concludes that the prosecution history provides no support for Knowles’ proposed constructions of “surface” in claim 1.

Analog states that Cote teaches a package for an electret condenser microphone, illustrated below.



(Citing CX-341 at Fig. 1.) Analog asserts that the microphone is electrically attached to a plate made out of PCB material, element 40 in Figure 1. (*Id.*) Analog says the transducer and the PCB are between an upper housing portion 24 and a lower housing portion 22. (Citing CX-341 at 3:15-21.) Analog continues that the upper and lower housings are attached together with epoxy at element 48. (Citing CX-341 at 3:35-37.) Analog concludes that the transducer is attached to two members of the package, the circuit board 40 (or the upper rim of the lower housing portion 22) and the upper housing portion 24.

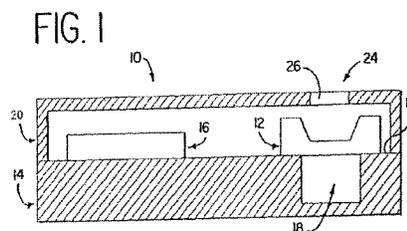
Analog argues in demonstrating why Cote does not anticipate claim 1 of the '089 patent, the patentee stated that, in Cote, the transducer was attached “to an upper rim portion of a base and an annular shoulder of a cap.” (Citing RX-377 at ADI00863202 (emphasis added by Analog).) Analog says the transducer was attached to two members, and not just one member, as the claim language requires. (Citing Tr. at 962:8-11; JX-2 at 11:28-30.) Analog says that the patentee concluded that Cote does not teach the “transducer attached to a surface of *one of the*

**PUBLIC VERSION**

*first and second members.*” (Citing RX-377 at ADI00863202 (emphasis added by Analog).)

Analog asserts that Knowles admits that Mr. Minervini does not define “surface” explicitly. (Citing Tr. at 952:20-24.) Analog argues that Knowles takes a snippet from the prosecution history and tries to twist it to its advantage. Analog alleges where the prosecution history says that Cote does not invalidate because the transducer is attached “to an upper rim portion of a base and an annular shoulder of a cap,” Knowles changes the conjunction in its construction, arguing that the patentee meant “to an upper rim portion of a base or an annular shoulder of a cap.” (Comparing RX-377 at ADI00863202, with CX-554 at 4 (emphasis added by Analog).) Analog contends that the change of “and” to “or” in Knowles’ proposed construction misrepresents the prosecution history.

Analog adds that, contrary to Knowles’ argument, Mr. Minervini never distinguished Cote because the substrate to which the transducer was attached was not flat; the word “flat” is never mentioned in the prosecution history. (Citing *N. Telecom Ltd. v. Samsung Elec. Co.*, 215 F.3d 1281, 1293-95 (Fed. Cir. 2000).) Analog argues that, contrary to Dr. Bauer’s assertion, the ’089 patent embraces a tiered or non-flat surface to which the transducer is bound. (Citing CX-610 at Q. 107.) Analog includes Figure 1 of the ’089 patent:



Analog states that, in Figure 1 of the ’089 patent, the substrate member, substrate 14, is a tiered structure, with the microphone resting on the top tier. (Citing JX-2 at Figs. 1-5, 3:49-54.)

## PUBLIC VERSION

**Staff's Position:** Staff is of the view that the term “surface” should be consistently construed for both phrases to mean “outermost boundary or face.” Staff says that Knowles wishes to construe these two phrases inconsistently based on a misinterpretation of the prosecution history.

Staff points to the language of claim 1, reciting: “the transducer being attached to a surface formed on one of the first member or the second member,” “the surface being formed with at least one patterned conductive layer,” and “an outside surface of the surface mountable package comprising a plurality of terminal pads.” Staff says these limitations all require things to either be formed on, comprise, or attached to a “surface.” Staff reasons to do so, the “surface” must necessarily be the outermost boundary or outer face. Staff says nothing in the claim language states that the “surface” cannot be a rim or a shoulder, and in fact, these two terms are not even used in the claims.

Staff asserts that the Abstract states “the substrate includes an upper surface transducer unit is[sic] attached to the upper surface of the substrate . . . .” (Citing JX-2 at Abstract.) Staff reasons that the specification also requires the transducer to be attached to the “upper” or “outermost” surface. Staff says that the specification does not mention that the “surface” cannot be a rim or a shoulder.

Staff says that Knowles argues for a limited construction of “surface formed on one of the first member or second member” because, in Knowles’ view, this configuration was distinguished by the applicant during the prosecution of the ‘089 patent. (Citing Tr. at 952:5-8.) Staff contends that this “distinguishing” statement was made in the context of the Cote patent, which was used by the United States Patent Office to reject the then-pending claims in the ‘089

## PUBLIC VERSION

patent. Staff asserts that in responding to this rejection over Cote, the applicant stated the following:

The electret transducer taught by Cote is not mounted or attached to a surface formed on one of the first or second members. Instead, Cote teaches an electret microphone that mounts to an upper rim portion of a base (col. 3, line 30) and an annular shoulder of a cap (col. 3, line 58). Thus, Cote does not teach the claimed structure wherein the microphone transducer is attached to a surface of one of the first and second members.

Cote does not teach or suggest that the transducer is mounted to a surface. As such, Cote cannot teach the further electrical claimed connection between the transducer and the at least one patterned conductive layer formed on the surface to which it is attached. In fact, Cote fails to teach or suggest the formation of a patterned conductive layer associated with any part of the described electret microphone.

(Citing JX-4, Amendment dated November 9, 2006 at 8-9.) In the Staff's view, Knowles' interpretation of this excerpt of the prosecution history goes too far.

Staff argues there is nothing in the above passage that shows an intent to disclaim any configurations where a transducer is attached to a raised shoulder or rim of the first or second member. (Citing RX-354C at Q. 190.) Staff says all the applicant disclaimed is configurations where the transducer is attached to both the first member and the second member, quoting "Cote teaches an electret microphone that mounts to an upper rim portion of a base (col. 3, line 30) and an annular shoulder of a cap (col. 3, line 58)." (Citing JX-4, Amendment dated November 9, 2006 at 8-9.) Staff contends, because Cote did not teach a transducer (or microphone) attached to either the first member or second member, as required by Claim 1, the applicant contended that Cote could not anticipate the then-pending claims. In Staff's view, Knowles's attempt to broaden this excerpt to exclude all configurations where a transducer is mounted to both the top and the bottom and to multi-tiered surfaces on the top and bottom should be rejected as it has no basis in the prosecution history. (Citing RX-354C at Q. 190.)

## PUBLIC VERSION

Staff next focuses on extrinsic evidence, saying that several dictionaries have defined this term to mean “the exterior or upper boundary of an object or body,” the outside of a material body.” (Citing RX-359, RX-360.)<sup>17</sup>

In its reply brief, Staff argues Knowles imports unnecessary limitations into the claims as it requires a “surface” not to be a upper rim or annular shoulder. Staff says Knowles, relying on the specification, contends that every figure depicting the member to which the microphone is attached, shows a flat surface. (Citing CIB at 89.) Staff says Knowles further contends that the specification discloses that the substrate can be made out of printed circuit board material, which is also flat. (Citing CIB at 90.) Staff argues that Knowles reliance on these embodiments is misplaced.

Staff argues that the Federal Circuit has routinely held that it is improper to import limitations from an embodiment in the specification where the meaning of the term has not been expressly limited in the context of the patent. (Citing *Phillips*, 415 F.3d at 1323; *JWW Enters. v. Interact Accessories, Inc.*, 424 F.3d 1324, 1335 (Fed. Cir. 2005).) Staff contends that nothing in the ‘089 patent specification clearly shows that the patentee intended for the claims to be confined to the disclosed embodiments. Staff asserts that the ‘089 patent expressly states that it is not limited to the embodiments disclosed in the specification and is only limited by the scope of the claims. (Citing JX-2 at 11:14-18.)

Staff argues that to the extent Knowles seeks to use the prosecution history to import a requirement that the “surface” must be flat, nothing in the record “clearly and unmistakably” supports such an argument. (Citing *Purdue Pharma L.P. v. Endo Pharmaceuticals Inc.*, 438 F.3d 1123, 1136 (Fed. Cir. 2006).)

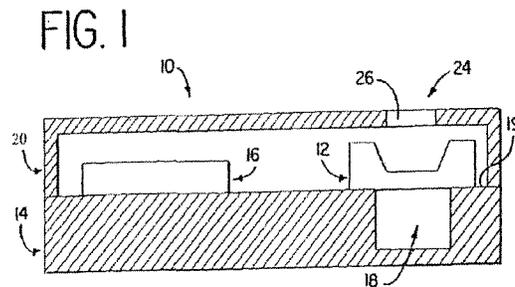
**Construction to be applied:** “outermost boundary or face”

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<sup>17</sup> Staff requests that I take judicial notice of the dictionary definitions.

## PUBLIC VERSION

I find that the intrinsic evidence does not provide any special meaning for “surface,” and the plain and ordinary meaning should apply. Analog and Staff are correct when they contend that nothing in the ‘089 patent suggests that the term should be modified to eliminate a rim or shoulder from this construction. In fact, Figure 1 of the ‘089 patent shows the substrate 14 to be a tiered structure, with the microphone resting on the top tier. (JX-2 at Fig. 1, 3:49-54 (“The back volume 18 may be formed by a number of methods, including controlled depth drilling of an upper surface 19 of the substrate 14 to form a recess over which the silicon condenser microphone is mounted (FIG. 1).”) Figure 1 is displayed, below:



I note that, as Staff argues, the language of claim 1, recites: “the transducer being attached to a surface formed on one of the first member or the second member,” “the surface being formed with at least one patterned conductive layer,” and “an outside surface of the surface mountable package comprising a plurality of terminal pads.” Claim 1 of the ‘089 patent clearly intends that the transducer, among other things, be formed on, or attached to, a “surface.” To do so, the “surface” must necessarily be the outermost boundary or face.

After examining the claim language, the specification and the prosecution history, it is clear to me that the term “surface” as used in the asserted claims of the ‘089 patent should be given its plain and ordinary meaning, to wit: “outermost boundary or face.” I find that examination of the extrinsic evidence (such as expert testimony) offered by the parties is

## PUBLIC VERSION

unnecessary because the intrinsic evidence is sufficient to understand the meaning of “surface.” *Vitronics Corp.*, 90 F.3d at 1583 (“In most situations, an analysis of the intrinsic evidence alone will resolve any ambiguity in a disputed claim term. In such circumstances, it is improper to rely on extrinsic evidence.”)

#### 4. “Patterned Conductive Layer”

The term “patterned conductive layer” appears in asserted claims 1, 15, and 16.<sup>18</sup>

**Knowles’ Position:** Knowles has proposed that “patterned conductive layer” be construed as: “[o]rdinary meaning, namely, a layer of material, the layer being less than the entire surface on which it sits, suitable for carrying electrical current.” (Citing CX-554 at 4.)

Knowles argues that, in the context of claim 1, the patterned conductive layer is characterized by its location and its function. Knowles says first, the patterned conductive layer is formed on the surface of the first or second member; which is the same surface to which the microphone is attached. (Citing JX-2 at 11:27-32.) Knowles asserts that the patterned conductive layer is electrically coupled both to the microphone within the package and to a plurality of terminal pads on the outside of the package. (Citing JX-2 at 11:32-36.) Knowles says in non-asserted dependent claim 15, the patterned conductive layer comprises terminal pads which provide the electrical connection between the microphone and the exterior of the package. Knowles continues, in asserted dependent claim 16, the patterned conductive layer is electrically coupled to a metalized region on the exterior of the package. Knowles concludes that, based on the claim language, the patterned conductive layer is on the top surface of the package

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<sup>18</sup> Although the term does not specifically appear in the remaining asserted claims 2, 7, 17, 18 and 20, those claims each depend from claim 1. Therefore all of the elements in claim 1, including the term at issue here, are a part of those remaining asserted claims.

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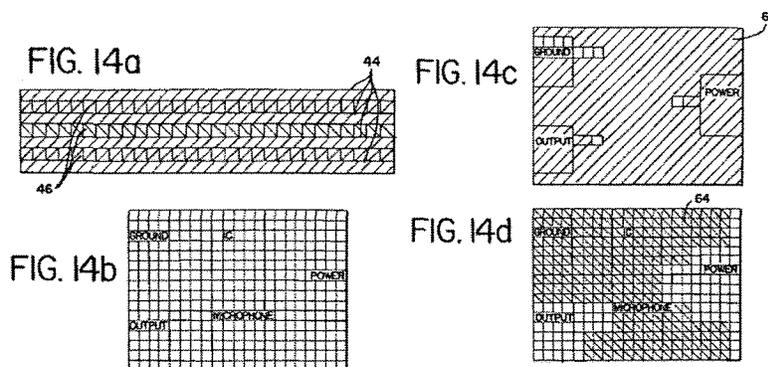
component to which the microphone is attached, and it provides electrical pathways used by the package.

Knowles argues that the specification further explains the meaning of a patterned conductive layer, quoting:

[T]he conductive layers 44 of the bottom portion 50 may be patterned to form circuitry, ground planes, solder pads, ground pads and plated through hole pads. As shown in FIGS. 14-18, there may be additional alternating conductive layers 44, non-conductive layers 46, and environmental protective membranes 62 as the package requires. Alternatively, some layers may be deliberately excluded as well. The first non-conductive layer 46 may be patterned so as to selectively expose certain features on the first conductive layer 44.

(Citing JX-2 at 5:49-58.)

Knowles includes multiple figures from the specification to illustrate the patterned conductive layer, and says that Figs. 14(a) through 14(d) show the layering in the bottom member:



Knowles asserts that the specification describes how these layers are formed and their purpose in the package, quoting:

Referring to FIGS. 14a through 14d, the bottom portion 50 comprises a laminated, multi-layered board including layers of conductive material 44 deposited on layers of non-conductive material 46. Referring to FIG. 14b, the first layer of conductive material is used to attach wire bonds or flip chip bonds. This layer includes etched portions to define lead pads, bond pads, and ground pads. The pads would have holes drilled through them to allow the formation of plated through-holes.

## PUBLIC VERSION

(Citing JX-2 at 5:59-67.) Knowles says similarly, Fig. 6 shows the top layer of the substrate.

(Citing JX-2 at 4:15-19.)

Knowles argues it is clear from the specification that the patterned conductive layer is formed as part of a multi-layered circuit board. Knowles states that a portion of the surface has conductive material that can be used for making electrical pathways – circuitry, ground planes, solder pads, ground pads and plated through hole pads – within the package.

Knowles contends that the prosecution history does not reveal any further substantive description of the meaning of “patterned conductive layer,” nor does it suggest that the inventor intended to deviate from the ordinary meaning of that term.

Knowles concludes that the intrinsic evidence is unambiguous, therefore it is unnecessary to turn to extrinsic evidence. (Citing *Vitronics*, 90 F.3d at 1583.)

**Analog’s Position:** Analog says the parties’ constructions are largely the same; but contends that the Commission should adopt Analog’s proposed construction “because it is most consistent with the claim language and with the Commission’s previous construction of claim terms in Inv. No. 337-TA-629.” (Citing RX-56 at 18 (construing “layer” as a “single thickness of material”).)

**Staff’s Position:** Staff says that the parties don’t appear to dispute the term “patterned conductive layer,” and the proffered constructions are largely the same. (Citing RPHB at 86.)

**Construction to be applied:** “a single layer of material, the layer being less than the entire surface on which it sits, suitable for carrying electrical current”

The parties do not materially disagree on the proper construction of this term, and it will be given its plain and ordinary meaning.

The specification provides some insight into the meaning of this term when it explains:

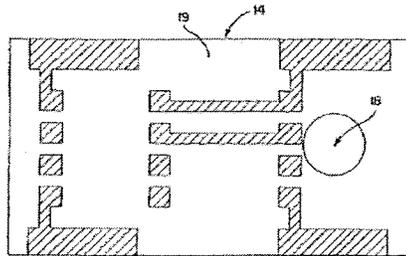
## PUBLIC VERSION

[T]he conductive layers 44 of the bottom portion 50 may be patterned to form circuitry, ground planes, solder pads, ground pads and plated through hole pads. As shown in FIGS. 14-18, there may be additional alternating conductive layers 44, non-conductive layers 46, and environmental protective membranes 62 as the package requires. Alternatively, some layers may be deliberately excluded as well. The first non-conductive layer 46 may be patterned so as to selectively expose certain features on the first conductive layer 44.

(JX-2 at 5:49-58.) Thus, the “patterned conductive layer” is structured so that less than the entire surface on which it sits (*i.e.* a “portion” of the layer) forms circuitry that is “conductive” or suitable for carrying electrical current.

Figure 6 of the '089 patent shows the top layer of the substrate:

JX-2 Fig. 6:



In describing one embodiment of the invention, the specification teaches, “the housing 42 generally comprises alternating layers of conductive and non-conductive materials 44, 46. The nonconductive layers 46 are typically FR-4 board. The conductive layers 44 are typically copper.” (JX-2 at 4:15-19.)

Based upon the foregoing, I find that the term “patterned conductive layer” shall be given its plain and ordinary meaning, which is “a single layer of material, the layer being less than the entire surface on which it sits, suitable for carrying electrical current”

### 5. “Volume”

The term “volume” appears in asserted claim 1.

## PUBLIC VERSION

**Knowles' Position:** Knowles has proposed that “volume” be construed as: “[a] space defined by the transducer and one of the first member or the second member.” (Citing CX-554 at 4.)

Knowles' argues that its proposed construction tracks the construction adopted the 629 investigation and the TEO ID.

Knowles contends in the context of claim 1, the volume is expressly described as “being defined by the transducer and one of the first member or the second member, the volume being acoustically coupled to the transducer.” (Citing JX-2 at 11:38-40.) Knowles says the transducer is “attached to a surface on one of the first member or the second member.” Knowles states that while “volume” appears in only one of the dependent claims (non-asserted claim 15), other dependent claims reference the region defined by the microphone and one of the first member or the second member. Knowles avers that claim 7 teaches a configuration where the microphone sits over the aperture formed in one of the first or second members, claim 8 teaches a configuration where the microphone is mounted adjacent to the aperture formed in the same member, and claim 9 teaches a configuration where the microphone is mounted in the opposite member as the aperture. (Citing JX-2 at 11:62-67-12:1-12.) Knowles concludes that, as used in claim 1, a volume is “exactly what it says it is,” namely a space between the microphone and the member to which it is attached, whether or not there is an aperture in that member directly under the microphone.

Knowles argues that the specification confirms that the plain meaning of “volume” found in the claim language is the proper construction. Knowles says consistent with the claims, the specification describes an embodiment where the microphone is mounted over the aperture formed in one of the first or second members, and another embodiment where the microphone is

PUBLIC VERSION

mounted in the opposite member as the aperture. (Citing JX-2 at 7:15-28.) Knowles adds that Figs. 26 and 27 reflect the former, and Figs. 23 and 28 reflect the latter:

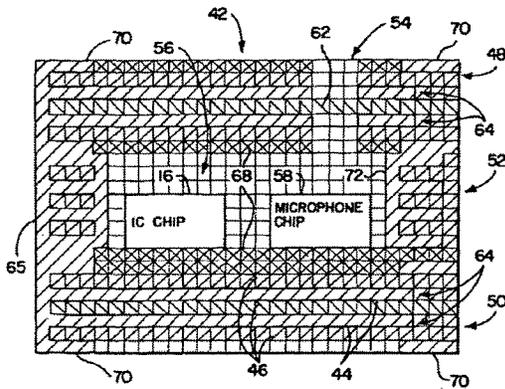


Fig. 23

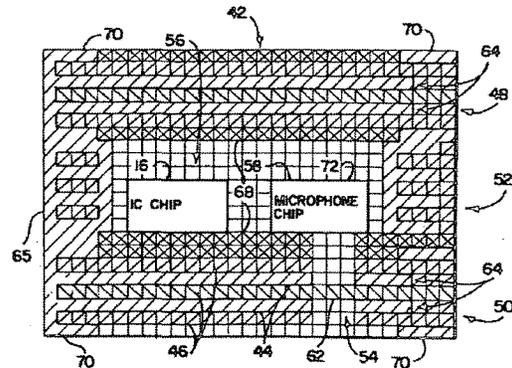


Fig. 26

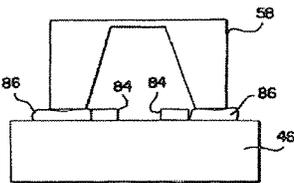


Fig. 28

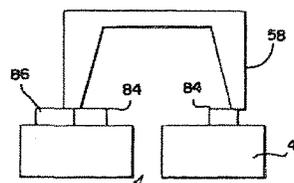


Fig. 27

Knowles says that Analog seeks to add the further limitation that the volume must be enclosed. (Citing CX-554 at 4.) Knowles continues under this proposed construction, volume would be limited to a “back volume.” (Citing RX-354 at Q. 36.) Knowles concedes that the word “volume” only appears in the specification with the qualifier “back;” but Knowles argues it is inaccurate to import such a limitation. Knowles says first, the inventor expressly chose the word “volume,” and not “back volume,” to teach his invention in claim 1. Knowles says second, the drawings show configurations where the only space defined by the microphone and the member to which it is attached also has an aperture, keeping it from being fully “enclosed.” Knowles continues third, the specification describes the back volume in one of the embodiments as being “formed by using the air cavity created by laminating the bottom portion 50 and the top portion 48 together” – in other words, defined by both the first member and the second member. Knowles cites the Federal Circuit as having noted, a construction that would exclude some

## PUBLIC VERSION

embodiments (and for that matter, exclude some claims) is “rarely correct.” (Citing *Verizon Servs.*, 503 F.3d at 1305.)

Knowles contends that the prosecution history does not reveal any further substantive description of the meaning of a volume, nor does it suggest that the inventor intended to deviate from the ordinary meaning of that term.

Knowles says that the extrinsic evidence confirms that Knowles’ proposed construction of “volume” is correct. Knowles cites the testimony of Dr. Egolf, one of its experts. Knowles said Dr. Egolf first explained the basic function of a condenser microphone of the type disclosed in the ‘089 patent. (Citing CX-461C at Q. 17.) Knowles avers that Dr. Egolf explained that such an encased microphone, in order to function, requires a “back volume” (also known as a “back chamber” or “back cavity”) and a “front volume” (also know as a “front chamber” or “front cavity”). (Citing CX-461C at Q. 19.) Knowles says Dr. Egolf said when placed in an enclosure, the diaphragm and backplate of the microphone divide the enclosure into the front volume and back volume. (*Id.*) Knowles states that Dr. Egolf testified that the function of the front volume is to allow the approaching sound waves to access the front side of the diaphragm. (*Id.*) Knowles asserts that Dr. Egolf mentioned the function of the back volume is to provide a pressure reference for the diaphragm. (*Id.*) Knowles concludes that Dr. Egolf pointed to articles by Dr. Stephen C Thompson (CX-573 and CX-574), as well as an IEEE article by Jiung-Yue Tien et al. (CX-550) to support his understanding of the function and placement of the front and back volumes. (Citing CX-461C at Q. 19.)

Knowles quotes the testimony of its expert, Dr. Gileo:

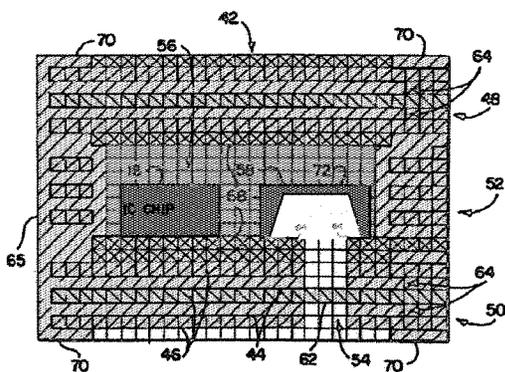
For an enclosed microphone assembly or package, the “front volume” (sometimes referred to as the “front chamber”) functions by providing a pathway for the sound wave to travel from the opening (or “aperture” or “acoustic port”) in the assembly or package and the diaphragm. The “back volume” (sometimes referred

PUBLIC VERSION

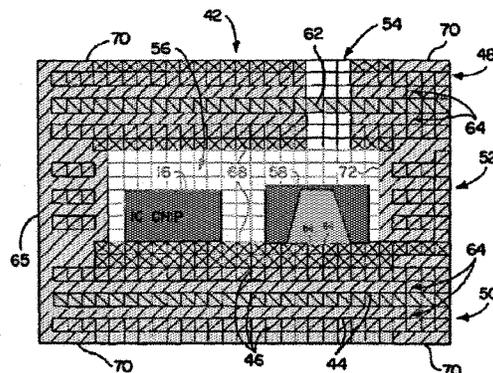
to as the “back chamber”) functions by providing resistance to the deflection of the diaphragm.

(Citing CX-462 at Q. 71.)

Knowles asserts that in support of his testimony, Dr. Gilleo cited the two patents in suit (JX-1 and JX-2), U.S. Patent No. 5,870,482 (Loeppert)(CX-278)(which was incorporated by reference into the two patents-in-suit), the two Thompson papers cited by Dr. Egolf, Dr. Egolf’s report and witness statement, and conversations that he had with Dr. Egolf. Knowles says Dr. Gilleo also prepared demonstratives illustrating the front and back volumes disclosed by the ‘089 patent:



CDX-6C.34



CDX-6C.35

Knowles says that CDX-6C.34 is a colored composite of Figs. 26 and 27, and CDX-6C.35 is a colored composite of Figs. 23 and 28. (Citing CX-462C at Q. 73.) Knowles avers that Dr. Gilleo shaded the front volume in yellow and the back volumes in magenta. (*Id.*) Knowles says that, in CDX-6C.34, the space defined by the microphone and substrate is a front volume, while in CDX-6C.35, the space defined by the microphone and substrate is a back volume. (*Id.*) Knowles adds that Dr. Egolf also testified that CDX-6C.34 and CDX-6C.35 reflect what a person having ordinary skill in the art would recognize as front and back volumes. (Citing CX-461C at Q. 23-24; Tr. at 390:14-19.)

## PUBLIC VERSION

Knowles argues that it is clear from the extrinsic evidence that a volume would have an ordinary meaning to a person having ordinary skill in the art, namely, a space that can perform either the function of a front volume or a back volume. Knowles asserts that this is consistent with its proposed construction as well as the construction adopted in the 629 investigation.

In its reply brief, Knowles asserts that Analog points to the fact that the words “front volume” never appear in the text and points to the testimony of its expert Dr. Pecht. (Citing RX-354 at Q. 184.) Knowles argues that Dr. Pecht is not credible on this issue. Knowles alleges that in the cited testimony, Dr. Pecht claimed that “the person of ordinary skill would not have an understanding of ‘front volume,’ because this is an acoustics term.” Knowles says that Dr. Pecht, during his unscripted testimony, “backtracked from this position,” testifying that the person having ordinary skill in the art would in fact have some knowledge of microphones. (Citing Tr. at 818:19-819:24.) Knowles asserts that Analog “has dropped its lack of enablement defense, now admitting that both parties agree that a person having ordinary skill would have some understanding of microphones.” (Citing RIB at 16-17.) Knowles states that Analog’s admission “tracks Dr. Egolf’s description of the functions of the front and back volumes.” (Citing CX-461C at Q. 4; CX-462 at Q. 71.)

**Analog’s Position:** Analog argues that the disagreement between the parties is whether or not, in the context of the ’089 patent, the claimed “volume” must be the enclosed back volume.

Analog asserts that aside from the claim language itself, every reference to “volume” in the ’089 patent is to a “back volume” (Citing RX-385 at 17:15-16; RX-56 at 53.) Analog adds that the Abstract and the Summary of Invention – which describe the alleged invention and not just one embodiment – both explain that the ’089 patent teaches a microphone package with an

## PUBLIC VERSION

enlarged “back volume.” (Citing JX-2 at Abstract, 1:50-54.) Analog adds that the Commission recognized in the 629 investigation that the prosecution history, in particular in the restriction requirement Knowles made, demonstrates that even the patentee equates “volume” with “back volume.” (Citing RX-56 at 53-54; JX-4 at 01/19/2007 Response to Restriction Requirement at 11.)

Analog avers that a “back volume,” according to Knowles’ acoustics expert, Dr. Egolf, is a pressure reference for a microelectronic microphone. (Citing Tr. at 378:3-9; CX-528 at 12.) Analog asserts that in all of the images in Dr. Egolf’s expert report and the discussion in the ’089 patent, the “back volume” is an enclosed space within a package that is behind the microphone, meaning opposite the side of the diaphragm facing where sound enters the package. (Citing CX-528 at 12.) Analog says that back volume 18 in the ’089 patent is enclosed in each of the figures of the patent that embody the claim invention. (Citing JX-2; Tr. at 266:9-13.) Analog says that the one figure, Figure 25, that has two spaces within the package open to the outside environment and no enclosed spaces, has no “back volume.”<sup>19</sup> Analog argues that, “because the only ‘volume’ described in the ’089 patent specification is a ‘back volume’ and a ‘back volume’ is an enclosed space, the term ‘volume’ in the ’089 patent should be construed as Analog suggests.”

Analog argues that the term in the claim has some meaning, and it does not mean “any volume, anywhere.” Analog says that, because the ’089 patent only makes reference to a “back volume” and never makes reference to a “front volume,” a person of ordinary skill in the art would not interpret “volume” to mean an open front volume, and the claim cannot be fairly read to be so broad as to cover any volume, anywhere, used for any purpose. (Citing RX-385 at

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<sup>19</sup> Analog says that Figure 25 was determined not to be an embodiment of the claims because it does not have a “back volume.” (Citing RX-56 at 54-55; JX-2 at 7:10-13.)

## PUBLIC VERSION

17:15-16; Tr. at 374:9-18.) Instead, a person of ordinary skill would interpret it to mean “back volume.” (Citing RX-354C at Q. 184.)

Analog concedes that its construction may render some claims nonsensical; but says “that is of no consequence.” Analog says Knowles “bears the pain of poor draftsmanship of the patent claims.” Analog says if the clear language from the patentee suggests a particular construction, that prevails over maintaining the validity of the patent claims. (Citing *Nazomi Commc’ns, Inc. v. Arm Holdings, PLC*, 403 F.3d 1364, 1368 (Fed. Cir. 2005).)

**Staff’s Position:** Staff’s proposed claim construction is identical to the definition arrived at by the ALJ in both the 629 investigation and the TEO ID. Because Analog attempts to limit the term “volume” to a particular type of volume, *i.e.* a back volume, Staff does not agree with its construction.

Support for Staff’s proposed construction comes directly from the claim language itself. Claim 1 recites that the “volume” is “defined by the transducer and one of the first member or second member.” Thus, Staff asserts that claim 1 does not specifically mention either a back volume or a front volume. Rather, Staff says that the only limitation placed on “volume” is that it must be defined by the transducer and either the first or second member. Notably, the claim language also does not state that the volume must be enclosed.

Accordingly, Staff asserts that the evidence has shown that “volume” means “space defined by the transducer and one of the first member or second member.”

**Construction to be applied:** “a space defined by the transducer and one of the first member or the second member”

The parties do not contest that the “volume” is defined on one side by the transducer. The difference of opinion among the parties is how the “volume” is defined by “one of the first

## PUBLIC VERSION

member or the second member.”

Analog’s proposed construction would limit the term to “back volume,” despite the fact that nowhere in the claims of the ‘089 patent does it mention a “back volume.”<sup>20</sup>

My construction of this term, omitting to limit the volume to a “back” volume, is consistent with the doctrine of claim differentiation, when viewed in light of claim 28, which teaches “[t]he surface mountable package of claim 1, wherein the volume includes a portion of the chamber.” Dependent claims are presumed to be of narrower scope than the independent claims from which they depend. *AK Steel Corp. v. Sollac*, 344 F.3d 1234, 1242 (Fed. Cir. 2003). In this case, claim 1 provides for a “volume” that is defined by the transducer and one of the first member or the second member, and there is no mention of its being open or closed.<sup>21</sup> Knowles’ acoustic expert, Dr. Egolf, testified credibly regarding the basic function of a condenser microphone of the type disclosed in the ‘089 patent. (CX-461C at Q. 17.) Dr. Egolf explained that such an encased microphone, in order to function, requires a “back volume” (also known as a “back chamber” or “back cavity”) and a “front volume” (also known as a “front chamber” or “front cavity”). (CX-461C at Q. 19.) Dr. Egolf said when placed in an enclosure, the diaphragm and backplate of the microphone divide the enclosure into the front volume and back volume. (*Id.*) Dr. Egolf testified that the function of the front volume is to allow the approaching sound waves to access the front side of the diaphragm. (*Id.*) Dr. Egolf mentioned the function of the back volume is to provide a pressure reference for the diaphragm. (*Id.*) Dr. Egolf pointed to articles by Dr. Stephen C Thompson (CX-573 and CX-574), as well as an IEEE article by Jiung-

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<sup>20</sup> I note that in the ‘089 patent Abstract, Summary of the Invention, and the detailed descriptions of preferred embodiments, the term “volume” is mentioned 17 times, and each time it is mentioned it is described as a “back volume.” The term “volume” does not appear by itself. (JX-2)

<sup>21</sup> The preferred embodiment describes the back volume as providing “a pressure reference for the transducer.” (JX-2 at 3:41-43.)

## PUBLIC VERSION

Yue Tien et al. (CX-550) to support his understanding of the function and placement of the front and back volumes. (CX-461C at Q. 19.)

In addition, Dr. Gilleo testified:

For an enclosed microphone assembly or package, the “front volume” (sometimes referred to as the “front chamber”) functions by providing a pathway for the sound wave to travel from the opening (or “aperture” or “acoustic port”) in the assembly or package and the diaphragm. The “back volume” (sometimes referred to as the “back chamber”) functions by providing resistance to the deflection of the diaphragm.

(CX-462 at Q. 71.)

Claim 28 adds to claim 1 the limitation that the volume must include a portion of the chamber, further narrowing the scope of the claim.

In addition, claim 7 teaches an embodiment in which the aperture is formed in the same member as the “surface” upon which the transducer is “attached ... completely covering the aperture.” Neither of these embodiments contemplates a “closed” (i.e. “back”) volume. Figure 26 of JX-2 shows an embodiment in which the “volume” is not enclosed; but the chamber is fully enclosed. This embodiment is illustrative of the configuration taught in claim 7.

In the 629 investigation, neither the Commission nor I found, explicitly or by implication, that the proper construction of volume required that it be enclosed. The Commission’s decision affirmed my construction of the claim term “volume.” The Commission struck reference in my Initial Determination to the language of JX-2, 7:5-7 as “not needed to support the ALJ’s construction.” (CX-411 at 11.) That stricken language refers to Figure 24 of JX-2 and was directed to the issue of whether or not the term “volume” required that the space reside at least partly within the surface of the substrate (first member) (e.g. in a recess or hole in the surface). It had nothing to do with the embodiment taught in claim 7 or the issue of whether or not the volume must be closed.

## PUBLIC VERSION

Here the evidence supports a finding that is consistent with my findings in the 629 investigation, that the term “volume” in claim 1 is defined by the transducer and one of the first member or the second member, and without the further limit advanced by Analog that the volume be “closed” or be limited to a “back” volume.

The remaining embodiments fit within the construction of “volume” applied here; but they would not be covered if the term were defined to include a requirement that the space be “closed.” Such a construction would exclude the limits of claims 7 and 28 and several iterations of the preferred embodiment from the scope of the claim, which the Federal Circuit has described as being rarely correct. *Verizon Servs., Corp. v. Vonage Holdings Corp.*, 503 F.3d 1295, 1305 (Fed. Cir. 2007); *MBO Labs., Inc. v. Becton, Dickinson & Co.*, 474 F.3d 1323, 1333 (Fed. Cir. 2007).

### IV. INVALIDITY

#### A. Applicable Law

It is the respondent’s burden to prove invalidity, and the burden of proof never shifts to the patentee to prove validity. *Scanner Techs. Corp. v. ICOS Vision Sys. Corp. N.V.*, 528 F.3d 1365, 1380 (Fed. Cir. 2008). “Under the patent statutes, a patent enjoys a presumption of validity, *see* 35 U.S.C. § 282, which can be overcome only through facts supported by clear and convincing evidence[.]” *SRAM Corp. v. AD-II Eng’g, Inc.*, 465 F.3d 1351, 1357 (Fed. Cir. 2006).

The clear and convincing evidence standard placed on the party asserting the invalidity defense requires a level of proof beyond the preponderance of the evidence. Although not susceptible to precise definition, “clear and convincing” evidence has been described as evidence which produces in the mind of the trier of fact “an abiding conviction that the truth of a factual

## PUBLIC VERSION

contention is ‘highly probable.’” *Price v. Symsek*, 988 F.2d 1187, 1191 (Fed. Cir. 1993) (citing *Buildex, Inc. v. Kason Indus., Inc.*, 849 F.2d 1461, 1463 (Fed.Cir.1988).)

### 1. Anticipation

“A patent is invalid for anticipation if a single prior art reference discloses each and every limitation of the claimed invention. Moreover, a prior art reference may anticipate without disclosing a feature of the claimed invention if that missing characteristic is necessarily present, or inherent, in the single anticipating reference.” *Schering Corp. v. Geneva Pharm., Inc.*, 339 F.3d 1373, 1377 (Fed. Cir. 2003) (citations omitted).

“When no prior art other than that which was considered by the PTO examiner is relied on by the attacker, he has the added burden of overcoming the deference that is due to a qualified government agency presumed to have properly done its job[.]” *Am. Hoist & Derrick Co. v. Sowa & Sons, Inc.*, 725 F.2d 1350, 1359 (Fed. Cir. 1984). Therefore, the challenger’s “burden is especially difficult when the prior art was before the PTO examiner during prosecution of the application.” *Hewlett-Packard Co. v. Bausch & Lomb Inc.*, 909 F.2d 1464, 1467 (Fed.Cir.1990).

### 2. Obviousness

Section 103 of the Patent Act states:

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

35 U.S.C. § 103(a) (2008).

“Obviousness is a question of law based on underlying questions of fact.” *Scanner Techs. Corp. v. ICOS Vision Sys. Corp. N.V.*, 528 F.3d 1365, 1379 (Fed. Cir. 2008). The

## PUBLIC VERSION

underlying factual determinations include: “(1) the scope and content of the prior art, (2) the level of ordinary skill in the art, (3) the differences between the claimed invention and the prior art, and (4) objective indicia of non-obviousness.” *Id.* (citing *Graham v. John Deere Co.*, 383 U.S. 1, 17 (1966)). These factual determinations are often referred to as the “*Graham* factors.”

“When no prior art other than that which was considered by the PTO examiner is relied on by the attacker, he has the added burden of overcoming the deference that is due to a qualified government agency presumed to have properly done its job[.]” *Am. Hoist & Derrick Co.*, 725 F.2d at 1359. Therefore, the challenger’s “burden is especially difficult when the prior art was before the PTO examiner during prosecution of the application.” *Hewlett-Packard Co.*, 909 F.2d at 1467.

The critical inquiry in determining the differences between the claimed invention and the prior art is whether there is a reason to combine the prior art references. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 417-418 (2007). In *KSR*, the Supreme Court rejected the Federal Circuit’s rigid application of the teaching-suggestion-motivation test. The Court stated that “it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does.” *Id.* at 418. The Court described a more flexible analysis:

Often, it will be necessary for a court to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art, all in order to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue...As our precedents make clear, however, the analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ.

*Id.*

## PUBLIC VERSION

Since *KSR* was decided, the Federal Circuit has announced that, where a patent challenger contends that a patent is invalid for obviousness based on a combination of prior art references, “the burden falls on the patent challenger to show by clear and convincing evidence that a person of ordinary skill in the art would have had reason to attempt to make the composition or device, . . . and would have had a reasonable expectation of success in doing so.” *PharmaStem Therapeutics, Inc. v. Viacell, Inc.*, 491 F.3d 1342, 1360 (Fed. Cir. 2007).

In addition to demonstrating that a reason exists to combine prior art references, the challenger must demonstrate that the combination of prior art references discloses all of the limitations of the claims. *Hearing Components, Inc. v. Shure Inc.*, 600 F.3d 1357, 1373-1374 (Fed. Cir. 2010) (upholding finding of non-obviousness based on the fact that there was substantial evidence that the asserted combination of references failed to disclose a claim limitation); *Velandar v. Garner*, 348 F.3d 1359, 1363 (Fed. Cir. 2003) (explaining that a requirement for a finding of obviousness is that “all the elements of an invention are found in a combination of prior art references”).

### **B. The ‘231 Patent**

#### **1. Anticipation**

##### **a. Halteren**

**Analog’s Position:** Analog contends that U.S. Patent No. 6,324,907 (“Halteren”) anticipates claim 1 of the ‘231 patent.

According to Analog, the only dispute regarding Halteren is whether or not it discloses a “package.” Analog argues that Halteren meets Analog’s proposed construction of “package.” Analog states that Halteren discloses an electrical connection between the MEMS microphone and the substrate. (Citing RX-353C at Q. 165; RX-47 at 7:52-60.) Analog states that Halteren

## PUBLIC VERSION

discloses an electrical connection between the package and another circuit outside of the package. (Citing RX-353C at Q. 166.) Analog claims that Halteren discloses “contact pads” which are used to make a connection between the package and the outside world. (Citing Tr. at 860:1-862:8; RX-47 at Fig. 1, 7:28-36, 8:37-45.)

Analog asserts that Halteren describes several ways to protect the MEMS microphone from the external environment. (Citing RX-353C at Q. 167; RX-354C at Q. 85.) Analog states that the silicon microphone of Halteren is packaged by a flexible substrate with a lid that is bound to it. (Citing RX-47 at 8:13-15.) Analog claims that the cavity that is formed by the joint encapsulation of the lid and the flexible member protects the microphone from chemical and mechanical damage. (Citing RX-47 at 8:13-16; RX-372.) Analog states that Knowles agrees that Halteren provides protection to the microphone within the package against vibration and electromagnetic interference. (Citing RX-386 at 218:19-219:4, 220:3-22.) Analog asserts that Dr. Bauer acknowledged that the Halteren assembly provides “minimal” protection. (Citing Tr. at 908:18-22.)

Analog argues that Halteren discloses a package under Knowles’ proposed construction of “package.” Even though Analog does not agree with Knowles’ construction, Analog asserts that Halteren discloses the additional elements required by Knowles’ construction. Analog argues that Halteren discloses all of the remaining elements of claim 1. (Citing RX-47.) Analog claims that Knowles agrees that other than “package,” Halteren discloses all of claim 1. (Citing RX-386 at 218:1-8.)

In its reply brief, Analog argues that Knowles raises multiple new arguments regarding Halteren that were not addressed in Knowles’ pre-hearing brief. (Citing Ground Rule 8.2.) Analog asserts that the parties appear to agree that if Analog’s construction of “package” is

## PUBLIC VERSION

adopted, then Halteren anticipates claim 1. Analog claims that Halteren anticipates claim 1 even using the construction of “package” used by Knowles in its initial post-hearing brief.

**Knowles’ Position:** Knowles contends that Halteren does not anticipate claim 1 of the ‘231 patent.

Knowles argues that under its proposed construction of “package,” Halteren fails to disclose a package. Knowles argues that Halteren fails to disclose that the assembly is intended to be mounted on a printed circuit board or other substrate. (Citing RX-47 at 7:32-36; CX-610 at Q. 39, 81.)

Knowles argues that Halteren fails to disclose a second level interconnection. Knowles notes that Halteren explains that the device is intended to be used with a connector. (Citing RX-47 at 7:32-36.) Knowles claims that Halteren thus fails to disclose a package that may be mounted using surface mount or through hole technology. (Citing CX-610 at Q. 38.) Knowles argues that the indeterminate length of Halteren is further evidence that the device is not a package. (Citing CX-610 at Q. 81; Tr. at 200:6-202:5, 1032:20-1033:10.)

Finally, Knowles argues that the device of Halteren is not a “package” because it does not provide mechanical support for the microphone and protection against shock. (Citing CX-610 at Q. 81; Tr. at 1027:3-18.) Knowles asserts that the end of the Halteren assembly containing the MEMS microphone is unrestrained, and there is no disclosure in Halteren that suggests how the assembly’s movement is controlled.

**Staff’s Position:** Staff contends that Halteren anticipates claim 1 of the ‘231 patent.

Staff claims that Halteren discloses a “microelectromechanical system package.” According to Staff, there is clear and convincing evidence that Halteren depicts and describes a package that has two levels of connection and provides protection from the external

## PUBLIC VERSION

environment. (Citing RX-354C at Q. 76; RX-47.)

Staff asserts that Halteren discloses a “microelectromechanical system microphone.” Staff points to silicon microphone 61 in Halteren. (Citing RX-47 at 7:53-57.) Staff asserts that Halteren discloses a substrate comprising a surface for supporting the microphone. Staff points to substrate 40 in Halteren. (Citing RX-47 at 7:28-57.)

Staff claims that Halteren discloses a cover comprising a conductive layer having a center portion bounded by a peripheral edge portion. Staff identifies the metal lid of Halteren as the claimed cover. (Citing RX-47 at 8:4, Fig. 2A.) Staff states that Halteren discloses a housing formed by connecting the peripheral edge portion of the cover to the substrate. (Citing RX-47 at 5:57-58, 6:56-62, 8:6-10, Fig. 2A.)

Staff asserts that the center portion of the cover in Halteren is spaced from the surface of the substrate to accommodate the microphone. (Citing RX-47 at 5:57-58, 6:56-62, 8:6-10, Fig. 2A.) Staff claims that the housing in Halteren includes an acoustic port. (Citing RX-47 at 7:37-43.) Staff states that the housing provides protection from an interference signal. (Citing RX-47 at 3:48-53.)

In its reply brief, Staff argues that the package disclosed in Halteren can be mounted to a printed circuit board or substrate. Staff claims that Dr. Bauer admitted that the package of Halteren could be mounted to a printed circuit board. (Citing RX-386 at 200:9-20.) Staff notes that Dr. Tummala also testified that the Halteren package can be bonded to a substrate or printed circuit board. (Citing Tr. at 563:4-9.)

Staff disputes Knowles’ assertions that the only embodiment in Halteren discloses a connector and the length of the flexible substrate is too long. Staff claims that the portion of Halteren relied upon by Knowles does not demonstrate that the Halteren package is a connector.

## PUBLIC VERSION

(Citing RX-47 at 7:28-36.) Staff asserts that Halteren broadly describes the second level connection. (Citing RX-47 at 8:38-44.)

Staff argues that Knowles is incorrect to claim that the distance of the second level connection from the device body in Halteren demonstrates that Halteren is not a “package.” Staff claims that Halteren has a similar package outline to a package depicted and described in one of Knowles’ own patents. (Citing JX-11.) Thus, Staff argues that Halteren is similar to a structure that Knowles itself has called a package. (Citing Tr. at 916:12-15.)

Staff argues that, contrary to Knowles’ assertion, the package in Halteren protects the microphone from shock. Staff states that the length of the package in Halteren can be as small as 20 mm. (Citing RX-47 at 8:19-21.) Staff states that while the package can be 100 microns thick, it also can be very small in length. (*Id.*) Staff asserts that the Halteren package is intended to protect the device from the external environment. (Citing RX-47 at 6:47-64; Tr. at 911:21-25, 912:9-12.)

**Discussion and Conclusion:** Based on the evidence in the record, I find that Analog has offered clear and convincing evidence that Halteren anticipates claim 1 of the ‘231 patent.

Halteren discloses what is referred to as a “flexible substrate transducer assembly.” (RX-47.) As explained in Halteren:

The present invention relates to a flexible substrate transducer assembly that integrates a transducer or a transducer system, such as a gas sensor or electro-acoustic transducer, with or without built-in signal processing capability, and a flexible substrate. The flexible substrate is used to provide connectivity between the transducer system and electronic equipment which house the transducer assembly. This integration of the transducer system and a flexible carrier substrate provides an integrated solution that supports cost-effective manufacturing of the flexible substrate transducer assembly by using standard components and proven manufacturing technologies. The present invention is particularly well adapted for use in compact electronic equipment such as mobile phones and hearing instruments that will benefit from the small outer dimensions obtainable by the present flexible substrate transducer assembly.

(RX-47 at 1:5-20.) Figure 2A of Halteren shows an embodiment of the flexible substrate transducer assembly:

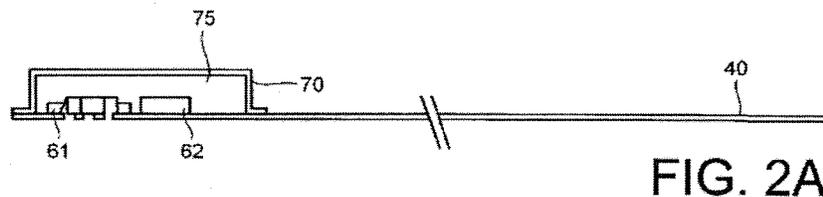


FIG. 2A

(*Id.* at Fig. 2A.)

The only dispute between the parties is whether or not Halteren discloses a “package.” First, I address the other elements of claim 1 before arriving at the issue of whether or not the flexible substrate transducer assembly of Halteren is a “package.”

The evidence supports a finding that Halteren discloses a “microelectromechanical system microphone.” (RX-353C at Q. 171.) This microphone is element 61 in Figure 2A. Halteren describes element 61 as a “silicon microphone.” (RX-47 at 7:52-57.)

Halteren discloses “a substrate comprising a surface for supporting the microelectromechanical microphone.” (RX-353C at Q. 173.) The substrate is element 40 in Figure 2A (referred to as a “flexible member”) and it supports the silicon microphone. (RX-47 at 7:28-57.)

Halteren discloses “a cover comprising a conductive layer having a center portion bounded by a peripheral edge portion.” (RX-353C at Q. 175.) The cover is element 70 in Figure 2A, and is described as a “metal lid.” (RX-47 at 8:4.) The metal lid comprises a conductive layer, as Halteren explains that “[t]he lid preferably comprises, or is fully fabricated in, an electrically and/or magnetically conductive material.” (RX-47 at 3:48-49.) Halteren further discloses that there is an electrically conducting path from the lid to the conducting layer of the

## PUBLIC VERSION

flexible member. (*Id.* at 8:1-6.) The metal lid includes a center portion bounded by a peripheral edge portion, as shown in Figure 2A. (*Id.* at Fig. 2A.)

Halteren discloses “a housing formed by connecting the peripheral edge portion of the cover to the substrate, the center portion of the cover spaced from the surface of the substrate to accommodate the microelectromechanical system microphone.” (RX-353C at Q. 177.) The metal lid and flexible member are connected to form a housing. (*See, e.g.*, RX-47 at 5:57-58, 6:56-62, 8:6-10, Fig. 2A.) The center portion of the metal lid is spaced from the flexible member to accommodate the silicon microphone. (*Id.* at Fig. 2A.)

Halteren discloses a “housing including an acoustic port for allowing an acoustic signal to reach the microelectromechanical system microphone.” (RX-353C at Q. 179.) Figure 2A depicts an acoustic port below the silicon microphone, and the specification describes embodiments that include one or more acoustic ports on the housing. (RX-47 at 5:36-6:4, Fig. 2A.)

The housing of Halteren “provides protection from an interference signal.” (RX-353C at Q. 181.) Halteren states that “[t]he lid preferably comprises, or is fully fabricated in, an electrically and/or magnetically conductive material. This will make the lid function as an EMI shield that effectively shields the transducer system and the generated transducer signals from interfering electromagnetic signals of the external environment.” (RX-47 at 3:48-53.) In addition, Halteren discloses the use of a metal lid as the cover, and Dr. Tummala’s unchallenged testimony is that “[i]t has been long understood in the art that EMI shielding could be accomplished by using a metal lid.” (RX-353C at Q. 181.)

The parties dispute whether or not Halteren discloses a “microelectromechanical system package,” as required by claim 1. I construed “package” to mean “a single, self-contained unit

## PUBLIC VERSION

which fully encloses a device, and which provides: (1) protection for the device from the external environment, (2) an electrical connection between the device and the package, and (3) an electrical connection between the package and another circuit outside of the package.”

Applying this construction, Halteren discloses a “microelectromechanical system package.” (RX-353C at Q. 164; RX-354C at Q. 76.) The flexible substrate transducer assembly of Halteren is a single, self-contained unit which fully encloses a device – a silicon microphone. (RX-47 at Fig. 2A; RX-353C at Q. 164.) The flexible substrate transducer assembly provides protection for the microphone from the external environment. (RX-47 at 2:57-67, 3:48-53, 8:11-13; RX-353C at Q. 167; RX-354C at Q. 82.) There is an electrical connection between the microphone and the flexible member of the flexible substrate transducer assembly. (RX-47 at 1:9-11, 7:45-67; RX-353C at Q. 165; RX-354C at Q. 78.) There is also an electrical connection between the flexible substrate transducer assembly and another outside circuit through the use of four electrical conductors, depicted as elements 20-23 in Figure 1 of Halteren. (RX-353C at Q. 166; RX-354C at Q. 79.) Halteren states that:

Four electrical conductors 20-23 are arranged on the lower surface of flexible member 40 of flexible substrate transducer assembly 10 of FIG. 1. Four exposed parts corresponding to the respective conductors 20-23 are arranged at a first end of the member. ***These exposed parts are utilized as contact pads that provide required electrical connections between assembly 10 and a piece of electronic equipment (not shown) that holds a connector adapted to contact and fix the position of the exposed parts.*** Conductor 21 is a ground terminal and therefore occupies most of an area of a conducting layer in the flexible member 40 (as item 150 of FIG. 4) to provide an EMI decoupling of conductors 20, 22, 23. The ground conductor 21 is furthermore arranged around a circumference of a second end portion 45 of the member 10, while each of the three other conductors 20, 22, 23 is terminated in a corresponding contact pad, Vout 50, CLKIN 51, Vbat 52 located at the second end of the member.

(RX-47 at 7:28-44) (emphasis added). Halteren provides additional discussion regarding the electrical connection between the assembly and an outside circuit. (*Id.* at 8:29-44.)

## PUBLIC VERSION

Knowles argues that Halteren does not disclose a “package.” Knowles’ arguments are based on its proposed construction of “package.” As discussed in Section III.B.1 *supra*, Knowles’ proposed construction of “package” is overly narrow and unsupported by the evidence. For all of the reasons discussed in the claim construction analysis of “package,” I find that Knowles’ arguments regarding Halteren lack merit.

Based on the foregoing, I find that Analog has offered clear and convincing evidence that Halteren anticipates claim 1 of the ‘231 patent.

### **b. Premachandran**

**Analog’s Position:** Analog contends that an article entitled *Si—based Microphone Testing Methodology and Noise Reduction*, PROCEEDINGS OF SPIE, vol. 4019, p. 588-592 (2000) (“Premachandran”) anticipates claim 1 of the ‘231 patent.

Analog states that Knowles agrees that Premachandran discloses a package, even in light of the extra limitations included in Knowles’ proposed construction. (Citing CX-610 at Q. 85; CX-613 at 37-38; Tr. at 983:16-17.) Analog states that Knowles asserts that Premachandran lacks the following four claim elements: (1) “a substrate comprising a surface for supporting the microelectromechanical microphone;” (2) “a cover comprising a conductive layer;” (3) a “housing;” and (4) a “housing [that] provides protection from an interference signal.” (Citing CX-610 at Q. 85; CX-613 at 33-35, 37-38.)

With regard to the substrate limitation, Analog claims that Premachandran discloses a lead frame as the substrate with a surface for supporting the MEMS microphone. (Citing RX-422 at Fig. 3; RX-353C at Q. 197, 199; RX-354C at Q. 125.) Analog claims that the parties agree that a “substrate” is “a base material upon which at least one electronic device can be mounted.” (Citing CX-554 at 5.) Analog argues that Dr. Pecht’s book makes clear that a lead

## PUBLIC VERSION

frame can and does serve as a substrate. (Citing RX-409 at ADI0859659.)

With regard to the cover limitation, Analog states that Figure 3 of Premachandran discloses a lead frame package with a plastic cover. Analog claims that Premachandran tested plastic, metal, and ceramic enclosures on the lead frame. (Citing RX-422 at ADI00863208-09; RX-353C at Q. 201.) Analog argues that one of ordinary skill in the art reading the reference would understand it as describing the package depicted in Figure 3, except that the package includes a metal cover. (Citing RX-422 at ADI 00863208.) According to Analog, a package with a metal cover clearly meets the “cover” limitation of claim 1.

Analog states that Knowles argues that if a metal cover is used, the microphone would not function. (Citing CX-613 at 54.) Analog asserts that one of ordinary skill in the art making the package disclosed in Premachandran with a metal cover would attach the metal cover so that it is grounded to the lead frame and insulated where it needed to be. (Citing RX-353C at Q. 202; RX-354C at Q. 128.) Analog reasons that since Mr. Premachandran conducted experiments with a package including a metal cover, one can only assume that the cover was attached in such a way that did not short the microphone. (Citing RX-354C at Q. 128.)

Analog claims that Premachandran also discloses the cover limitation because it teaches wrapping the package depicted in Figure 3 with copper foil to protect from EMI. (Citing RX-353C at Q. 201.) Analog argues that the copper foil is a conductive layer that is part of the cover, thereby meeting the claim language.

With regard to the “housing” element, Analog argues that Premachandran discloses this element. According to Analog, a “housing” is the boundary around the microphone formed by the substrate and the cover. (Citing Tr. at 980:6-9.) Analog states that Figure 3 of Premachandran shows that the cover and the lead frame substrate are bound with adhesive,

## PUBLIC VERSION

creating a housing. (Citing Tr. at 980:10-12; RX-353C at Q. 204; RX-354C at Q. 129.)

Analog notes that Knowles argues that a housing comprised of only the lead frame and the cover would not result in a functional microphone. (Citing Tr. at 1010:6-1011:1.) Analog responds by arguing that it is not clear that without the plastic substrate, the microphone package would not function if there were many holes in the housing. Analog claims that nothing in packaging technology prohibits the housing or the package from having multiple openings. Analog further asserts that claim 1 uses the open-ended transitional phrase “comprising,” meaning that a microphone package with an additional plastic substrate is permitted under the claim.

Analog claims that Premachandran a housing that provides protection from an interference signal. (Citing RX-353C at Q. 208; RX-354C at Q. 129.) Analog asserts that the purpose of the paper is to discuss testing methods for packaging a microphone to reduce the amount of noise interference – which is a type of electromagnetic interference. (Citing RX-422 at ADI00863207; Tr. at 517:9-11, 804:10-805:4.)

Analog states that Knowles disputes the existence of this element because the shielding is not disclosed in Figure 3 of Premachandran. Analog argues that even a cursory read of the paper makes clear that the intent was to describe how to protect packages, such as the package of Figure 3, from interference signals. (Citing RX-422; RX-353C at Q. 208; RX-354C at Q. 129.) Analog argues that Premachandran discloses the remaining elements of claim 1. (Citing RX-422; CX-613 at 37; RX-341C at 231:4-7, 225:5-11; Tr. at 977:1-11, 980:10-12, 981:1-16; RX-353C at Q. 195, 203, 205.)

In its reply brief, Analog argues that Premachandran is clearly prior art. (Citing RX-429; RX-422.) Analog states that it introduced evidence that the book containing the Premachandran

## PUBLIC VERSION

paper was published on May 9, 2000 and registered at the Copyright Office on July 13, 2000. (Citing RX-430; Tr. at 627:9-12.) Analog claims that the copyright registration is *prima facie* evidence that the book containing the Premachandran paper was published well before the September 10, 2002 priority date for the '231 patent. (Citing 17 U.S.C. § 410(c).)

**Knowles' Position:** Knowles contends that Premachandran fails to anticipate claim 1 of the '231 patent.

Knowles argues that Premachandran fails to disclose a conductive cover. Knowles asserts that Premachandran only discloses the use of a plastic cover, which is not conductive. Knowles states that Premachandran noted that during testing, the package was surrounded with conductive material, but that the conductive material was external to the package itself, and not an integral component of the cover. (Citing CX-610 at Q. 85; Tr. at 515:3-516:1.)

Knowles argues that Premachandran fails to disclose a housing that provides EMI shielding. Knowles states that because the cover of Premachandran is made from plastic, it cannot provide EMI shielding. (Citing CX-462C at Q. 21; CX-580; CX-610 at Q. 85.)

Finally, Knowles argues that Premachandran fails to disclose a housing made up of a substrate and cover. Knowles states that in Premachandran, the microphone sits on the paddle of a metal lead frame, and the lead frame is placed inside a housing made up of a plastic cover and a plastic substrate. According to Knowles, the "substrate" of claim 1 is where the microphone is mounted and a part of the package housing. Knowles asserts that the microphone is mounted to the lead frame, but the lead frame is not part of the housing. Knowles also asserts that the plastic substrate is part of the housing, but is not where the microphone is mounted. (Citing CX-610 at Q. 85.) Because Premachandran does not disclose a housing that is made from the same substrate as supports the microphone, Knowles argues that it does not anticipate claim 1.

## PUBLIC VERSION

In its reply, Knowles argues that Analog failed to prove that Premachandran is prior art to the '231 patent. Knowles criticizes Analog's reliance on a web site screen-shot to prove a publication date. (Citing RX-430.) Knowles notes that the book containing the Premachandran paper states that the paper was "unavailable at the time of these proceedings," thus calling into question the date that the Premachandran paper was actually publicly available. (Citing RX-429 at p. 593.)

Knowles argues that the lead frame of Premachandran, while providing support for the microphone, does not form the housing. Knowles states that if the lead frame and the cover comprised the housing, the microphone would not function, as there would be acoustic ports on both sides of the microphone diaphragm. (Citing Tr. at 519:8-19.)

Knowles argues that while Premachandran mentions the use of a metal cover, it never discloses simply replacing the plastic cover in Figure 3 with a metal cover. Knowles claims that any discussion about how one of ordinary skill in the art would modify Figure 3 with a metal cover is irrelevant to the issue of anticipation.

**Staff's Position:** Staff contends that Analog has failed to prove that Premachandran anticipates claim 1 of the '231 patent.

Staff claims that Analog failed to demonstrate the publication date of Premachandran. Staff states that Analog relies on the copyright date to establish a publication date of May 9, 2000. (Citing Tr. at 452-453.) Staff argues that a copyright date is insufficient to establish a priority date because it does not provide any evidence that Premachandran was accessible to the public as of that date. Staff claims that the Federal Circuit's decision in *In re Lister*, 583 F.3d 1307 (Fed. Cir. 2009) supports this conclusion.

Staff claims that Analog has not offered any other evidence as proof of the public

## PUBLIC VERSION

accessibility of Premachandran. Staff asserts that the evidence shows that Premachandran was not available for publication at the time the paper was presented at the proceedings for a technical conference on the design and testing of MEMS/MEOMS packages. (Citing RX-429 at p. 593.)

Assuming *arguendo* that Premachandran is prior art to the '231 patent, Staff argues that Analog failed to demonstrate that it anticipates claim 1. Staff claims that Premachandran fails to disclose a housing that provides protection from an interference signal, as required by claim 1. Staff asserts that the disclosure of Premachandran is limited to a package with a plastic cap and substrate. (Citing RX-429 at Fig. 3; CX-610 at Q. 85.) Staff notes that Figure 6 depicts an EMI shield created by wrapping copper foil around “the packages and the PCD board and [connecting it] to the ground of the PCB board.” (Citing RX-429 at p. 580.) However, Staff claims that there is no description provided of the type of package, if any, used in Figure 6 to create an EMI shield. (Citing RX-429 at p. 580; CX-610 at Q. 85.)

Staff also argues that Premachandran does not disclose a “package.” Staff notes that Analog claims that the lead frame and the cover in Premachandran form the “package” of claim 1. (Citing Tr. at 765:8-11; RX-353C at Q. 197; RX-354C at Q. 125.) Staff asserts that if the lead frame was the first or second member, the device in Premachandran would not function. (Citing Tr. at 519:8-19; CX-610 at Q. 85.)

In its reply brief, Staff argues that Premachandran fails to disclose a cover comprising a conductive layer. Staff claims that a brief reference to a metal package is not enough to demonstrate Premachandran discloses a package with all of the requirements of claim 1 that includes a conductive cover. (Citing CX-610 at Q. 85.) Staff argues that Analog’s position on this claim element is too speculative. (Citing RX-353C at Q. 201.) Staff asserts that the copper

## PUBLIC VERSION

foil described in Premachandran is not part of the cover because it is wrapped around the package and the PCB board. (Citing RX-429 at p. 580.)

**Discussion and Conclusion:** Based on the evidence in the record, I find that Analog has failed to offer clear and convincing evidence that Premachandran anticipates claim 1.

The first issue to resolve is whether or not Premachandran is prior art to the '231 patent. The '231 patent was filed on September 10, 2002. Analog claims that Premachandran was published sometime in 2000 and is therefore a "printed publication" pursuant to 35 U.S.C. § 102(b). Section 102(b) states that a person shall be entitled to a patent unless "the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of the application for patent in the United States[.]" 35 U.S.C. § 102(b) (2009).

The Federal Circuit has addressed the meaning of the term "printed publication" in § 102(b), and found that "'public accessibility' has been called the touchstone in determining whether a reference constitutes a 'printed publication' bar under 35 U.S.C. § 102(b)." *In re Hall*, 781 F.2d 897, 899 (Fed. Cir. 1986). The court has explained that:

A document is publicly accessible if it "has been disseminated or otherwise made available to the extent that persons interested and ordinarily skilled in the subject matter or art, exercising reasonable diligence, can locate it and recognize and comprehend therefrom the essentials of the claimed invention without need of further research or experimentation."

*Cordis Corp. v. Boston Scientific Corp.*, 561 F.3d 1319, 1333 (Fed. Cir. 2009) (quoting *In re Wyer*, 655 F.2d 221, 226 (CCPA 1981)). "Whether an asserted anticipatory document qualifies as a 'printed publication' under § 102 is a legal conclusion based on underlying factual determinations." *Cooper Cameron Corp. v. Kvaerner Oilfield Prods., Inc.*, 291 F.3d 1317, 1321 (Fed. Cir. 2002). Analog bears the burden of demonstrating by clear and convincing evidence

## PUBLIC VERSION

that Premachandran qualifies as a “printed publication.” *Northern Telecom, Inc. v. Datapoint Corp.*, 908 F.2d 931, 936-937 (Fed. Cir. 1990.)

I find that Analog has met its burden to demonstrate that Premachandran was a printed publication as of July 13, 2000, making it § 102(b) prior art to the ‘231 patent. The Premachandran paper was published as part of a book entitled “Design, Test, Integration, and Packaging of MEMS/MOEMS.” (RX-429.) Analog offered the entire book into evidence, and the book includes the Premachandran paper. (*Id.*) The book was published by SPIE – The International Society for Optical Engineering as SPIE Volume 4019. (*Id.*) The book bears a copyright date of 2000, includes an ISBN number, and contains a statement that the book was “[p]rinted in the United States of America.” (*Id.* at ADI00859705.) The table of contents includes the Premachandran paper. (*Id.* at ADI00859712.)

Analog also offers the book’s catalog listing from the United States Copyright Office. (RX-430.) This document provides corroborating evidence that the book was published in 2000, as the registration date for the book is listed as July 13, 2000. (*Id.*) The catalog listing states that the book is 596 pages, which is the same number of pages found in the book offered by Analog. (*Compare* RX-430, *with* RX-429.) Therefore, this provides evidence that the complete published book was in existence and submitted to the Copyright Office as of July 13, 2000. There is no evidence offered to rebut the assertion that the book was publicly available at least by the date that was submitted to the Copyright Office. (RX-429; RX-430.) Based on the foregoing, I conclude that the SPIE book containing the Premachandran paper was publicly accessible to interested persons exercising reasonable diligence as of July 13, 2000.

Knowles and Staff offer no evidence to the contrary. Instead, they assert that the Analog’s evidence is insufficient. For the reasons described *supra*, I do not concur with this

## PUBLIC VERSION

assertion.

Knowles and Staff also rely on the Federal Circuit's decision in *In re Lister*, 583 F.3d 1307 (Fed. Cir. 2009) to claim that Analog has failed to meet its burden. In *Lister*, the Patent Office had rejected Dr. Lister's patent claims under § 102(b) based on a manuscript written by Dr. Lister and submitted to the United States Copyright Office. The question was whether or not the manuscript was a "printed publication" by virtue of the fact that it was available for inspection by the public at the Copyright Office. The court stated that "[t]he...conclusion that the Lister manuscript was available at the Copyright Office for inspection by any interested person does not end our inquiry." 583 F.3d at 1314. The court explained that "our inquiry is whether [the manuscript] could be located by 'persons interested and ordinarily skilled in the subject matter or art exercising reasonable diligence.'" *Id.* at 1314-1315 (quoting *Kyocera Wireless Corp. v. Int'l Trade Comm'n*, 545 F.3d 1340, 1350 (Fed. Cir. 2008)).

The evidence showed that copyrighted works such as the Lister manuscript were available through the Westlaw and Dialog commercial databases. The court ultimately concluded that the manuscript was a printed publication as of the date that it was included in either Westlaw or Dialog because those databases allowed for searching of titles by keyword. The court explained that a reasonably diligent researcher could have found Dr. Lister's manuscript using the keyword search feature of Westlaw or Dialog. *Lister*, 583 F.3d at 1314-1316.

*Lister* is factually distinguishable from the current case. In *Lister*, there was no evidence that the manuscript at issue was publicly available beyond its storage at the U.S. Copyright Office and its inclusion in certain copyright databases. Here, the Premachandran paper was included as part of a book that was published in the year 2000. (RX-429.) The book was

**PUBLIC VERSION**

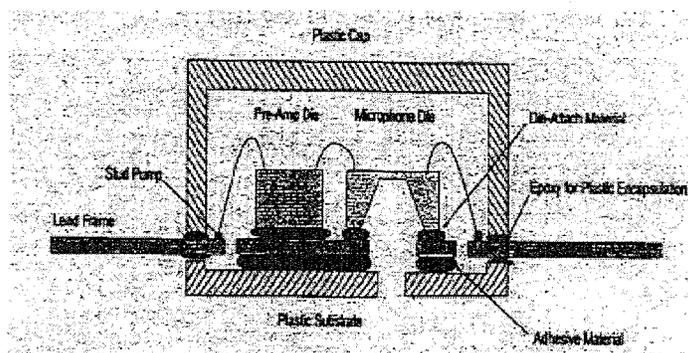
published by SPIE – The International Society for Optical Engineering as SPIE Volume 4019.

(*Id.*) The book bears a copyright date of 2000, includes an ISBN number, and contains a statement that the book was “[p]rinted in the United States of America.” (*Id.* at ADI00859705.)

The table of contents includes the Premachandran paper. (*Id.* at ADI00859712.)

Turning to the substance of Premachandran, I find that Analog has failed to demonstrate that it discloses each and every element of claim 1.

Premachandran does not clearly disclose “a cover comprising a conductive layer having a center portion bounded by a peripheral edge portion.” The primary disclosure in Premachandran is the microphone package depicted in Figure 3. (RX-422 at ADI00863208.) That package includes a plastic cap as the cover, and plastic is not a conductive material. (*Id.*; CX-610 at Q. 85.) Figure 3 depicts the following:



**Fig.3 Cross section view of microphone package**

(RX-422 at ADI00863208.)

Even though the package in Figure 3 depicts the use of a plastic cover, Analog and its experts note that Premachandran states that testing was done using plastic, ceramic, and metal enclosures. (RX-353C at Q. 201; RX-354C at Q. 127.) While Analog is correct that Premachandran mentions “ceramic, plastic and metal can” configurations, there is no indication of the composition of the tested package that included a metal cover, or that the tested package

## PUBLIC VERSION

with a metal cover met the other limitations of claim 1. (CX-610 at Q. 85.) The mere mention of the use of a metal cover does not demonstrate clear and convincing evidence that Premachandran anticipates claim 1. Furthermore, Dr. Tummala testifies that one of ordinary skill in the art would know how to replace the plastic cover of the package in Figure 3 with a metal cover without shorting the microphone device. (RX-353C at Q. 202.) Such testimony may be relevant to an obviousness argument, but does not demonstrate that Premachandran anticipates claim 1.

Analog's experts also rely on Premachandran's disclosure of the use of copper foil. (RX-353C at Q. 201; RX-354C at Q. 127.) Premachandran states:

Standard copper foil tape CHO-Foil RA copper, that are recommended for EMI shielding were used as shielding for PCB and microphone package (Fig.6). The copper foil is wound around the packages and the PCB board and connected to the ground of PCB board. Testing was done with difference microphone dice with the same ASIC die.

(RX-422 at ADI00863209.) Figure 6 of Premachandran depicts the following:

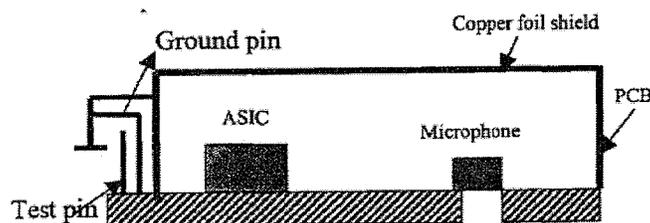


Fig 6. Schematic view of copper foil shield

(*Id.*)

The disclosure in Premachandran that copper foil is “wound around the packages and the PCB board” is not a clear and convincing disclosure of “a cover comprising a conductive layer.” This passage demonstrates that the copper foil was external to the package, and not a part of the cover. (CX-610 at Q. 85.) The fact that the copper foil wrapped around the PCB board shows

## PUBLIC VERSION

that the foil is not a component of the cover. (*Id.*) Therefore, the disclosure of the use of copper foil is not sufficient to meet the “a cover comprising a conductive layer” limitation.

Premachandran does not clearly disclose “a housing formed by connecting the peripheral edge portion of the cover to the substrate.” To demonstrate the “substrate” claim element, Dr. Tummala and Dr. Pecht rely on the lead frame. (RX-353C at Q. 197; RX-354C at Q. 125.) To demonstrate the “cover” claim element, Dr. Tummala and Dr. Pecht rely on the cap. (RX-353C at Q. 201-202; RX-354C at Q. 127.) To demonstrate the “housing” claim element, Dr. Tummala and Dr. Pecht rely on the connection of the cap to the lead frame. (RX-353C at Q. 204; RX-354C at Q. 129.)

As seen above, Figure 3 of Premachandran also contains a plastic substrate below the microphone, and without that plastic substrate, the microphone package would be incomplete and inoperable. (RX-422 at ADI00863208; CX-610 at Q. 85.) Therefore, I find that there are three components that make up the “housing” of Premachandran – the plastic cap, the lead frame, and the plastic substrate. Yet, the language of claim 1 requires that the housing is “formed by connecting the peripheral edge portion of the cover to the substrate.” This language requires that the housing is made of two components – the cover and the substrate. Therefore, Premachandran does not clearly disclose the “housing” element of claim 1. (CX-610 at Q. 85.)<sup>22</sup>

Based on the foregoing, I conclude that Analog has failed to offer clear and convincing evidence that Premachandran anticipates claim 1 of the ‘231 patent.

### c. Baumhauer

**Analog’s Position:** Analog contends that U.S. Patent No. 4,533,795 (“Baumhauer”) anticipates claim 1 of the ‘231 patent.

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<sup>22</sup> I note that Analog does not offer any argument that the lead frame and plastic substrate of Figure 3 together comprise the “substrate” of claim 1. (*See* RX-353C at Q. 197; RX-354C at Q. 125.)

## PUBLIC VERSION

Analog claims that the only dispute between the parties is whether or not Baumhauer discloses a “package.” Analog states that Baumhauer discloses an electrical connection between the package and another circuit outside of the package. (Citing RX-354C at Q. 137; RX-353C at Q. 217; CX-610 at Q. 83.) Analog asserts that persons of ordinary skill in the art would have understood that the carrier substrate of Baumhauer could have terminal pads on the bottom side of the printed circuit board, which could provide a second level electrical connection to the outside worlds. (Citing RX-386 at 231:14-21; RX-354C at Q. 137; RX-353C at Q. 217.)

Analog argues that for the microphone of Baumhauer to function, it must be connected to all the other system components that may not be on the substrate disclosed in the specification. (Citing RX-353C at Q. 219; RX-354C at Q. 137.) Analog claims that one of ordinary skill in the art would understand that most likely Baumhauer discloses a multicomponent package with more than one component in the same package as the microphone. (Citing Tr. at 557:19-558:14; RX-353C at Q. 219.) Analog claims that there must be electrical connections coming out of the multicomponent package for it to function. (Citing RX-353C at Q. 219.) Analog asserts that Baumhauer discloses the remaining elements of claim 1.

**Knowles’ Position:** Knowles contends that Baumhauer fails to anticipate claim 1 of the ‘231 patent.

Knowles argues that Baumhauer fails to disclose a “package.” Knowles asserts that Baumhauer fails to disclose that it is intended to be mounted on a printed circuit board or other substrate, as the only discussion of a printed circuit board is the substrate to which the microphone is attached. (Citing RX-48 at 9:6-11.) Knowles asserts that Baumhauer teaches “chip-on-board” technology because there is no disclosure that the carrier substrate 31 will itself be mounted anywhere. (Citing CX-610 at Q. 45, 81; Tr. at 511:10-15.)

## PUBLIC VERSION

Knowles claims that Baumhauer fails to disclose the second level interconnection required by a “package.” Knowles states that Baumhauer only discloses a connection between the microphone and the carrier substrate, but does not disclose any further connection. (Citing CX-610 at Q. 45.)

**Staff’s Position:** Staff contends that Baumhauer fails to anticipate claim 1 of the ‘231 patent.

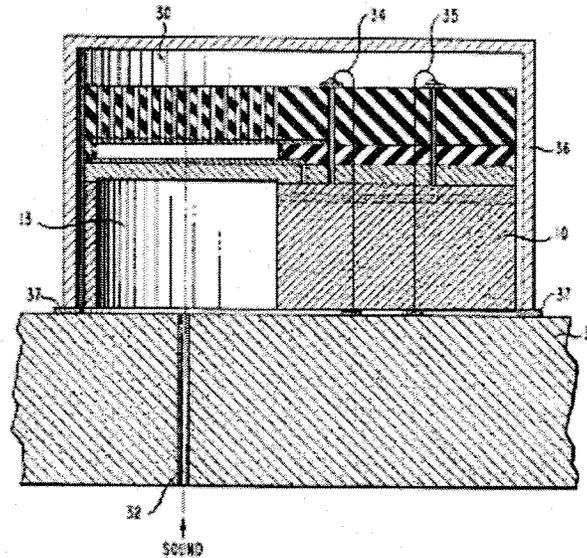
Staff asserts that Baumhauer fails to disclose a “package.” Staff claims that Baumhauer discloses a first level connection, but does not disclose a second level connection. (Citing Tr. at 742:16-19.) Staff claims that this conclusion is supported by expert testimony. (Citing Tr. at 511:10-15, 742:16-19; CX-610 at Q. 45.)

**Discussion and Conclusion:** Based on the evidence in the record, I find that Analog has failed to demonstrate by clear and convincing evidence that Baumhauer anticipates claim 1 of the ‘231 patent.

I find that Baumhauer fails to disclose a “microelectromechanical system package.” I construed “package” to mean “a single, self-contained unit which fully encloses a device, and which provides: (1) protection for the device from the external environment, (2) an electrical connection between the device and the package, and (3) an electrical connection between the package and another circuit outside of the package.”

The parties focus on Figure 6 of Baumhauer, which discloses the following:

PUBLIC VERSION



(RX-48 at Fig. 6.)

The transducer of Baumhauer is mounted on what is referred to as “carrier substrate 31.” (See, e.g., RX-48 at 9:49-10:12.) I construed “package” to mean “a single, self-contained unit which fully encloses a device, and which provides: (1) protection for the device from the external environment, (2) an electrical connection between the device and the package, and (3) an electrical connection between the package and another circuit outside of the package.” I find that Baumhauer fails to disclose a “package,” as it merely discloses a covered microphone mounted on a carrier substrate. There is no disclosure of the two levels of connection that are required in a “package.”

Such a conclusion is supported by expert testimony. Knowles’ expert Dr. Bauer testified that “Baumhauer ‘795 does not disclose any second level package, which suggests to me that this is more similar to ‘chip-on-board,’ a technology that is commonly described as ‘packageless,’ an ‘alternative to packaging,’ and a ‘non-package.’” (CX-610 at Q. 45.) On cross-examination, Analog’s expert Dr. Tummala acknowledged that “one potential option” is that Baumhauer discloses a packageless chip-on-board. (Tr. at 511:10-512:3.) Dr. Pecht, Analog’s other expert,

## PUBLIC VERSION

agreed that Figure 6 of Baumhauer fails to depict a second level connection. (*Id.* at 742:16-19.)

This conclusion is consistent with the Commission's opinion in the 629 investigation.

There, the Commission stated:

We agree with the ALJ that Baumhauer fails to anticipate claims 1 and 2 of the '231 patent because it does not disclose a "microelectromechanical package." The ALJ's finding is based *inter alia*, on the testimony of Dr. Gilleo that Baumhauer does not disclose a "package" because it does not disclose the ability to connect the microphone to another circuit.

(CX-411 at 8-9) (citations omitted).

Analog relies on the opinions of Dr. Tummala and Dr. Pecht, who both testify that a second level connection is implied, and that the microphone of Baumhauer would not function without the second level connection. (RX-353C at Q. 217, 219-221; RX-354C at Q. 136-138.) Neither Dr. Tummala nor Dr. Pecht can point to anything in Baumhauer that supports the existence of "a single, self-contained unit which fully encloses a device, and which provides...an electrical connection between the package and another circuit outside of the package." (*Id.*) I find that such expert testimony, on its own, is insufficient evidence to demonstrate clear and convincing evidence of the necessary second level connection. *Motorola, Inc. v. Interdigital Tech. Corp.*, 121 F.3d 1461, 1473 (Fed. Cir. 1997) ("An expert's conclusory testimony, unsupported by the documentary evidence, cannot supplant the requirement of anticipatory disclosure in the prior art reference itself.")

Based on the foregoing, I find that Analog has failed to offer clear and convincing evidence that Baumhauer anticipates claim 1 of the '231 patent.

### **2. Obviousness**

#### **a. Level of Ordinary Skill in the Art**

**Analog's Position:** Analog contends that one of ordinary skill in the art has at least a

## PUBLIC VERSION

degree in engineering or one of the physical sciences, a minimum of one or two years of full-time experience in device packaging, and general knowledge of electronics packaging that would include some understanding of package designs, constructions, functions, attributes, and processes used to produce them and to incorporate the devices into the package. (Citing RX-56 at 92-93.) Analog asserts that a person of ordinary skill in the art in 2000 would know that a package for a MEMS microphone needs a back cavity to allow the MEMS element to move and that such a package also needs a hole to allow acoustic energy to reach the MEMS element. (Citing RX-354C at Q. 52; CX-460C at Q. 15; CX-611 at Q. 15-18; Tr. at 95:3-22, 97:5-98:3, 274:21-275:16, 359:6-360:10, 348:25-349:18, 836:21-837:6, 850:8-18.)

**Knowles' Position:** Knowles' expert Dr. Bauer used the following definition of a person of ordinary skill in the art: a degree in engineering or one of the physical sciences, a minimum of one to two years of full-time experience in device packaging, and a general knowledge of electronic packaging that would include some understanding of package designs, constructions, functions, attributes, and processes used to produce them and to incorporate the devices into the package. (CX-610 at Q. 15.)

**Staff's Position:** Staff notes that in the 629 investigation, the Commission defined one of ordinary skill in the art as a person having a degree in engineering or one of the physical sciences, a minimum of one to two years of full-time experience in device packaging, and a general knowledge of electronic packaging that would include some understanding of package designs, constructions, functions, attributes, and processes used to produce them and to incorporate the devices into the package.

**Discussion and Conclusion:** Based on the evidence in the record, I find that a person of ordinary skill in the art related to the '231 patent would have: (1) a degree in engineering or one

## PUBLIC VERSION

of the physical sciences; (2) a minimum of one to two years of full-time experience in device packaging; and (3) general knowledge of electronic packaging that would include some understanding of package designs, constructions, functions, attributes, and processes used to produce them and to incorporate the devices into the package.

As the parties acknowledge, this was the definition of one of ordinary skill in the art adopted in the 629 investigation. (CX-412 at 92-93.) The parties' experts have used this definition in their analyses, and no party offers an argument opposing this definition. (*See, e.g.*, CX-610 at Q. 15; RX-354C at Q. 31-32.) Therefore, I find no reason to alter this definition that was first adopted in the 629 investigation.

### **b. Halteren in View of Sjursen**

**Analog's Position:** Analog contends that claim 1 of the '231 patent is obvious in view of Halteren in combination with U.S. Patent No. 7,003,127 ("Sjursen").

Analog argues that if it is determined that Halteren does not anticipate claim 1 based on Knowles' argument that it does not disclose a "package," then Halteren in combination with Sjursen would disclose all of the elements of claim 1. Analog claims that Sjursen discloses a package for a microphone – an electret condenser microphone instead of a MEMS microphone. (Citing RX-15 at 2:11-14; RX-354C at Q. 110.)

Analog claims that under any of the proposed constructions of "package," the combination of Halteren and Sjursen would disclose the claimed "microelectromechanical system package" of claim 1. Analog argues that the combination would only require the use of Sjursen's substrate with the rest of the package disclosed in Halteren. (Citing RX-15 at 7:24-25; RX-354C at Q. 113.) Analog states that the combination package discloses a first level electrical connection because one of ordinary skill in the art would know how to wire bond the MEMS

## PUBLIC VERSION

microphone of Halteren to the PCB of Sjursen. (Citing RX-354C at Q. 115; RX-353C at Q. 165; Tr. at 798:9-15.)

Analog argues that the combination package discloses a second level connection. (Citing RX-354C at Q. 116; Tr. at 938:19-22.) Analog claims that the second level connection disclosed in Sjursen is directly below the housing and can be made with either butt leads or electrical pads. (Citing RX-15 at 7:24-28, Fig. 29.) Analog claims that the other second level connection requirements proposed by Knowles – the connection must be under the device, the connection must provide mechanical support, and the connection must be to a printed circuit board or other substrate – would be satisfied by the combination package. (Citing RX-353C at Q. 93.)

Analog asserts that both Halteren and Sjursen disclose a housing that protects the microphone from external elements. (Citing RX-354C at Q. 117.) Analog states that because Sjursen discloses pads underneath the package, the combination package would provide protection from mechanical vibration and shock as required by Knowles' construction of package. (Citing RX-354C at Q. 117.) Analog claims that the combination package would have an outline similar to the outline of the package depicted in Figure 1 of the '231 patent. (Citing RX-354C at Q. 119.)

Analog argues that there is ample motivation to combine Halteren and Sjursen. According to Analog, both reference describe microphone packages suitable for hearing aids. (Citing RX-15 at Abstract; RX-47 at 2:26-30; RX-354C at Q. 110.) Analog states that Dr. Bauer acknowledges that Sjursen and Halteren are directed to the same problem. (Citing CX-610 at Q. 87.)

Analog claims that there is a motivation to replace the flexible member of Halteren with the PCB of Sjursen. Analog notes that Sjursen states that the PCB may either be a rigid board or

## PUBLIC VERSION

a flex circuit. (Citing RX-15 at 7:14-17, 6:37-40; RX-47 at 3:1-5; Tr. at 798:12-15.) Analog states that based on Dr. Bauer's admissions, a person of ordinary skill in the art would be motivated to combine the reference because Sjursen solves a problem that Halteren raises. Analog states that Dr. Bauer agrees that Halteren wants to automate the attachment of the package to the second level and eliminate the need for litz wires. (Citing Tr. at 871:15-872:2, 880:19-24; RX-47 at 1:40-2:5.) According to Analog, Sjursen proposes a solution to allow for automated assembly. (Citing RX-15 at 2:3-7.)

In its reply brief, Analog claims that Knowles offers new arguments regarding why Sjursen is not a "package." Analog asserts that those new arguments have been waived under Ground Rule 8.2 because they do not appear in Knowles' pre-hearing brief.

Analog argues that Knowles is incorrect to assert that Sjursen does not disclose a package that can be mounted using surface mount or through hole technology. Analog argues that Sjursen discloses pads that can be mounted using surface mount technology. (Citing Tr. at 938:19-22, 1030:1-7, 1030:21-24, 945:20-946:1; RX-15 at 7:25-28.) Analog claims that Sjursen also discloses surface mountable butt leads. (Citing Tr. at 790:17-791:1, 945:20-946:1; RX-444 at ADI00863601; RX-353C at Q. 93; RX-385 at 137:19-25, 141:15-16.)

**Knowles' Position:** Knowles contends that Analog failed to offer clear and convincing evidence that the combination of Halteren and Sjursen renders claim 1 obvious.

Knowles argues that the combination of the references fails to disclose a "package." Knowles states that in Sjursen, the only disclosed means for electrically connecting the microphone and other circuitry inside the assembly in through a wire harness or flex circuit. (Citing RX-15 at 7:24-33, 6:37-40.) Knowles claims that there is no disclosure that the assembly uses either through hole or surface mount technology to connect the assembly electronics to any

## PUBLIC VERSION

other element. (Citing Tr. at 1029:22-1030:24.) Knowles claims that there is no disclosure that the assembly of Sjurzen is mounted onto a printed circuit board or other substrate. (Citing RX-15 at 15:3-7; Tr. at 1028:21-24.)

Knowles asserts that there is no evidence of a reason to combine the references. Knowles claims that: (1) neither Halteren nor Sjurzen disclose packages; (2) Sjurzen discloses an electret microphone, while claim 1 requires a MEMS microphone; and (3) the sides of the electret microphone in Sjurzen are mechanically connected to its metal housing, while the bottom of the MEMS microphone taught by claim 1 is mechanically connected to the top of the substrate. Knowles claims that Analog has failed to offer evidence that, in light of these differences, one of ordinary skill in the art would have a reason to combine the references to produce the package of claim 1.

In its reply brief, Knowles claims that the assertion that Sjurzen discloses but leads is pure speculation on the part of Analog. (Citing RX-15 at Fig. 29.) Knowles states that the specification only discloses an electrical connection to the microphone assembly through a wire harness or flex circuit. (Citing RX-15 at 7:30, 6:37.) Knowles explains that while the specification describes the use of electrical pads to make an electrical connection outside of the assembly, the embodiment depicted cannot possibly include pads underneath the PCB, as required by Knowles' construction. (Citing RX-15 at 7:24-28, 12:52-13:64.) Knowles points to Dr. Bauer's testimony that not all "pads" are suitable for surface mount connections. (Citing Tr. at 1014:9-1015:17.) Knowles further argues that replacing the flexible substrate of Halteren with the rigid PCB of Sjurzen would contradict one of the stated purposes of Halteren, which was to provide a flexible assembly. (Citing RX-47 at 2:26-30.)

**Staff's Position:** Staff contends that Analog failed to offer clear and convincing

## PUBLIC VERSION

evidence that the combination of Halteren and Sjursen renders claim 1 obvious.

Staff argues that there was no reason to combine Halteren and Sjursen in the manner proposed by Analog. Staff states that at the time of the '231 patent, the packaging of MEMS devices was complex and application-specific. (Citing CX-610 at Q. 137; CX-620; CX-619.) Staff claims that the nature of MEMS packaging does not suggest that it would have been easy or predictable to swap various components to create a package.

Staff claims that one of ordinary skill in the art would not have known to use the substrate from an electret microphone package, as found in Sjursen, instead of the flexible substrate found in the MEMS microphone package of Halteren. (Citing CX-610 at Q. 87.) Staff notes that in Sjursen, the transducer is mounted to the cover as opposed to the surface of the substrate as in Halteren. (Citing RX-354C at Q. 108.)

**Discussion and Conclusion:** In Section IV.B.1.a, *supra*, I have already concluded that Analog offered clear and convincing evidence that Halteren anticipates claim 1 of the '231 patent. Therefore, I find it unnecessary to combine Halteren with another prior art reference to determine the validity (or lack thereof) of claim 1.

Assuming *arguendo* that it is determined that Halteren fails to disclose a “package,” I find that Analog has offered clear and convincing evidence that Halteren in light of Sjursen renders claim 1 obvious, and that it would have been obvious to one of ordinary skill in the art to combine the disclosures of Halteren and Sjursen to reach the package of claim 1.

Sjursen is directed to a disposable hearing aid. (*See generally* RX-15.) Sjursen discloses a hearing aid microphone assembly as follows:

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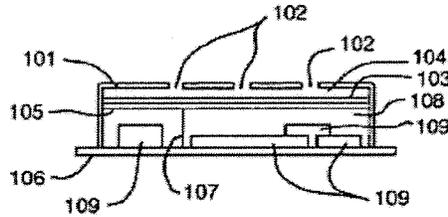


FIG. 1

(RX-15 at Fig. 1.) The assembly contains an electret microphone, which is comprised of a “front chamber 104, a diaphragm 103, a backplate 105, a back chamber 108, and electrical components 109.” (JX-15 at 4:55-56.) The assembly also includes “a printed circuit board 106 on which the components are mounted, and an electrical connection 107[.]” (*Id.* at 4:56-58.) Further description of the PCB 106 is found later in the specification:

The PCB 106 may contain one or more copper layers L1, L2 for making electrical connections to signal components, and to ground. The PCB may either be a rigid board (e.g., glass epoxy FR-4) or a flex-circuit (e.g., polyimide). Other details of PCB construction are well known in the industry. Preferably, the PCB contains at least two layers L1, L2 of which one layer is substantially a power or ground plane, and in conjunction with the metal housing provides electrical shielding of the integral electronics from interference, i.e., EMI. In one embodiment, the PCB extends beyond the metal housing (as shown) in FIG. 8. Electrical pads or terminals may be positioned on the PCB. In the embodiment shown in FIG. 8, these terminals may be located outside the metal housing to make electrical connections to other components such as a battery 404 or to a receiver (see FIG. 4). This allows easy connections of a mechanical on/off switch spring element (not shown) and a wire harness (not shown) for electrical connections to the receiver and the negative terminal of the battery.

(*Id.* at 7:14-32.) Figure 8 is shown below:

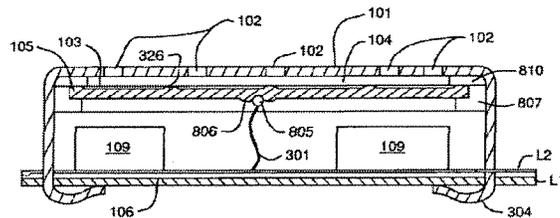


FIG. 8

(RX-15 at Fig. 8.)

## PUBLIC VERSION

I find that Sjursen discloses a “package.” I have construed “package” to mean “a single, self-contained unit which fully encloses a device, and which provides: (1) protection for the device from the external environment, (2) an electrical connection between the device and the package, and (3) an electrical connection between the package and another circuit outside of the package.” Sjursen discloses a single, self-contained unit which fully encloses a device. (RX-15 at 4:50-60, Fig. 1.) The package provides protection for the microphone from the external environment, as the microphone is covered by a metal housing 101, which is connected to the PCB 106. (RX-15 at 4:50-5:39, Fig. 1; RX-354C at Q. 117.)<sup>23</sup> Sjursen discloses an electrical connection between the microphone and the package, as it is clear that the microphone is electrically connected to the PCB 106. (See, e.g., RX-15 at 4:50-60, 5:62-65, 7:5-54, Figs. 1, 8.) Finally, Sjursen discloses an electrical connection between the package and another circuit outside of the package, as described in the passage quoted *supra* regarding the electrical pads or terminals. (RX-15 at 7:14-32; RX-354C at Q. 116.) An electrical connection is also described with reference to Figures 28 and 29 of Sjursen. (RX-15 at 20:43-58, Figs. 28-29; RX-354C at Q. 116.)

While I have concluded that Sjursen discloses a “package,” the obviousness analysis does not end there. The Federal Circuit has explained that “it remains appropriate for a post-*KSR* court considering obviousness ‘to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue.’” *Fresenius USA, Inc. v. Baxter Int’l, Inc.*, 582 F.3d 1288, 1300-1301 (Fed. Cir. 2009) (quoting *KSR*, 550 U.S. at 418)). The determination of whether or not there exists a reason to combine prior art references is not made using rigid formulas or rules. See *Wyers v. Master Lock Co.*, 616 F.3d 1231, 1238-1240

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<sup>23</sup> I note that the cover in Sjursen comprises a conductive layer and includes acoustic ports, and that the combination of the cover and substrate of Sjursen provides EMI protection. (RX-15 at 4:50-60, 7:19-23.) In addition, Sjursen discloses a substrate comprising a surface for supporting a microphone. (*Id.*; Tr. at 927:19-23.)

## PUBLIC VERSION

(Fed. Cir. 2010) (describing the more “expansive and flexible approach” to obviousness articulated by the Supreme Court in *KSR*).

I find that there is a sufficient reason that one of ordinary skill in the art would combine the known elements from Sjurzen and Halteren. Both references expressly address the same technological field – microelectronics microphones in hearing instruments. (See RX-47 at 1:5-20; RX-15 at 1:60-2:10; RX-354C at Q. 110; Tr. at 797:9-25.) As Dr. Pecht opined, “Halteren and Sjurzen are both directed at technology that helps interconnect and protect microelectronics microphones.” (RX-354C at Q. 112.) Dr. Pecht further testified that “[b]oth prior art references are directed toward hearing aid technology and would, therefore, be examined by one of ordinary skill in the art in terms of their respective solutions for microphone packaging (among other things).” (*Id.* at Q. 110.) Dr. Pecht noted that Sjurzen discloses that its PCB 106 is interchangeable with a flexible substrate, thereby making it clear to one of ordinary skill in the art that rigid and flexible substrates can be interchangeable. (*Id.*)

Dr. Pecht described what a microphone would look like if one of ordinary skill in the art were to replace the substrate of Halteren with the substrate of Sjurzen. (RX-354C at Q. 113-117.) I find Dr. Pecht’s testimony credible on this issue and conclude that there is clear and convincing evidence of obviousness.

Knowles and Staff offer arguments regarding why there is no reason to combine the references, but I find those arguments are without merit. Knowles claims that neither Halteren nor Sjurzen disclose a “package” under Knowles’ proposed construction. I have not adopted Knowles’ proposed construction of package, and I have found *supra* that the “package” limitation is met by the combination of Halteren and Sjurzen.

Knowles and Staff also argue that Sjurzen discloses a “side-mounted electret

## PUBLIC VERSION

microphone” instead of a “bottom-mounted MEMS microphone.” (CIB at 64; *see also* SIB at 54.) This argument ignores Dr. Pecht’s testimony regarding the proposed combination of Halteren and Sjursen, where the substrate of Sjursen is used with the other components – including the microphone – of Halteren. (RX-354C at Q. 113-117.) There is no dispute that Halteren discloses “a microelectromechanical system microphone.” (RX-353C at Q. 171; RX-47 at 7:52-57.)

Moreover, I find that Sjursen is still relevant to the obviousness analysis even though it discloses the use of an electret microphone. The evidence demonstrates that electret microphone packages were the predecessor to MEMS microphone packages. (CX-608C at Q. 15; CX-609C at Q. 11, 16; RX-387C at 61:2-63:20.) Thus, I find that it is reasonable to believe that one of ordinary skill in the art at the time of the filing of the ‘231 patent would have been knowledgeable regarding electret microphone packages and would have examined, *inter alia*, electret microphone package designs when designing a MEMS microphone package.

Staff asserts that at the time of the ‘231 patent, MEMS packaging was complex and application specific. Staff cites to evidence to support this assertion. (*See* CX-619; CX-620.) I find that generic statements regarding the complexity of packaging MEMS devices, like the ones identified by Staff, cannot overcome the detailed testimony of Dr. Pecht describing how one of ordinary skill in the art would know how to combine the disclosures of Halteren and Sjursen to reach claim 1.

Based upon the foregoing, I find that Analog has provided clear and convincing evidence that Halteren in view of Sjursen discloses each and every element of claim 1 of the ‘231 patent and that a person of ordinary skill in the art would be motivated to combine Halteren with Sjursen to arrive at the invention of claim 1, thereby rendering claim 1 obvious.

**c. Baumhauer in View of Sjursen**

**Analog's Position:** Analog contends that the combination of Baumhauer and Sjursen renders claim 1 of the '231 obvious.

Analog argues that if it is determined that Baumhauer fails to disclose a "package," the combination of Baumhauer and Sjursen discloses this claim element. (Citing RX-354C at Q. 147.) Analog argues that the PCB from Sjursen could replace the carrier substrate in Baumhauer to create a package that meets all of the elements of claim 1 under any proposed construction of "package." (Citing RX-354C at Q. 147, 149-151.)

Analog argues that a person of ordinary skill in the art would be motivated to combine Baumhauer and Sjursen. Analog states that both patents are directed at technologies for microelectronics microphones for hearing aids. (Citing RX-48 at 1:11-16; RX-15 at 1:62-64; RX-354C at Q. 144.) Analog argues that it would have been easy for a person of ordinary skill to combine the technologies in the two references because they both use a printed circuit board and a metal cover. (Citing RX-354C at Q. 144.)

**Knowles' Position:** Knowles contends that the combination of Baumhauer and Sjursen does not render claim 1 obvious. Knowles asserts that for the reasons previously explained, both Baumhauer and Sjursen fail to disclose a "package."

Knowles argues that Analog has not offered a sufficient reason to combine the references. Knowles states that both Baumhauer and Sjursen disclose assemblies, and not packages. Knowles claims that Sjursen discloses an electret microphone, while the claim 1 of the '231 patent requires a MEMS microphone. Knowles asserts that the sides of the electret microphone in Sjursen are mechanically connected its metal housing, spanning from one side of the housing to the other, while the bottom of the MEMS microphone taught by claim 1 is mechanically

## PUBLIC VERSION

connected to the top of the substrate. Knowles argues that Analog has failed to offer evidence that one of ordinary skill in the art would have the known to overcome these differences to create the package found in claim 1 from the combination of Baumhauer and Sjursen.

**Staff's Position:** Staff contends that the combination of Baumhauer and Sjursen fails to render claim 1 obvious. Staff repeats its arguments concerning Sjursen that it made when addressing the combination of Halteren and Sjursen.

**Discussion and Conclusion:** Based on the evidence in the record, I find that the combination of Baumhauer and Sjursen renders claim 1 of the '231 patent obvious.

In Section IV.B.1.c *supra*, I found that Baumhauer does not disclose a “package.” Baumhauer discloses all of the other limitations of claim 1. Baumhauer discloses a “microelectromechanical system microphone.” (RX-353C at Q. 222-223.) Baumhauer discloses a substrate comprising a surface for supporting microphone, as the carrier substrate 31 of Baumhauer supports the microphone. (*Id.* at Q. 224-225.) Baumhauer discloses a cover comprising a conductive layer having a center portion bounded by a peripheral edge portion. (*Id.* at Q. 226-227.) Baumhauer discloses that the enclosure member 36 shown in Figure 6 can be made of “conductive or conductively plated plastic or metal[.]” (RX-48 at 9:57-58, Fig. 6.)

Baumhauer discloses a housing formed by connecting the peripheral edge portion of the cover to the substrate, the center portion of the cover spaced from the surface of the substrate to accommodate the microphone. (RX-353C at Q. 228-229; RX-48 at Fig. 6.) The housing of Baumhauer includes at least one acoustic port. (RX-353C at Q. 230-231; RX-48 at 9:49-54, 10:9-11, Fig. 6.) The housing of Baumhauer provides protection from an interference signal. (RX-353C at Q. 232-233; RX-48 at 9:54-64.) Knowles does not dispute that Baumhauer discloses these claim elements. (*See* CIB at 56-58.)

## PUBLIC VERSION

In the obviousness analysis regarding the combination of Halteren and Sjursen, I have concluded that Sjursen discloses a “package.” Dr. Pecht describes how one of ordinary skill in the art would know how to modify the disclosure of Baumhauer using the PCB 106 of Sjursen to create the package of claim 1. (RX-354C at Q. 147-151.) Specifically, the PCB 106 of Sjursen could be combined with the microphone of Baumhauer to create a “package” that provides protection for the microphone, an electrical connection between the microphone and the substrate, and an electrical connection between the substrate and a circuit outside of the package. (*Id.*)

I find that there is adequate reason for one of ordinary skill in the art to combine the references, as both references expressly address the same technological field – microelectronics microphones in hearing aids. (RX-354C at Q. 144-146; RX-48 at 1:5-23; RX-15 at 1:60-2:10.) Dr. Pecht offers evidence regarding how one of ordinary skill in the art would combine Baumhauer and Sjursen to result in the apparatus found in claim 1. (RX-354C at Q. 147-151.) I find Dr. Pecht’s testimony credible on this issue and conclude that there is clear and convincing evidence of obviousness.

Knowles and Staff offer arguments in opposing the combination of Baumhauer and Sjursen. Knowles argues that neither Baumhauer nor Sjursen disclose a package. (CIB at 65; CX-610 at Q. 88-89.) For the reasons explained *supra*, I have concluded that Sjursen discloses a package. Therefore, Knowles’ argument lacks merit.

Next, Knowles and Staff argue that there is an insufficient reason to combine the references. Knowles again relies on the incorrect assertion that Sjursen does not disclose a package. Knowles and Staff again argue that Sjursen discloses a “side-mounted electret microphone” instead of a “bottom-mounted MEMS microphone.” (CIB at 66; *see also* SIB at

## PUBLIC VERSION

55-56.) This argument ignores Dr. Pecht's testimony regarding the proposed combination of Baumhauer and Sjursen, where the substrate of Sjursen is used with the other components – including the microphone – of Baumhauer. (RX-354C at Q. 147.) There is no dispute that Baumhauer discloses “a microelectromechanical system microphone.” (RX-353C at Q. 222-223.)

Moreover, I find that Sjursen is still relevant to the obviousness analysis even though it discloses the use of an electret microphone. The evidence demonstrates that electret microphone packages were the predecessor to MEMS microphone packages. (CX-608C at Q. 15; CX-609C at Q. 11, 16; RX-387C at 61:2-63:20.) Thus, I find that it is reasonable to believe that one of ordinary skill in the art at the time of the filing of the '231 patent would have been knowledgeable regarding electret microphone packages and would have examined, *inter alia*, electret microphone package designs when designing a MEMS microphone package.

Based upon the foregoing I find that Analog has provided clear and convincing evidence that Baumhauer in view of Sjursen discloses each and every element of claim 1 of the '231 patent and that a person of ordinary skill in the art would be motivated to combine Baumhauer with Sjursen to arrive at the invention of claim 1, thereby rendering claim 1 obvious.

### **d. Premachandran**

**Analog's Position:** Analog contends that if Premachandran is not found to anticipate claim 1 of the '231 patent, it would still render claim 1 obvious.

Analog argues that it is undisputed that Premachandran describes testing the effect of using a copper foil and a copper box to protect against EMI. (Citing RX-422 at ADI00863207; Tr. at 981:24-982:7.) Based on this disclosure of the use of copper foil, Analog claims that one of ordinary skill in the art would know how to create a cover with a conductive layer either

## PUBLIC VERSION

using metallic lids, plating plastic and other insulating lids with metal, or by embedding metal in those same insulating lids. (Citing RX-353C at Q. 201)

**Knowles' Position:** Knowles contends that Premachandran does not render claim 1 of the '231 patent obvious.

Knowles argues that combining the various disclosures of Premachandran would at most result in a microphone package that is surrounded by a discrete copper box or discrete copper foil. Knowles states that this would still fail to disclose a cover with a conductive layer and a housing with an integral EMI shield, as required by claim 1. Knowles claims that the combination does not address the fact that Premachandran fails to disclose a housing made up of a substrate and cover.

Knowles claims that there was no reason to combine the various disclosures of Premachandran. According to Knowles, the paper makes clear that the experiments described were complete and there was no further work contemplated. Knowles claims that the '231 patent expressly describes packages like the one in Premachandran as the problem, and not the solution. (Citing CX-610 at Q. 50.) Knowles notes that the specification of the '231 patent pointed out the undesirable characteristics of the packages disclosed in Premachandran. (Citing JX-1 at 1:27-33, 3:8-16.)

**Staff's Position:** Staff contends that Premachandran does not render claim 1 obvious. Staff states that Premachandran only discloses wrapping copper foil around the packages and PCB board, and the only package discussed in any detail includes a plastic cap. Thus, Staff believes that Premachandran does not provide a suggestion or motivation to make a package like the one in claim 1. (Citing RPHB at 95; CX-610 at Q. 91.) Staff also argues that Premachandran does not disclose a housing, as described in Staff's anticipation analysis.

## PUBLIC VERSION

**Discussion and Conclusion:** Based on the evidence in the record, I find that Analog has not offered clear and convincing evidence that Premachandran renders claim 1 of the '231 patent obvious.

The alleged package of Premachandran includes a plastic cap and plastic substrate. (RX-422 at ADI00863208.) The reference discloses performing testing on the package in various conditions, one of which includes copper foil shielding. (*Id.* at ADI00863209.) The paper states that “[t]he copper foil is wound around the packages and the PCB board and connected to the ground of the PCB board.” (*Id.*)

Analog argues that modifying the disclosure of Premachandran would result in the package of claim 1. Specifically, Dr. Pecht opines that “a person of ordinary skill [in the art] would know that wrapping a package with copper foil is equivalent to plating the lid or the housing of a package with copper. A package like that in Figure 3, with a cover plated with copper, would have a cover with a conductive layer and EMI shielding, meeting the disputed limitations of Claim 1.” (RX-354C at Q. 133.)

I find that Analog has not offered clear and convincing evidence of obviousness based on Premachandran. While Premachandran discloses a testing method using copper foil wrapped around the package, there is no indication that this would lead one of ordinary skill in the art to plate the cover of the package in Figure 3 with copper. (*See* CX-610 at Q. 90-91.) Dr. Pecht provides no support for the opinion that one of ordinary skill in the art, when presented with a package with a plastic cap that is wrapped in copper foil, would know how to plate the cap with copper to result in a cover with a conductive layer and EMI shielding. (RX-354C at Q. 133.) This unsupported opinion is insufficient to render claim 1 obvious in light of Premachandran.

In addition, I found in Section IV.B.1.b *supra* that Premachandran lacked “a housing

## PUBLIC VERSION

formed by connecting the peripheral edge portion of the cover to the substrate.” Analog’s obviousness argument does nothing to address the lack of this limitation.

Based on the foregoing, I find that Analog has failed to offer clear and convincing evidence that Premachandran renders claim 1 obvious.

### e. Secondary Considerations

**Knowles’ Position:** Knowles contends that secondary considerations support a finding of non-obviousness.

Knowles argues that there is evidence of commercial success. Knowles claims that when it was introduced, the SiSonic product had distinct advantages over existing electret condenser microphones (ECMs), as the SiSonic was a self-contained surface mount package that could be used in automated, pick and place manufacturing processes, it was durable with regard to heat and being dropped, and there was a simple unified means of electrical connection and mechanical support to the customer’s printed circuit board. (Citing CX-608C at Q. 15-17.) Knowles states that sales of the SiSonic went from zero in 2003 to over 1 billion units by the end of calendar year 2009, and Knowles has been the leading supplier of MEMS microphones for the past 4 years. (Citing CX-608C at Q. 20.) {

} (Citing CX-608C at Q. 21-26.) Knowles claims that a key to this success is the package design. (Citing CX-608C at Q. 27.) Knowles states that Dr. Loeppert similarly testified that the SiSonic was the first commercialized MEMS microphone and has been very successful. (Citing CX-609C at Q. 2-4.) Knowles asserts that Dr. Loeppert’s testimony demonstrates that an important part of this success was the package design for the SiSonic products. (Citing CX-609C at Q. 5-16; Tr. at 114:9-14.) Knowles states that it has established the nexus of SiSonic’s

**PUBLIC VERSION**

commercial success to the '231 patent by virtue of the evidence to support the technical prong analysis.

Knowles argues that there is evidence of licensing activity. {

}

**PUBLIC VERSION**

{

}

Knowles claims that there is evidence of praise by others. (Citing CX-609C at Q. 17.) Knowles asserts that in March 2005, Knowles received the 15<sup>th</sup> Annual Innovation Award for its SiSonic MEMS-based SMT (surface mount technology) Microphone which specifically recognized the “innovative packaging technique to provide advantages over common electret microphones.” (Citing CX-609C at Q. 18, 19-28.) Knowles states that in the fall of 2005, the SiSonic “Zero Height” MEMS-Based SMD (surface mount device) Microphone received from Nanotech Briefs the “first annual Nano 50<sup>TM</sup> Award recognizing the top 50 technologies, products and innovators that have significantly impacted – or are expected to impact – the state of the art in nanotechnology.” (Citing CX-609C at Q. 18, 29, 30.) Knowles avers that in 2003, the SiSonic microphone was named runner-up for the Best of Small Tech Awards by Small Times magazine. (Citing CX-609C at Q. 18, 31, 32.) Knowles notes that while other features are touted, the Nanotech Briefs and Small Times awards are primarily related to Minervini’s package designs and are based on submissions by Knowles expressly touting Minervini’s unique packaging approach as the world’s first surface mount microphone based on MEMS technology. (Citing CX-609C at Q. 33-35.)

Finally, Knowles argues that there is evidence of copying by others. Knowles states that it appears that Analog {

} (Citing RX-355C at Q. 36; Tr. at

397:1-3.) According to Knowles, {

}

**PUBLIC VERSION**

} (Citing Tr. at 409:20-410:15.) Knowles asserts that it appears that Analog

{

} (Citing (RX-355C at Q. 44, 45; Tr. at 410:20-411:9, 412:10-

17, 413:22-414:1, 419:7-25; CX-194.) Knowles states that Analog personnel {

}

(Citing Tr. at 414:2-22, 415:1-11.)

In its reply brief, Knowles notes that in the 629 investigation, there was a finding that Knowles practiced the '231 patent and that Knowles was entitled to a presumption that the commercial success of the SiSonic products was due to the patented invention. (Citing CX-412 at 166-67; CIB at 69-70.) Knowles reiterates that the success of the SiSonic product is due in large part to the package design. (Citing CX-608C at Q. 27; Tr. at 114:9-14.)

Knowles argues that, contrary to Analog's assertion, simply because Knowles' licenses settled litigation does not mean that the licenses were done to avoid litigation. Knowles asserts that agreeing to a running royalty with unlimited potential for royalty payments to Knowles during the life of the patent weighs against the conclusion that the license was taken to avoid litigation costs. Knowles states that there were other, non-litigation reasons for licensing, such as creation of a second source.

**Analog's Position:** Analog contends that Knowles' alleged evidence of secondary considerations cannot overcome the strong showing of obviousness.

Analog argues that the "three member" SiSonic products do not practice claim 1 of the '231 patent, and thus there is not a sufficient nexus between the success of those products and the '231 patent. Analog asserts that even if Knowles can show that its SiSonic products practice claim 1, the evidence falls short of establishing that such success was the result of the alleged

**PUBLIC VERSION**

invention of claim 1. According to Analog, Dr. Loeppert testified that there were numerous reasons why the SiSonic was commercially successful that have nothing to do with the alleged invention of claim 1 of the '231 patent, including: (1) the SiSonic's low manufacturing cost compared with ECM microphones; (2) Knowles' small microphone die size; (3) the connection {

}

Analog claims that Dr. Loeppert testified that he was unable to “identify one [factor] that contributed more to the success [of the SiSonic] than another.” (Citing Tr. at 112:16-112:22, 1058:4-9.) Likewise, Analog states that Mr. Niew testified that there were “a lot of things that were factors” in the commercial success of the SiSonic. (Citing Tr. at 663:21-664:13.) Analog argues that given the numerous factors that Knowles attributes to the commercial success of the SiSonic product – all of which are unrelated to the alleged invention of claim 1 of the '231 patent – Knowles has fallen far short of showing commercial success of the SiSonic products were to attributable to the invention.

Analog argues that Knowles' evidence of licensing does not support a finding of non-obviousness. Analog notes that Knowles has licensed the '231 patent three times, and each license was the result of a settlement of a lawsuit. (Citing RX-313C; RX-314C; RX-315C; Tr. at 646:25-647:7, 647:14-23, 650:23-651:9, 652:2-9.) Analog argues that Knowles cannot show that companies took licenses to the '231 patent because the technology disclosed in the '231 patent

PUBLIC VERSION

was innovative and new, or that the companies took the licenses because they thought the '231 patent was valid. Rather, Analog claims that the evidence shows that the companies took licenses to avoid costly litigation or for business reasons unrelated to the merits of the patents –  
{  
}

Analog asserts that the licenses were offered to prevent a decrease in Knowles' market share, not because competitors saw the novelty of the technology. (Citing Tr. at 664:23-666:8.) According to Analog, this hardly indicates that the technology claimed in the '231 patent was novel or non-obvious.

Analog argues that there is no evidence of copying. Analog asserts that it embarked on an elaborate and expensive design and development process that spanned many years. (Citing RX-355C at Q. 22-48.) Analog pointed to Mr. Harney's testimony that Analog did not copy Knowles' MEMS microphone products for its products. (*Id.*)

Analog states that the sum total of Knowles' evidence of copying appears to be: (1) a suggestion that {

} (2) {

} and (3) {

} According to Analog, none of this is even close to proving (let alone suggesting) that Analog copied Knowles' SiSonic products, and that such copying is reflected in any of the accused products.

First, Analog states that during Mr. Harney's testimony, Knowles' counsel suggested that Analog {

**PUBLIC VERSION**

{ (Citing Tr. at 409:10-410:15.) Analog argues that far from proving copying, this demonstrates the opposite – {

} (Citing RX-355C at Q. 43-48.)

Second, Analog claims that { } does not provide evidence of copying.

Analog asserts that {

} Analog

argues that the “footprint” is not a part of the alleged invention of the ’231 patent. (Citing JX-1.)

Analog points to Mr. Harney’s testimony {

} (Citing Tr. at 422:14-

423:4.)

Analog argues that Knowles has not established any link between a {

} and the accused products. On the contrary, Analog claims

that Knowles can only show a link {

} (Citing RX-355C at Q. 36-43; Tr. at 413:22-414:1.) Analog states that {

} (Citing RX-355C at Q. 44-47.)

Finally, Analog asserts that Knowles cannot demonstrate failure by others. According to Analog, the sum total of Knowles’ evidence appears to be Dr. Loeppert’s unsubstantiated testimony that two other companies – Sonion and Infineon – had “packaging concepts but neither company was able to come up with a package design that would enable them to have a

## PUBLIC VERSION

successful product.” (Citing CX-609C at Q. 13.) Analog claims that there is no support for this statement, and that the record indicates that Sonion took a license to the ’231 patent (as part of a cross license) as settlement of litigation – not because they could not commercialize a product. (Citing RX-315C; Tr. at 649:22-25.)

**Staff’s Position:** Staff contends that Knowles has failed to demonstrate any evidence of secondary considerations.

With respect to commercial success, Staff states that the evidence has shown that prior to 2008, Knowles only marketed and sold a three-piece package. (Citing Tr. at 106:1-22.) Because Staff asserts that the three-piece package design does not practice claim 1, Staff believes that Knowles has not shown a nexus between claim 1 of the ’231 patent and the commercial success of the SiSonic products.

With respect to licensing activity, Staff asserts that evidence has not shown that the settlement agreements that were entered into because of the strength of the patent as opposed to a desire to avoid the costs of litigation. (Citing Tr. at 646:1-647:7.) Staff is of the view that the evidence is insufficient to establish that Knowles’ licensing of the ’231 patent is a secondary consideration of non-obviousness.

Staff claims that Knowles has failed to prove copying. Staff argues that Knowles has offered insufficient evidence to support a claim of copying. (Citing Tr. at 410:16-23.)

In its reply brief, Staff states that Knowles has not shown what sales specifically relate to the two-piece SiSonic product after its introduction into the market. Therefore, Staff claims that Knowles has not established that the two-piece SiSonic product is commercially successful.

Staff argues that Knowles failed to demonstrate evidence of industry praise. Staff notes that Knowles did not begin selling the two-piece product until 2008, yet the awards relied upon

**PUBLIC VERSION**

by Knowles to show industry praise were given in 2005. (Citing CX-395; CX-396; CX-397; CX-398; CX-400.)

With respect to copying, Staff states that Analog {  
} (Citing Tr. at 422:14-423:4.) Staff asserts that  
Analog { }  
Staff claims that although Knowles attempts to cast the appearance {  
} the evidence does not  
show this to be the case. Staff states that Analog {  
} (Citing RX-355C at Q. 46.) Staff claims that {  
} (Citing RX-  
355C at Q. 46.) Thus, Staff states that {

} Moreover, Staff claims that the evidence also shows that ADI {  
} (Citing RX-355C at Q. 47.)

**Discussion and Conclusion:** Based on the evidence in the record, I find that Knowles has introduced evidence of industry praise, but that such evidence is insufficient to overcome Analog's *prima facie* showing of obviousness described *supra*.

Secondary considerations may include evidence of copying, long felt but unsolved need, failure of others, commercial success, unexpected results created by the claimed invention, unexpected properties of the claimed invention, licenses showing industry respect for the invention, and skepticism of skilled artisans before the invention. *In re Rouffet*, 149 F.3d 1350,

PUBLIC VERSION

1355 (Fed. Cir. 1998). Reviewing the evidence of secondary considerations is an important step in the obviousness analysis. As explained by the Federal Circuit:

It is jurisprudentially inappropriate to disregard any relevant evidence on any issue in any case, patent cases included. Thus evidence rising out of the so-called “secondary considerations” must always when present be considered en route to a determination of obviousness. Indeed, evidence of secondary considerations may often be the most probative and cogent evidence in the record. It may often establish that an invention appearing to have been obvious in light of the prior art was not. It is to be considered as part of all the evidence, not just when the decisionmaker remains in doubt after reviewing the art.

*Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1538-39 (Fed. Cir. 1983) (citations omitted).

Knowles first raises the alleged commercial success of its SiSonic products. “Evidence of commercial success, or other secondary considerations, is only significant if there is a nexus between the claimed invention and the commercial success.” *Ormco Corp. v. Align Tech., Inc.*, 463 F.3d 1299, 1311-1312 (Fed. Cir. 2006). “When a patentee can demonstrate commercial success, usually shown by significant sales in a relevant market, and that the successful product is the invention disclosed and claimed in the patent, it is presumed that the commercial success is due to the patented invention.” *J.T. Eaton & Co. v. Atlantic Paste & Glue Co.*, 106 F.3d 1563, 1571 (Fed. Cir. 1997); *see also Brown & Williamson Tobacco Corp. v. Philip Morris Inc.*, 229 F.3d 1120, 1130 (Fed. Cir. 2000). If the patentee makes such a showing, the challenger must offer evidence to rebut the presumption that the patentee’s commercial success is due to the patented invention. *Id.*

As detailed in Section VI.C.1 *infra*, I have concluded that the SiSonic product practices claim 1 of the ‘231 patent, even in the so-called three-piece construction. Knowles has offered evidence to show that the SiSonic products have achieved commercial success in the marketplace. (CX-608C at Q. 18-26.) From 2003 through 2009, Knowles has sold over 1 billion units of the SiSonic product. (*Id.* at Q. 20.) Knowles’ 2009 revenue from the SiSonic products

## PUBLIC VERSION

was { } (*Id.* at Q. 21-22; CX-155C at KE1408547-48.) Knowles offers a report from iSuppli that refers to Knowles as a “pioneer” in the MEMS microphone market and states that Knowles “dominates the market up to now with an impressive 90% market share in 2008 (anticipated 83% in 2009).” (CX-193C at KE1581566; CX-608C at Q. 25-26.) Because I have found that the SiSonic product practices claim 1 of the ‘231 patent, there is a presumption that Knowles’ commercial success is due to the patented invention.

Therefore, it is left to Analog to rebut the presumption that Knowles’ commercial success is due to the patented invention. I find that Analog has successfully rebutted the presumption. Analog cited to Dr. Loeppert’s testimony regarding other important factors that lead to the success of the SiSonic product, such as the low cost of the product. (*See, e.g.*, Tr. at 108:3-8, 111:9-12.) Dr. Loeppert specifically testifies that keeping costs down was a “major factor” in the success of the SiSonic product. (*Id.* at 111:9-12.) Dr. Loeppert testified that he “cannot identify one [factor] that contributed more to the success [of the SiSonic product] than another.” (*Id.* at 112:16-22.) Mr. Niew noted that there are “a lot of things that are factors” in the commercial success of the SiSonic product. (*Id.* at 664:9-13.) Given the foregoing testimony, I find that Analog has rebutted the presumption that Knowles’ commercial success is due to the patented invention.

Knowles asserts that evidence of licensing demonstrates the non-obviousness of claim 1. Knowles relies on licenses with Akustica, AAC, and Sonion in an attempt to demonstrate industry respect for the invention. (RX-313C; RX-314C; RX-315C.) In explaining the relevance of licensing as a secondary consideration, the Federal Circuit has cautioned that:

Such [licensing] programs are not infallible guides to patentability. They sometimes succeed because they are mutually beneficial to the licensed group or because of business judgments that it is cheaper to take licenses than to defend infringement suits, or for other reasons unrelated to the unobviousness of the

**PUBLIC VERSION**

licensed subject matter. Such a “secondary consideration” must be carefully appraised as to its evidentiary value and we have tried to do that here.

*EWP Corp. v. Reliance Universal Inc.*, 755 F.2d 898, 907-908 (Fed. Cir. 1985.) The Federal Circuit also explained that “[l]icenses taken under the patent in suit may constitute evidence of nonobviousness; however, only little weight can be attributed to such evidence if the patentee does not demonstrate ‘a nexus between the merits of the invention and the licenses of record.’” *In re GPAC Inc.*, 57 F.3d 1573, 1580 (Fed. Cir. 1995) (citation omitted).

Each of the licenses relied upon by Knowles was the result of a settlement of a lawsuit.

{

}

(CX-608C at Q. 33; Tr. at 664:23-666:8.) None of this testimony demonstrates any nexus between the merits of the invention and the licenses. There is no record evidence establishing that the licensees sought a license from Knowles due to the merits of the ‘231 patent. Therefore, I conclude that there is not a sufficient nexus between the licenses and the merits of the patented invention.

Knowles asserts that evidence of praise by others in the industry demonstrates the non-obviousness of the ‘231 patent. Industry praise can be evidence of non-obviousness, but the praise must be linked to the patented invention. *Power-One, Inc. v. Artesyn Techs., Inc.*, 599 F.3d 1343, 1352 (Fed. Cir. 2010). I find that Knowles has offered evidence of industry praise, and that there is a sufficient nexus between the praise and the patented features of the ‘231 patent. The SiSonic product won an innovation award from EDN Magazine in 2004. (CX-609C at Q. 19-24.) The award recognized Knowles’ “innovative packaging technique to provide advantages over common electret microphones.” (CX-397 at KE0534385; *see also* CX-398 at

PUBLIC VERSION

KE0534394.) While Knowles offers additional evidence of awards received for the SiSonic product, none of the other awards expressly address the packaging as the reason for the award. (CX-609C at Q. 29-32; CX-400; CX-401.) Analog argues that the awards were given to a product that didn't practice the '231 patent, but that argument is without merit for the reasons addressed in Section VI.C.1 *infra*.

Finally, Knowles alleges that there is evidence of copying by Analog. Knowles cites evidence regarding {

} (RX-355C at Q. 36.) Mr. Harney testified that {

} (Tr. at 409:20-

410:10.) {

} (*Id.* at

Q. 46; Tr. at 410:11-15.) Instead, Analog {

} (RX-355C at Q. 44-45.)

Knowles cites to evidence that {

} (*See, e.g.*, Tr. at 410:20-

411:9.) Knowles also cites to evidence to show that {

} (CX-521C; Tr. at 414:2-415:25.)

I find that none of this evidence demonstrates that Analog copied the patented package design found in the SiSonic products. Analog's {

} shows that Analog was conscious of patent rights and sought to avoid any infringement claims. (Tr. at 409:20-410:10.) The fact that {

} without more, does not establish that Analog copied Knowles' package design.

Finally, {

## PUBLIC VERSION

} is not evidence of copying for at least two reasons. First, the package dimensions are not a patented feature, therefore there is no nexus between { } and the '231 patent. Second, {

} (Tr. at 422:14-423:4.)

The only evidence in the record that supports Knowles' assertion of secondary considerations consists of a single award given to Knowles related to packaging technology. (CX-397 at KE0534385; *see also* CX-398 at KE0534394.) All of the other alleged evidence of secondary considerations does not support Knowles' position for the reasons discussed *supra*. I find that a single award given to Knowles to recognize the SiSonic packaging is not enough to overcome the *prima facie* case of obviousness presented by Analog. *See Leapfrog Enters., Inc. v. Fisher-Price, Inc.*, 485 F.3d 1157, 1162 (Fed. Cir. 2007).

### C. The '089 Patent

#### 1. Anticipation

##### a. Halteren

**Analog's Position:** Analog argues that Halteren, by clear and convincing evidence, anticipates claims 1, 2, 7, 16, 17, 18, and 20 of the '089 patent. Analog asserts that the dispute between the parties centers on whether or not Halteren is a "surface mountable package." Analog avers that the parties "agree that Halteren discloses the remaining limitations of all of the asserted claims." (Citing CX-613 at 39; RX-386 at 189:21-190:9; CX-610 at Q. 93; Tr. at 855:4-859:25.)

Referring to the discussion about construction, Analog asserts that Halteren discloses a

## PUBLIC VERSION

“package” for a silicon microphone.<sup>24</sup> Analog says the only issue that remains to be resolved is whether the package disclosed in Halteren is “surface mountable.”

Analog cites the testimony of its expert, Dr. Tummala, who testified that the contact pads, elements 20-23, can be hot-bar soldered to a board using pressure and heat, creating a surface mount bond. (Citing Tr. at 578:13-579:3; RX-365 at ADI00863393; RX-353C at Q. 242; RX-44A at ¶ 119.) Analog says Dr. Tummala indicated that the package design of Halteren is such that hot-bar soldering would be a simple way to surface mount the package because the leads are all on one side. (Citing Tr. at 580:6-581:6.) Analog asserts that Dr. Bauer testified that if Halteren was hot-bar soldered, there would be no need for a connector to attach the package to the board. (*Id.* at 1025:15-24.)

Analog says that Dr. Pecht testified that Halteren could also be mounted to a board using conductive adhesive. (Citing RX-393C at ¶ 121; RX-354C at Q. 162.) Analog continues that Dr. Bauer agrees that a person of ordinary skill in the art would be familiar with this mounting technique. (Citing Tr. at 192:4-9; RX-386 at 113:17-23.) Analog says that Dr. Bauer and Dr. Tummala agree that conductive adhesives can be used for surface mounting a package to a board in certain applications. (Citing Tr. at 192:10-15, 590:19-591:8.)

Analog asserts that Knowles’ main argument is that because Halteren did not say he wanted the disclosed package to be mounted to a surface, the disclosure in Halteren is insufficient to meet the claim limitation. Analog counters that, “based on Knowles’ own admission,” its argument fails. Analog says even if one assumes that Halteren discloses a package intended to be used with a ZIF connector, then Halteren is intended to be mounted to the surface of a board. Analog quotes Dr. Bauer to describe what a ZIF connector is:

---

<sup>24</sup>Analog says that the parties agree that “package” for the ’231 patent and the ’089 patent should be given the same construction.

## PUBLIC VERSION

Q: And what he is talking about is you have the hard board, the printed circuit board, with some sort of electronic circuit and you are taking the flex circuit and you are putting them flush and applying pressure to hold them together? Is that right?

A: That's exactly what a ZIF connector is, yes.

(Citing Tr. at 898:13-20, 900:1-8.) Analog concludes that, under Knowles' interpretation of Halteren, the package of Halteren is mounted flush with the printed circuit board and pressure is applied to the package to keep it in place. Analog argues that construction of "surface mountable," being mounted with a ZIF connector meets this limitation. Analog continues that neither Analog's nor the Staff's constructions limit a "surface mountable package" to require *soldering* the package in place. Analog says the connector acts just as solder would, to hold the package "against the surface of the printed circuit board." (Citing Tr. at 1023:21-1024:6.)

Analog alleges that Knowles agrees that a person of ordinary skill in the art would know how to physically directly bond the package of Halteren to a separate substrate. Analog says that Dr. Bauer stated that the contact pads, depicted in Figure 1 of Halteren, can be directly physically bonded to a printed circuit board by "order[ing] a customized machine that would cost perhaps one and a half, two million dollars, and specify a printed circuit board substrate that is actually built using materials and processes that are generally used for building package substrates rather than printed circuit boards, and specify that board so that the materials interface would be able to accept a horribly expensive and overpowering single point TAB bonding process." (Citing RX-386 at 200:3-201:21.) Analog argues that despite the characterization that the process would be expensive, which is not prohibited by Analog's definition of "surface mountable package," it is clear that Knowles believes that the package disclosed in Halteren is "capable of being mounted to a surface." Analog adds that Dr. Gilleo agrees that one could "laminate [the package disclosed in Halteren] to a surface." (Citing RX-390C at 641:9-11.)

## PUBLIC VERSION

Analog says that laminating entails applying pressure and heat to create a connection, like an outer lead bonding machine, which surface mounts TAB packages. (Citing RX-385 at 146:24-147:25.)

Analog concludes that all of the parties' experts in this case agree that the package disclosed in Halteren meets Analog's construction of "surface mountable package," and if the Analog's construction of "surface mountable package" is adopted, the evidence is clear and convincing that all of the asserted claims of the '089 patent are invalid as anticipated by Halteren.

Analog argues that the package in Halteren can be mounted to a printed circuit board using a soldering technique, noting that Dr. Tummala testified that Halteren can be hot-bar soldered to a board. (Citing Tr. at 578:13-579:3; RX-365 at ADI00863393; RX-353C at Q. 242; RX-44A at ¶ 119.) Analog adds that Dr. Tummala indicated that hot gas soldering or laser soldering are also ways to solder Halteren's package to a board. (Citing RX-353C at Q. 242.) Analog asserts that Knowles' expert, Dr. Bauer, agrees that a flex circuit, like the one disclosed in Halteren, could be soldered to a board using hot bar soldering, obviating the need for a connector.<sup>25</sup> (Citing Tr. at 901:15-18, 1025:15-24.) Analog says that Dr. Bauer testified that a person of ordinary skill in the art, without reading the Halteren reference, "might be aware of some extraordinary process that could be used to" solder the contact pads of Halteren to a surface. (Citing Tr. at 864:4-16.) Analog avers that Dr. Pecht stated that Halteren could be mounted using hand soldering, selective soldering, wave soldering, vapor phase soldering, or

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<sup>25</sup> Analog says that Dr. Bauer qualifies his answer, by saying that because Halteren uses the word "connector" once, Halteren does not teach the use of hot-bar soldering. (Citing Tr. at 901:15-18.) Analog asserts that no evidence in the record shows that, because Halteren discloses the use of a connector that a person of ordinary skill in the art would not also know that Halteren could be mounted to a board without the use of a connector. Analog adds that Dr. Gilileo's book, to which Dr. Bauer cites and with which he agrees, states that hot-bar soldering is a way to remove the connector to reduce weight, area, cost, and increase reliability. (Citing Tr. at 894:19-25; CX-616 at KE1660702.)

## PUBLIC VERSION

reflow soldering. (Citing RX-354C at Q. 162.) Analog contends that all of these soldering methods are discussed in Ray Prasad's book, upon which Dr. Bauer relies. (Citing RX-365; Tr. at 219:16-221:11.)

Analog argues that the invention in Halteren could be soldered to a board because the pads are finished with a layer of gold. (Citing RX-353C at Q. 242; RX-354C at Q. 164; RX-47 at Figs. 3C, 4.) Analog argues that, because Halteren includes a gold layer on the second level connection contact pads, it is clear that Halteren intended the disclosed package to be surface mountable using a solder reflow process. (*Id.*) Analog contends that a person of ordinary skill in the art would recognize the construction of the contact pads and know that they would be suitable for surface mount soldering. (*Id.*)

Analog says that Dr. Bauer suggests that the thickness of the gold layer is relevant to the inquiry as to whether Halteren is solderable or not. Analog argues that “[t]hickness has nothing to do with solderability.” (Citing Tr. at 560:8.) Analog asserts it is only related to the “embrittlement” or reliability of the solder joint. (Citing Tr. at 613:19-25, 560:9-16, 1026:8-12.)

Analog argues that, if it is found that the thickness of the pads is relevant to this inquiry, the evidence does not indicate that the gold pads of Halteren are too thick for soldering. Analog avers that Dr. Bauer testified that the gold layer on solder pads is, at the high end, around 0.5-0.6 microns. (Citing Tr. at 1018:22-1019:3.) Analog continues that Dr. Bauer indicated that the thickness of the gold layer is typically between 0.1 and 0.2 microns for surface mounting pads. (*Id.*) Analog asserts that Dr. Bauer's range cannot be correct, and that the range he advocates would exclude the package disclosed by Mr. Minervini in the '089 patent from being “surface mountable.” Analog states that Mr. Minervini discloses a gold layer on his solder pads as 0.63-0.76 microns of gold, which is outside of the acceptable range Dr. Bauer describes for solder

## PUBLIC VERSION

pads. (Citing JX-2 at Table 9; Tr. at 567:25-568:5.)<sup>26</sup>

Analog contends that Dr. Bauer does not testify that 1.5 microns of gold on the Halteren pads makes it “unsolderable.” Analog quotes him to say instead, “1.5 [microns] of gold would be one of the first things that a person having ordinary skill in the art operating in a mainstream surface mount assembly operation would understand he cannot use.” (Citing Tr. at 1018:3-8.) Analog avers even if Dr. Bauer is correct, he does not dispute that Halteren can be soldered using technology that is not “mainstream,” something that large companies, like Intel, use regularly. (Citing Tr. at 583:2-14.) Analog continues that Dr. Bauer states that one could solder Halteren to a board; but he comments that the joint may not be reliable. (Citing Tr. at 1026:4-12.) Analog adds although Dr. Bauer testified that the solder joint has a “severe reliability issue” when the composition of the solder is more than 3% gold, he presents no evidence that demonstrates (or even suggests) that soldering a contact pad with a 1.5 micron layer of gold would result in a solder joint with greater than 3% composition of gold. (Citing Tr. at 1019:15-22.) Analog asserts that Intel, at least in one of its packages, does not restrict the thickness of gold on its contact pads, as described in great detail in the 2000 specifications for its tape carrier package in RX-371. Analog says that Intel addresses solder joint reliability and pad metallurgy problem by requiring a minimum amount of solder to be placed on each lead to ensure that, upon reflow, the gold content of the joint will not be too high. (Citing RX-371 at ADI00863572.) Analog avers nowhere in the document does it suggest a thickness of gold for the pads. Analog reasons, therefore, the thickness of the gold on the contact pads indicates nothing about their solderability.

Analog says that Halteren indicates that his intention was to create a “surface mountable” package suitable for use with “existing standard production equipment and processes, such as

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<sup>26</sup> Analog says that the conversion from microinches to microns is 1 microinch = 0.0254 microns, and says conversions can be done at an online website: <http://www.metric-conversions.org/length/microinches-to-microns.htm>.

## PUBLIC VERSION

pick and place machines and re-flow soldering.” (Citing RX-47 at 1:63-65.) Analog asserts as he lays foundation for his invention, Halteren states that the electronic equipment into which microphone packages are typically mounted has contact pads or terminals. (Citing Tr. at 867:25-868:10; RX-47 at 1:23-29.) Analog continues that Halteren states that typically litz wires are used to connect the microphone package and the printed circuit board by a manual soldering process. (Citing Tr. at 870:8-16; RX-47 at 1:41-51.) Analog avers that Halteren said that this process was “unsuited for automated machine assembly.” (Citing RX-47 at 1:47.) Analog asserts that Dr. Bauer agrees that a “person of ordinary skill [reading Halteren] would understand that [human operators] was what he was trying to eliminate to make it more easy to automate.” (Citing Tr. at 871:20-872:2.) Analog adds that Halteren then says “it would be desirable to provide a transducer assembly that is better suited for manufacture in existing standard production equipment and processes, such as pick and place machines and re-flow soldering...the present invention provides the desired ease of manufacture.” (Citing RX-47 at 1:62-2:1.) Analog concludes that Halteren intended for the package disclosed to be “suitable for automated assembly.”<sup>27</sup>

Analog alleges that all of the parties’ experts agree that Halteren discloses the remaining limitations of the asserted claim 1 of the ‘089 patent and details the evidence it believes supports such a finding. (Citing RX-47 at 2:36-45, 5:12-16, 5:41-44, 5:57-61, 6:29-44, 7:28-32, 7:40-64, 8:13-16, Figs. 1, 2, 2A, 2B; CX-613 at 39; Tr. at 855:4-17, 855:22-25, 856:7-17; RX-353C at Q. 244, 246, 248, 250, 252, 254, 256, 258, 260,<sup>28</sup> 262.)

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<sup>27</sup> Analog says Dr. Bauer argues that the “the desired ease of manufacture” relates to the ease of manufacture of the package and not mounting the package onto a board. (Citing CX-610 at Q. 93 at 75-76.) Analog argues that when the entire passage is read, it is clear that “the desired ease of manufacture” refers to mounting the package onto the printed circuit board in a piece of electronic equipment, which is discussed in the preceding sentence, and not to the manufacturability of Halteren’s package, which is a paragraph away. (Citing RX-47 at 1:62-2:19.)

<sup>28</sup> Analog says that Dr. Pecht’s analysis of the “volume” uses the construction from the TEO ID; but he believes that Halteren does not have a “volume” under Analog’s proposed construction.

## PUBLIC VERSION

Analog alleges that Halteren discloses the remaining limitations of asserted claims 2, 7, 16, 17, 18 and 20, and details the evidence it believes supports such a finding. (Citing RX-47 at 3:1-5, 3:18-25, 3:32-37, 3:48-53, 3:66, 4:5-63, 4:28-31, 4:64-5:3, 5:41-44, 8:1-6, 8:13-15, 8:37-45, Fig. 2A; RX-353C at Q. 266, 269, 271, 274, 276, 279, 282, 285; CX-613 at 39, 40.)

In its reply brief, Analog argues that the parties agree that Halteren discloses all of the elements of all of the asserted claims, with the exception that Knowles disputes whether Halteren discloses a “surface mountable package.” (Citing CIB at 120.)

Analog notes that Knowles also argues, in its post-hearing brief, that Halteren fails to disclose “terminal pads intended for use as surface mount solder pads.” (Citing CIB at 119.) Analog alleges this argument was absent from Knowles’ pre-hearing brief, and should not be considered. (Citing CPHB at 45-46; Ground Rule 8.2.)

Analog says that Knowles agrees that Halteren discloses a “package” under Analog’s construction, and that Halteren discloses a “surface mountable package” under Analog’s construction. (Citing CIB at 122.) Analog asserts that the elements that Knowles finds missing from Halteren are “only requirements for its latest construction of “surface mountable package.”” (*Id.*) Analog argues that it has demonstrated that Knowles’ interpretation of Halteren as a Z1F connector meets Analog’s construction of “surface mountable,” because the package of Halteren would be mounted flush against a printed circuit board. (Citing RIB at 100-101.)

Analog says that Knowles’ only basis for arguing that Halteren is not a “surface mountable package” is that Halteren could not be mounted using a “standard manufacturing line.” Analog argues that Knowles provides no evidence to suggest that “surface mountable” should be so limited. Analog concludes that the undefined term “standard” is missing from

## PUBLIC VERSION

Knowles' proposed constructions, which would render the claims indefinite. (Citing *Geneva Pharms., Inc.*, 349 F.3d at 1384.)

**Knowles' Position:** Knowles argues that Analog has failed to produce clear and convincing evidence that Halteren discloses:

- that it is intended to be mounted on a printed circuit board;
- the requisite second level connection;
- protection against shock;
- terminal pads intended for use as surface mount solder pads; and
- surface mountability.

Knowles argues without these essential elements, Halteren does not disclose a surface mountable package, and it cannot meet the limitation of "A surface mountable package for containing a transducer, ... the surface mountable package comprising...." Knowles concludes, therefore, Halteren fails to disclose every element of claim 1 of the '089 patent (and dependent claims 2, 7, 16, 17, 18, and 20).

Knowles states that "[t]hese deficiencies in Halteren were addressed in sections III.D.3.a(1)-III.D.3.a(3). Arguments made there are equally applicable here and will not be repeated."

Knowles contends that Halteren discloses only one method of connecting its assembly to an external piece of equipment, which is through the use of "a connector adapted to contact and fix the position of the exposed parts." (Citing RX-47 at 7:32-36.) Knowles says that Dr. Bauer testified, a pad could be a "contact pad," a "solder pad," a "test pad," or a "dummy pad," and not all of these pads were surface mountable. (Citing Tr. at 1015:1-17.)

Knowles argues that the contact pads on the end of the Halteren assembly are appropriate for use with a connector that would "contact and fix the position" of one end of the assembly. Knowles says these "contact pads" are not "solder pads" that would be suitable for use in surface

**PUBLIC VERSION**

mounting, because these contact pads have an outer layer of 1.5 $\mu$  of gold. Knowles avers that Dr. Bauer unequivocally testified that this thickness of gold would not be suitable for use with soldering, quoting:

- Q. So I believe, Dr. Bauer, the question was why are the contact pads in Halteren not solderable?
- A. The contact pads in Halteren are not solderable specifically because of the thickness of the gold that is specified in the Halteren specification.... And the reason that you cannot solder parts, components that have that thick of a gold plate on them is that the gold severely embrittles the tin lead solders that were in use at the time of these patents.

(Citing Tr. at 1017:22-1018:13.)

Knowles says that Dr. Bauer went on to explain what would happen if one tried to apply solder to pads with this thickness of gold, quoting:

What happens is when you do the reflow solder process, all of the gold, not just part of it, all of it dissolves into the solder when the solder is in the molten state. When you are doing reflow solder processing, you put down the minimal amount of solder in order to make sure that you don't get shorts, balling, which means solder balls that roll around inside the assembly, all these sorts of things. You put down the minimal amount of solder paste. The solder paste consists of flux and solder. And when the solder reflows, all of the gold is dissolved into the solder. And if the percentage of gold in that solder, even a small amount will have some effect, but if it exceeds approximately 3 percent of the total volume of that solder joint, then it creates a severe reliability issue. And, as I say, that's one of the first things that a person having ordinary skill in the art would learn, and it is something that's clearly prohibited by most manufacturers, if not all. I am not aware of one that allows it, actually.

(Citing Tr. at 1019:4-1020:3.)

Knowles states that Dr. Tummala admitted that gold in the thickness specified by Halteren would have "an implication," which was solder embrittlement. (Citing Tr. at 560:6-9, 613:19-25, 1018:9-13)

Knowles argues that, even if the contact pads disclosed by Halteren were suitable for surface mounting, the process for surface mounting the assembly is not within the ordinary and

## PUBLIC VERSION

customary meaning of “surface mountable.” Knowles argues that Dr. Pecht said the Halteren assembly could be surface mounted using a technique known as “hot bar soldering” or by “conductive adhesive. (Citing RX-354C at Q.164.) Knowles asserts that the ordinary and customary meaning of surface mountable requires the use of solder in an automated assembly process that involves heating a board populated with surface mountable components in a “reflow” oven. Knowles says that Dr. Tummala agreed that Halteren was not surface mountable using reflow as done in a “standard manufacturing line.” (Citing Tr. at 476:7-14.) Knowles concludes, therefore, neither method proposed by Dr. Pecht is within the scope of a properly-construed “surface mountable package,” and Dr. Bauer explained why neither technique would be considered by a person having ordinary skill in the art. (Citing CX-610 at Q. 93.)

In its reply brief, Knowles argues Halteren fails to disclose a package because (a) it is not intended to be mounted on a printed circuit board, (b) it does not have a second-level packaging interconnect, and (c) it fails to protect against shock. Knowles argues for those reasons alone, Halteren cannot anticipate a claim that requires a surface mountable package. Knowles adds Halteren does not disclose a surface mountable device, and for that additional reason it cannot anticipate a claim that requires a surface mountable package.

Knowles contends that, in order to show that the Halteren assembly is surface mountable, Analog relies on what is technically possible instead of what is actually disclosed, and then criticizes Knowles for relying on what was actually disclosed by Halteren, quoting, “Knowles’ main argument is that because Halteren did not *say* he wanted the disclosed package to be mounted to a surface, the disclosure in Halteren is insufficient to meet the claim limitation.” (Citing RIB at 100-101 (emphasis in original).)

Knowles argues that Analog’s approach is contrary to the law, because invalidity by

## PUBLIC VERSION

anticipation requires that “the four corners of a single, prior art document describe every element of the claimed invention.” (Citing *Advanced Display Systems*, 212 F.3d at 1282.) Knowles asserts that the four corners of Halteren disclose only one mechanism for connecting the flex assembly to another piece of electrical equipment, and that mechanism is by mating the contact pads at the end of the flex assembly to a connector. (Citing RX-47 at 7:32-36.) Knowles says that Analog proposes that the flex assembly could be surface mounted using one of two mechanisms that are not disclosed by Halteren, namely hot bar soldering and the use of conductive adhesive. Knowles contends that by proposing a modification to what is present on the four corners of the disclosure,<sup>29</sup> Analog has effectively moved away from a defense of anticipation and towards a defense of obviousness. (Citing *Application of Arkley*, 455 F.2d 586, 587 (CCPA 1972).) Knowles says that Analog has never asserted that claim 1 of the ‘089 patent is rendered obvious by Halteren itself. (Citing Joint Stipulation of Contested Issues at ¶28; RPHB at § V.E.2; Tr. at 439:22-448:3.)

Knowles argues that Analog’s assertions are contrary to the facts, because claim 1 of the ‘089 patent uses “surface mountable” in the ordinary sense, and in the ordinary sense it means a process consisting of applying of solder paste to a printed circuit board, placing the surface mountable leads or pads onto the printed circuit board, and reflowing the solder in an oven. Knowles says it is not achieved, as Analog suggests, through the use of hot bar soldering or conductive adhesive (which doesn’t use solder at all). Knowles adds that Dr. Bauer testified that the contact pads disclosed in Halteren, while appropriate for use with a connector, are wholly inappropriate for use with solder. (Citing Tr. at 1019:4-1020:3.) Knowles adds that Dr. Tummala admitted that the Halteren contact pads, as disclosed, would pose an “embrittlement” problem if soldered, and that the Halteren assembly could not be surface mounted using standard

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<sup>29</sup> Knowles states that Analog has not raised inherency in the context of the alleged surface mountability of Halteren.

## PUBLIC VERSION

reflow techniques. (Citing Tr. at 476:7-14, 613:19-25, 1018:9-13.)

Knowles says that Analog quotes Dr. Bauer, out of context, to suggest that a ZIF connector implied surface mounting. (Citing RIB at 101.) Knowles avers that, in context, Dr. Bauer was testifying about what was disclosed in a book on flex circuitry, not about what Halteren disclosed. Knowles asserts that “nothing in that book or in Dr. Bauer’s testimony suggests that the use of a ZIF connector requires the use of solder,” and that Dr. Bauer pointed out that, with a ZIF connector, the contact pads on the flex cable are held against the connector by pressure, not solder. (Citing Tr. at 1023:21-1024:6.) Knowles reasons that a person having ordinary skill in the art would understand that the ordinary meaning of surface mountable requires the use of solder, and that person would not equate a ZIF connector with surface mountable.

Knowles says that Analog argues that Knowles’ expert “admitted” that the Halteren assembly could be surface mounted by extraordinary means: “a customized machine that would cost perhaps one and a half, two million dollars, and specify a printed circuit board substrate that is actually built using materials and processes that are generally used for building package substrates rather than printed circuit boards, and specify that board so that the materials interface would be able to accept a horribly expensive and overpowering single point TAB bonding process.” (Citing RIB at 101.) Knowles contends that this argument actually works against Analog, because a person of ordinary skill in the art would not normally turn to expensive and extraordinary solutions. (Citing *Standard Oil*, 774 F.2d at 454)

Knowles states that Analog argues that even though a solder joint made using the gold contact pads on Halteren may not be reliable, because it could be done, a person having ordinary skill would do it. Knowles argues that a person having ordinary skill would turn to ordinary,

## PUBLIC VERSION

proven solutions, not solutions that are likely to fail. Knowles says Dr. Bauer testified, “1.5 micro inches of gold would be one of the first things that a person having ordinary skill in the art, operating in a mainstream surface mount assembly operation would understand he cannot use.” (Citing Tr. at 1018:3-8.)

Knowles says that Analog argues that “Halteren indicates that his intention was to create a ‘surface mountable’ package suitable for use with ‘existing standard production equipment and processes, such as pick and place machines and re-flow soldering.’” Knowles contends that it should be clear from the face of Halteren that the inventor was referring to the manufacture of the flex assembly and not to the use of the flex assembly on a production line. Knowles adds if it is not clear from the face of Halteren, Analog’s own expert added any missing clarity when he testified that the Halteren assembly was not surface mountable using a “surface mount reflow assembly process” as would be done in a “standard manufacturing line.” (Citing Tr. at 476:7-14; CX-420 at 225:12-22.226:4.)

**Staff’s Position:** Staff argues that the key issue with respect to the Halteren reference is whether it discloses a “surface-mountable” package. Staff refers to its argument with respect to the 231 patent regarding whether or not Halteren discloses a “package,” and says those same arguments apply here as well. Staff has construed “surface-mountable” to mean “a single, self-contained unit which encapsulates a device, . . . and which is capable of being physically directly bonded to a separate substrate.” Staff argues that, based on this construction, the Halteren device discloses the limitation.

Staff says it is undisputed that Halteren discloses contact pads or terminals on the bottom of the substrate. (Citing Tr. at 860:16-25; RX-353C at Q. 242) Staff adds that Halteren itself discloses that these pads are capable of being physically and directly bonded to a separate

## PUBLIC VERSION

surface, quoting:

As shown in FIG. 3C, the first end of the flexible member is left without the lower kapton® layer and three exposed parts are formed in the conductive copper layer so as to provide electrical contact terminals for conveying transducer signals and power supply voltages between the flexible substrate transducer assembly 10 and the housing of the piece of electronic equipment holding the assembly 10.

(Citing RX-47 at 8:37-45.) Staff contends that this excerpt shows that the Halteren device can be mounted to electrical equipment, which “could include a system board.”

Staff argues that the fact that Halteren utilizes contact pads finished in gold and nickel also demonstrates that Halteren intended his device to be surface-mountable. (Citing RX-47 at Figs. 3-4.) Staff says that Dr. Tummula testified as follows:

[G]old is typically used to prevent copper oxide formation on the contact pads to preserve solderability, [and] nickel is used as a barrier to prevent the copper from being dissolved in solder during the reflow process. Because Halteren includes a nickel layer on the second level connection contact pads, it demonstrates that Halteren intended the disclosed package to be surface mountable using the solder reflow method.

(Citing RX-353C at Q. 242.) Staff asserts that, although Knowles attempted to establish that the amount of gold used in the Halteren package was too thick to be soldered, the evidence showed that the amounts provided in the Halteren patent clearly allowed for soldering. (Citing Tr. at 503:14-504:18, 558:21-568:16.)

Staff contends that the testimony also demonstrated that Halteren can be mounted to a surface using conductive adhesive, hand soldering, selective soldering, wave soldering, vapor phase soldering, or reflow soldering. (Citing RX-354C at Q. 162.) Staff says that Dr. Pecht testified that it is possible to solder the Halteren package to a surface. (Citing Tr. at 864:4-16) Staff concludes that, given Halteren’s disclosure coupled with testimony from the experts, the evidence shows that Halteren discloses a surface-mountable package.

Staff argues that in an attempt to overcome an invalidity finding, Knowles contends that

## PUBLIC VERSION

Halteren is a connector and not a package, and refers to the discussion with respect to the '231 patent. (Citing CPHB at 46.) Staff disagrees with this assertion. Staff says that even if Halteren solely disclosed the use of its device as a connector, the evidence has shown that connectors can be surface mounted. (Citing RX-374 at ADI00863238; Tr. at 581:24-582:3.)

Staff contends that Halteren discloses each and every remaining limitation of claims 1, 2, 7, 16, 17, 18 and 20<sup>30</sup> of the '089 patent, detailing the evidence it believes supports such a finding.<sup>31</sup> (Citing RX-47 at 3:1-5, 3:18-25, 3:48-53, 4:5-18, 5:12-16, 5:41-44, 5:58-61, 6:37-44, 7:28-32, 7:52-64, 8:1-6, 8:15-16, Figs. 2A, 2B, 4; RX-353C at Q. 258.)

**Discussion and Conclusion:** Based upon the evidence in the record, I find that Analog has not presented clear and convincing evidence that Halteren anticipates asserted claims 1, 2, 7, 16, 17, 18 and 20 of the '089 patent.

The parties dispute whether or not Halteren discloses a “surface mountable package,” which I have construed to mean “a single, self-contained unit which fully encloses a device, and which provides: (1) protection for the device from the external environment, (2) an electrical connection between the device and the package, and (3) an electrical connection between the package and another circuit outside of the package, and which self-contained unit is capable of being physically directly bonded to a separate printed circuit board without the use of through holes.”

Knowles' argument on this point focuses almost entirely on its own proffered construction of “package” and on its own construction of “surface mountable” that would require the inclusion of a limit that requires “the ability to mount electrical components on the surface of a printed circuit board, held in place by soldering the abutting surfaces of the electrical

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<sup>30</sup> Staff does not assert that Halteren anticipates asserted claim 15.

<sup>31</sup> The Staff states that Halteren only discloses the “volume” limitation if the ALJ determines that “volume” can be defined by the transducer, aperture, and the substrate.

## PUBLIC VERSION

component and the circuit board, and suitable for automated assembly processes.” I did not adopt Knowles’ proposed constructions. The rationale for the construction applied is set forth in detail in Section III.C.1, *supra*, and I will not repeat it here.

Halteren describes “a lower surface of a flexible transducer assembly comprising a flexible circuit strip according to a first embodiment of the invention.” (RX-47 at 7:11-13) Halteren teaches a “transducer system covered by a lid ... arranged on the reverse side of the second end portion 45 of the flexible member” and referring to Figures 2A and 2B, “the transducer system comprises a silicon microphone 61 and a signal processing electronic circuit constituted by an ASIC 62 that receive an output signal of the silicon microphone 61 on an input terminal through a direct wire bond between a substrate of the microphone and the ASIC.” (RX-47 at 7:45-46, 7:52-57.)

Halteren teaches that “[t]he flexible substrate provides connectivity between the transducer system and electronic equipment which house the transducer assembly.” (RX-47 at Abstract, 1:9-11.)

Regarding the connection of the assembly to another piece of electronic equipment, Halteren says:

Four electrical conductors 20-23 are arranged on the lower surface of flexible member 40 of flexible substrate transducer assembly 10 of FIG. 1. Four exposed parts corresponding to the respective conductors 20-23 are arranged at a first end of the member. These exposed parts are utilized as contact pads that provide required electrical connections between assembly 10 and a piece of electronic equipment (not shown) that holds a connector adapted to contact and fix the position of the exposed parts.

(RX-47 at 7:28-36.)

The foregoing language in Halteren, providing a detailed description of a preferred embodiment of the invention, does not reveal or suggest mounting the assembly to the surface of

## PUBLIC VERSION

a PCB or other substrate. The language specifically teaches that the equipment to which the assembly is to be connected “holds a connector adapted to contact and fix the position of the exposed parts.” Halteren, therefore, describes that the transducer assembly is mounted to a connector on the second substrate and not to the substrate itself, using the end of the flexible substrate of the transducer assembly to both provide the electrical connection to the second substrate and, by being physically connected to the “connector” has its position fixed.

Analog’s argument that a person of ordinary skill in the art would know that the transducer assembly of Halteren could be mounted to the surface of a substrate using hot-bar soldering is wide of the mark for at least two reasons. First, the issue in determining anticipation is what is specifically disclosed by Halteren, not whether or not a person of ordinary skill in the art would know what one could or could not do in light of Halteren.<sup>32</sup> *Schering Corp. v. Geneva Pharm., Inc.*, 339 F.3d 1373, 1377 (Fed. Cir. 2003). Second, the evidence is neither clear nor convincing that a person of ordinary skill in the art would conclude that one could mount the transducer assembly of Halteren to the surface of a substrate using soldering.

Analog’s expert, Dr. Tummala, testified that the contact pads, elements 20-23, can be hot-bar soldered to a board using pressure and heat, creating a surface mount bond. (Tr. at 578:13-579:3; RX-365 at ADI00863393; RX-353C at Q. 242; RX-44A at ¶ 119.) Dr. Tummala said that the package design of Halteren is such that hot-bar soldering would be a simple way to surface mount the package because the leads are all on one side. (Tr. at 580:6-581:6.)

On the other hand, Knowles’ expert, Dr. Bauer, testified, a pad could be a “contact pad,” a “solder pad,” a “test pad,” or a “dummy pad,” and not all of these pads were surface mountable. (Tr. at 1015:1-17.) Dr. Bauer testified that the “contact pads” are not “solder pads” that would be suitable for use in surface mounting, because the contact pads have an outer layer

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<sup>32</sup> Analog has not raised the issue of inherency here.

## PUBLIC VERSION

of 1.5 $\mu$  of gold. Dr. Bauer testified credibly that this thickness of gold would not be suitable for use with soldering, because “the gold severely embrittles the fine lead solders that were in use at the time of these patents.” (Tr. at 1017:22-1018:13.)

Based upon the foregoing, I find that Analog has failed to prove by clear and convincing evidence that Halteren discloses the limitation of asserted claims 1, 2, 7, 16, 17, 18, and 20 of the ‘089 patent that requires a package that is “surface mountable.” Therefore, I find that there is no clear and convincing evidence that Halteren anticipates any of asserted claims 1, 2, 7, 16, 17, 18, or 20 of the ‘089 patent.

Assuming *arguendo* that Halteren were found to disclose the “surface mountable package” limitation of asserted claims 1, 2, 7, 16, 17, 18 and 20, then the evidence would support a finding that there is clear and convincing evidence that Halteren anticipates those asserted claims. More specifically, it has been established by clear and convincing evidence that Halteren discloses:

- a transducer, the transducer being responsive to sound pressure levels of an acoustic signal to provide an electrical output representative of the acoustic signals (RX-47 at 2:36-45, 5:12-16; RX-353C at Q. 244);
- at least a first member and a second member and a chamber being defined by the first member and the second member (RX-47 at Fig. 2A, 8:15-16; RX-353C at Q. 246; CX-613 at 39; Tr. at 855:4-11);
- the transducer being attached to a surface formed on one of the first member or the second member (RX-47 at Fig. 2A, 2B, 5:57-58, 6:29-44, 7:45-47; RX-353C at Q. 248; CX-613 at 39; Tr. at 855:4-11);
- the transducer residing within the chamber (RX-47 at Fig. 2A, 8:13-15; RX-353C at Q. 250; CX-613 at 39; Tr. at 855:4-11);
- the surface being formed with at least one patterned conductive layer (RX-47 at Fig. 2B, 7:52-64; RX-353C at Q. 252; CX-613 at 39; Tr. at 855:12-17);
- the patterned conductive layer being electrically coupled to the transducer

## PUBLIC VERSION

(RX-47 at Fig. 2A, 2B, 7:52-64; RX-353C at Q. 254; CX-613 at 39; Tr. at 855:12-17);

- an outside surface of the surface mountable package comprising a plurality of terminal pads (RX-47 at 7:28-32; RX-353C at Q. 256; Tr. at 856:7-17);
- a plurality of terminal pads electrically coupled to the patterned conductive layer (RX-47 at Fig. 1, 2:38-41, 7:40-45; RX-353C at Q. 258; Tr. at 855:22-25);
- a volume being defined by the transducer and one of the first member or the second member, the volume being acoustically coupled to the transducer (RX-47 at Fig. 2, 5:41-44; RX-353C at Q. 260; CX-613 at 39);<sup>33</sup>
- one of the first member or the second member being formed to include an aperture, the aperture configured to permit the passage of an acoustic signal to the transducer (RX-47 at Figs. 1, 2A, 2B, 5:58-61, 7:47-52; RX-353C at Q. 262; CX-613 at 39);
- the first member comprises a substrate and the second member comprises a cover coupled to the substrate to define the chamber (RX-47 at 3:1-5, 18-25, 4:64-5:3, 8:13-15; RX-353C at Q. 266; CX-613 at 39; Tr. at 857:16-22; CX-610 at Q. 95) (Claim 2);
- the aperture being formed in the respective one of the first member and the second member; the surface being formed on the respective one of the first member and the second member (RX-47 at Fig. 2A; 5:41-44; RX-353C at Q. 269; CX-613 at 39; Tr. at 857:23-858:6; CX-610 at Q. 97) (Claim 7);
- transducer being attached to a surface completely covering the aperture (RX-47 at 5:41-44; RX-353C at Q. 271; CX-613 at 39; Tr. at 857:23-858:6; CX-610 at Q. 97) (Claim 7);
- a metalized region being formed on an exterior surface of the surface mountable package (RX-47 at 4:5-10, 8:37-45; RX-353C at Q. 274; Tr. at 858:21-23; CX-610 at Q. 99) (Claim 16);
- the metalized region being electrically coupled to the patterned conductive layer (RX-47 at 3:32-37, 4:15-18, 28-31, 8:1-6; RX-353C at Q. 276; CX-613 at 40; Tr. at 858:24-859:2; CX-610 at Q. 99) (Claim 16);
- one or both of the first member and the second member including a shield

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<sup>33</sup>Dr. Pecht's analysis of the "volume" uses the construction from the TEO ID, but he believes that Halteren does not have a "volume" under Analog's proposed construction.

## PUBLIC VERSION

against electromagnetic interference (RX-47 at 3:48-51, 4:10-15; RX-353C at Q. 279; CX-613 at 40; Tr. at 859:3-5; CX-610 at Q. 101) (Claim 17);

- the first member including a first conductive portion, the second member including a second conductive portion, an electromagnetic interference shield being formed by the coupling of the first conductive portion and the second conductive portion (RX-47 at 3:20-25, 49-53, 66, 4:5-8, 15-63, 8:3-5; RX-353C at Q. 282; CX-613 at 40; Tr. at 859:7-20; CX-610 at Q. 103) (Claim 18); and
- the first member comprising a printed circuit board (RX-47 at 3:1-5; RX-353C at Q. 285; CX-613 at 40; Tr. at 859:21-25; CX-610 at Q. 105) (Claim 20).

Halteren discloses that the transducer assembly provides protection from the outside environment, specifically:

The supporting area of the flexible elongate member is bounded by the lid attached to the member's upper surface. The lid is, preferably, a closed lid without openings to the external environment so that when the lid is mounted over the transducer system and attached to the upper surface of the flexible member, the supporting area and the transducer system are shielded by the combined arrangement of the lid and the flexible member. The transducer system is allowed to interact with the external environment through the one or several holes positioned within the supporting area and which extend through the flexible member. Consequently, the flexible member forms part of an encapsulation of the transducer system.

(RX-47 at 3:18-30.) Halteren adds:

The lid preferably comprises, or is fully fabricated in, an electrically and/or magnetically conductive material. This will make the lid function as an EMI shield that effectively shields the transducer system and the generated transducer signals from interfering electromagnetic signals of the external environment.

(*Id.* at 3:48-53.)

Halteren also addresses protection from “[l]arge externally generated forces caused by rough handling of a piece of electronic equipment that holds the transducer assembly ...” saying:

According to a preferred embodiment of the invention, these potentially damaging forces are minimized by substantially rigidly attaching the lid to the upper surface of the flexible elongate member to restrain the supporting area of the flexible

## PUBLIC VERSION

elongate member so as to increase a stiffness of the supporting area.

(RX-47 at 6:47-49, 6:57-62.)

The clear picture presented by the language of Halteren is of a self-contained unit that comprises a lid securely fastened to a flexible member, thereby completely enclosing a transducer and protecting it from EMI and other environmental intrusions, including shock from rough handling, by the structural integrity of the lid mounted to the flexible substrate.

### b. Une

**Analog's Position:** Analog argues that U.S. Patent No. 6,594,369 ("Une") (RX-49) anticipates asserted claims 1, 2, 16, and 17 of the '089 patent, and says that the only dispute between the parties is whether Une discloses "the transducer being attached to a surface formed on one of the first member or the second member."<sup>34</sup> (Citing CX-610 at Qs. 107-113.) Analog alleges that the parties agree that Une discloses the remainder of the claim limitations.

Analog recites that claim 1 of the '089 patent requires that "the transducer being attached to a surface formed on one of the first member or the second member." (Citing JX-2 at 11:28-30.)

Analog contends that Une discloses a "transducer," which was previously construed in the 629 investigation to be a "microphone." Analog says that according to the plain language of the specification and Analog's experts, the microphone disclosed in Une includes three elements, all shown in Figure 10A (depicted below) – diaphragm 4, fixed electrode 6, and ring-shaped dielectric spacer 61. (Citing RX-49 at 5:65–6:1, 5:4-5; RX-354C at Q. 192; RX-353C at Q. 298; Tr. at 773:7:12, 812:20-813:5.) Analog asserts that Knowles cannot point to any evidence to

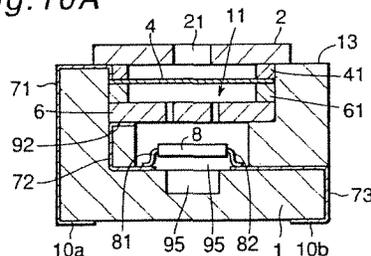
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<sup>34</sup> Analog says that Dr. Bauer claims that "since [Une] lacks the required surface," it also lacks the required "surface being formed with at least one patterned conductive layer," and "a plurality of terminal pads electrically coupled to the patterned conductive layer." (Citing CX-610 at Q. 107.) Analog says as long as it is found that Une has the required "surface," it discloses all the remaining limitations of the claim 1 of the '089 patent.

PUBLIC VERSION

suggest that the transducer is defined by other or additional elements in Figure 10A. (Citing CX-610 at Q. 107.)

Fig. 10A



Analog says that Knowles' acoustic expert, Dr. Egolf, agrees that a microphone is made of a fixed electrode, a diaphragm, a spacer, and a back chamber, and that he did not include an additional spacer in his definition of a microphone. (Citing Tr. at 358:10-19.)

Analog contends that the disclosed transducer in Une is only "attached to a surface" on one of the members, the substrate member, casing 1. (Citing RX-49 at Fig. 10A.) Analog says the transducer is not "attached" to cover 2, because it is separated by ring spacer 41 (which is not part of the microphone, casing 1 or cover 2). (*Id.*; RX-353C at Q. 299; RX-354C at Q. 192.)

Analog says that Knowles argues that Une does not disclose a "surface" because the inner surface of casing 1 has what it calls "multiple surfaces." (Citing CX-610 at Q. 107.) Analog says that Knowles argues that the inner wall of casing 1 is a distinct surface, stepped portion 92 is a distinct surface, and that stepped portion 95 is yet another distinct surface. (Citing RX-386 at 76:8-17.) Analog avers that the undisputed expert testimony is that the "surface" of Une is the entire surface area of casing 1. (Citing RX-354C at Q. 193; RX-353C at Q. 308; Tr. at 601:15-602:11.) Analog concludes that the microphone of Une is only attached to the single surface of the substrate member. (Citing RX-49 at Fig. 10A, 6:21-23, 7:52-53.)

Analog argues that even if the walls and the stepped portions are separate surfaces, the specification still does not disclose that the transducer is "attached" to the walls of casing 1.

## PUBLIC VERSION

Analog says rather, Une only discloses that the transducer is affixed to stepped portion 92. (Citing RX-49 at 6:21-23.) Analog concludes that the transducer disclosed in Une is “attached to a surface” within the meaning of claim 1 of the ’089 patent.

Analog adds if it is found that the transducer is somehow “attached” to the walls of casing 1, the ordinary meaning of the ’089 patent claim language, which uses “comprising” in conjunction with the article “a,” does not prohibit the transducer from being attached to more than one surface of the same member. (Citing *Baldwin Graphic Sys., Inc. v. Siebert, Inc.*, 512 F.3d 1338, 1342 (Fed. Cir. 2008); *Scanner Techs. Corp. v. ICOS Vision Sys. Corp. N.V.*, 365 F.3d 1299, 1305-1306 (Fed. Cir. 2004).)

Analog alleges that there is no dispute between the parties that Une discloses the remaining limitations of the asserted claims 1, 2, 16, and 17 of the ’089 patent and details the evidence it believes proves anticipation. (Citing RX-386 at 26:23-27:2, 61:3-7; RX-49 at 2:43-49, 3:13-22, 3:25-28, 3:30-38, 3:54-56, 5:4-9, 5:58-62, 6:7-13, 6:38-453, 6:57-60, 8:13-15, 10:28-34, 10:39-48, Fig. 10A; RX-353C at Q. 292-299, 301, 306, 310, 312, 314, 316, 318, 322, 325, 327, 330; RX-354C at Q. 195; CX-613 at 40-41.)

In its reply brief, Analog says that Knowles’ only argument that Une does not disclose all of the claim elements of claims 1, 2, 16, and 17 of the ’089 patent is its contention that the transducer of Une is not “attached to a surface formed on one of the first member or the second member.”

Analog says that Knowles contends that the transducer in Une is “sandwiched” between the cover and the substrate of the disclosed package. (Citing CIB at 123-24.) Analog asserts that the transducer of Une does not even touch cover 2 of Une’s package. (Citing RIB at 110-11.)

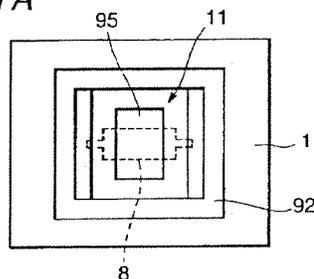
## PUBLIC VERSION

Analog states that the transducer is separated from cover 2 by ring spacer 41.<sup>35</sup> (*Id.*; RX-49 at Fig. 10A.) Analog argues that while the claims prevent the transducer from being attached to the two members that make up the chamber, the claims do not prevent the transducer from being sandwiched between two different parts of the package. (Citing JX-2 at 11:25-30.)

Analog says that Knowles also argues that because the transducer is mounted to an “upper rim” it is not mounted on “single flat surface.” Analog counters that the ’089 patent permits mounting the transducer to an upper rim of a substrate. Analog continues, in fact, many of the figures in the ’089 patent disclose mounting a transducer to an upper rim surface. (Citing JX-2 at Abstract.)

Analog asserts that Knowles states that a hole in the substrate “does not change the planar nature of the surface.” (Citing CIB at 89 n.9) Analog says that in Figure 11A below, Une discloses a substrate with a large hole in it, directly below the transducer. Analog concludes that stepped portion 92, a portion of the whole inner “surface” of casing 2 to which the transducer is attached, is all in one plane, satisfying Knowles’ proposed construction.

*Fig. 11A*



Analog says that Knowles argues that, because the walls of casing 2 are not in the same plane as stepped portion 92 and because the transducer touches the walls and the stepped portion 92, Une does not disclose the claimed “surface.” Analog contends that Knowles waived this

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<sup>35</sup> Analog notes that Knowles argues that the ring spacer 41 could be a part of Une’s transducer. Analog alleges that Knowles admits that a microphone transducer is a capacitor, made of a diaphragm closely spaced from a fixed plate, and does not include an additional spacer. (Citing CIB at 1-2.)

## PUBLIC VERSION

argument because it failed to make it in its pre-hearing brief. (Citing Ground Rule 8.2.) Analog adds that this argument fails, because the inner surface of Une is a single surface. (Citing RX-354C at Q. 193; RX-353C at Q. 308; Tr. at 601:15-602:11.) Analog argues that nothing in the intrinsic evidence of the '089 patent dictates the shape or the planarity of the “surface” of the member to which the transducer is attached.

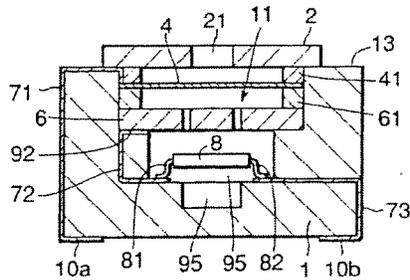
Finally, Analog says that Knowles argues that Une does not disclose a “patterned conductive layer” because Une does not have the claimed “surface.” (Citing CIB at 124.) Analog reasons, therefore, that there is no need to address this element separate from the discussion of “surface”. Analog adds that Dr. Bauer testified that Une has many patterned conductive layers. (Citing RX-386 at 64:8-9.)

**Knowles' Position:** Knowles argues that Analog has failed to produce clear and convincing evidence that Une anticipates claims 1, 2, 16 or 17 of the '089 patent, because Une does not disclose the surface mountable package taught by claim 1. Knowles says specifically, Une fails to disclose:

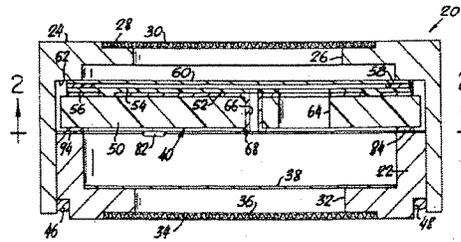
- a microphone attached to the flat surface of a single member of the package
- a patterned conductive layer formed on the flat surface of the single member of the package.

Knowles says that claim 1 of the '089 patent requires that the microphone be attached to one of the first or second members (but not both). Knowles asserts that in every embodiment disclosed in the specification, the microphone is attached to one of the first or second members (but not both), and the member to which the microphone is attached is flat. Knowles adds that, during prosecution, the inventor expressly distinguished his invention from one in which the microphone “mounts to an upper rim portion of a base (at 3:30) and an annular shoulder of a cap.” (Citing CX-433, Response to Office Action at 9.) Knowles asserts that Fig. 10A of Une

and Fig. 1 of Cote look remarkably similar:



Une (RX-49) Fig. 10A



Cote (CX-341) Fig. 1

Knowles contends that in both patents, the bottom-most of the discrete microphone components sits on a raised portion (Une calls it “stepped portion” while Cote calls it an “upper rim portion”) which is above the surface of the base. Knowles asserts that in both patents, the discrete microphone components are “sandwiched” between the raised portion on the bottom and the lid on the top. Knowles adds in Cote, there is an annular shoulder of the lid that is actually in contact with the microphone components, however, the “sandwich” configuration is present in both patents. Knowles quotes Dr. Bauer’s testimony:

Comparing this to Fig. 10A of Une ‘369, we can see that the microphone components sit on a “stepped portion” off of the bottom of the case, just like the microphone components of Cote ‘543 sit on an “upper rim portion” of the bottom of the case. And we can see that the microphone components are sandwiched between the “upper rim portion” of the bottom of the case and the lid. This is not exactly like Cote ‘543, since it doesn’t have an “annular shoulder,” but the sandwiching is the same. Thus Une ‘369 lacks a “transducer being attached to a surface formed on one of the first member or the second member.”

(Citing CX-610 at Q. 107.)

Knowles argues that, because Une does not have a single flat surface to which the microphone is attached, it fails to disclose, by clear and convincing evidence, every limitation of claim 1 of the ‘089 patent (and dependent claims 2, 16, and 17).

**PUBLIC VERSION**

Knowles contends that claim 1 of the '089 patent expressly requires a “patterned conductive layer” that is formed on the surface to which the microphone has been attached. Knowles argues that Une fails to disclose the required surface, and as such, it cannot disclose a patterned conductive layer on that surface. Knowles says this is virtually the same argument used by the inventor in traversing Cote, saying that after pointing out the lack of a single flat surface, the inventor noted:

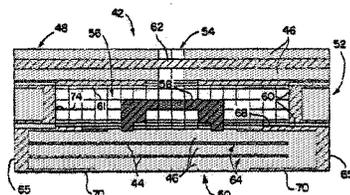
Cote does not teach or suggest that the transducer is mounted to a surface. As such, Cote cannot teach the further claimed electrical connection between the transducer and the at least one patterned conductive layer formed on the surface to which it is attached. In fact, Cote fails to teach or suggest the formation of a patterned conductive layer associated with any part of the described electret microphone.

(Citing CX-433, Response to Office Action at 10.)

In its reply brief, Knowles agrees that Analog correctly notes, whether or not Une anticipates claims 1, 2, 16, and 17 of the '089 patent turns on the constructions of “attached” and “surface formed on one of the first member or the second member.” (Citing RIB at 109.)

Knowles refers to sections IV.A.4-IV.A.5 of its reply brief and sections IV.A.4-IV.A.5 and IV.D.3.b of its initial brief, saying that, during prosecution Minervini distinguished his invention, with the bottom of the microphone mounted on the top of a flat package base, from prior art with its microphone sandwiched between a raised portion of the package base and a rim portion of the package cover. Knowles asserts, “[w]hile the inventor’s language may not have been perfectly articulate, the concept isn’t hard to grasp when comparing the drawings from both patents; the inventor believed he invented” the item shown at JX-2, Figure 8:

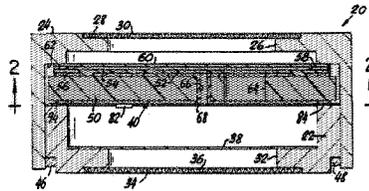
JX-002 Fig. 8  
(colorized):



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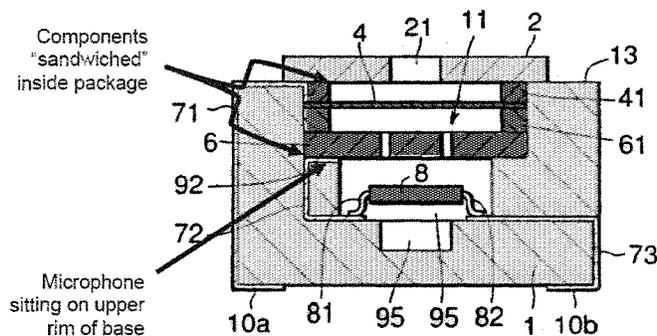
Which was different than the item shown at CX-341, Figure 1:

CX-341 Fig. 1  
(colorized):



Knowles argues that the record distinguishing Minervini's invention from Cote demonstrates how both the inventor and the examiner understood the invention. (Citing *Phillips*, 415 F.3d at 1317.) Knowles says that this same distinction applies to Une with its microphone sandwiched between a raised portion of the package base and the package cover. Knowles includes CDX-9.8 to illustrate the point:<sup>36</sup>

CDX-9.8:



Knowles adds that Une, like Cote, was cited and considered by the examiner during prosecution. Knowles argues that Analog has failed to address why I should find that the original examiner was wrong. (Citing *Am. Hoist & Derrick Co. v. Sowa & Sons*, 725 F.2d 1350, 1359 (Fed. Cir. 1984).)

**Staff's Position:** Staff argues that the Une reference discloses all the limitations present in claims 1, 2, 16 and 17, detailing the evidence it believes supports such a finding. (Citing RX-49 at 2:38-41, 2:43-49, 3:30-39, "3:54-47," 4:60-63, 6:10-13, 6:21-23, 6:38-46, 6:46-49, 6:50-52, 6:58-60, 10:28-34, 10:39-48, Fig. 10A; RX-48 at 6:7-10.)

<sup>36</sup> CDX-9.8 is a demonstrative exhibit and is not accepted as evidence of the facts purported to be shown therein.

## PUBLIC VERSION

Staff says that Knowles has contended that the Une transducer is attached to both the top and bottom of the Une package and thus it does not meet this limitation. Staff alleges that the evidence has shown that this contention is based on an incorrect reading of the specification. Staff says that contrary to Knowles' assertion, the Une reference does not disclose that the transducer is attached to the cover 2. (Citing RX-354C at Q. 192.) Staff observes that Knowles' argument appears to be based on their belief that the ring spacer 41 is part of the transducer and thus the transducer is mounted to the cover. Staff contends that the evidence has shown that the ring spacer is not a part of the transducer but an entirely separate component.

Staff asserts that the Une reference states that items 4, 61, and 6 of Fig. 10A are the only components that form the transducer. (Citing RX-49 at 5:65-6:1.) Staff contends that the ring spacer 41 is not a part of the transducer. (Citing RX-49 at 5:65-6:1.) Staff concludes that the Une transducer does not touch the cover, because it only touches the ring spacer. (Citing RX-49 at Fig. 10A.) Thus, the Une reference does not disclose a transducer attached to both a cover and a substrate.

Staff says that Knowles also contends that Une does not have a proper surface because the transducer is attached to a multi-tiered surface. (Citing CPHB at 46.) Staff contends that, "this argument is based on an improper reading of the prosecution history and should not be adopted here."

**Discussion and Conclusion:** Based upon the evidence in the record, I find that Analog has not presented clear and convincing evidence that Une anticipates asserted claims 1, 2, 16 and 17 of the '089 patent.

Analog argues that the only dispute between the parties is whether or not Une discloses "the transducer being attached to a surface formed on one of the first member or the second

## PUBLIC VERSION

member.” Actually, Knowles contends that claim 1 of the ‘089 patent expressly requires a microphone attached to the flat surface of a single member of the package and a patterned conductive layer formed on the flat surface of the single member of the package. Analog contends that Knowles waived these arguments pursuant to Ground Rule 8.2 because it failed to make them in its pre-hearing brief.

I note that Knowles, in its pre-hearing brief, raised the issue that Une discloses “configurations where the microphones are electrically and mechanically joined to the shoulders and rims of the tops and bottoms of the packages, just like the configuration disclosed by ... Cote, which formed the basis of a rejection during prosecution.” CPHB at 46 Knowles included graphics showing Une Fig. 1 and Cote, Fig 1. The foregoing arguably discloses the requirement that the microphone be attached to a single surface of a single member of the package, and I will address its substance. Knowles’ pre-hearing brief does not, however, address the requirement for a patterned conductive layer to be formed on the surface of a member, and I find that Knowles has waived that argument. (CPHB at 46; Ground Rule 8.2.)

Regarding the issue that was properly raised, Knowles attempts unsuccessfully to establish that Une depicts the microphone to be attached to multiple surfaces of the casing, and that Une shows that the microphone is attached to both the casing and the lid. First, Une clearly discloses an embodiment in which the surface on which the microphone (*i.e.* diaphragm 4, thin gap spacer 61, and the fixed electrode 6) is attached is a stepped portion of the casing (*i.e.* the first member) to stop and support the diaphragm and the fixed electrode on their peripheral edges, while they are separated from one another by a spacer. In the summary of the invention, Une states, *inter alia*:

The fixed electrode or the diaphragm has a peripheral edge mounted on the upper surface of the stepped portion and is conductively joined and fixed with proper

## PUBLIC VERSION

bonds, to a separate lead on the inner surface of the hollow portion.

(RX-49 at 5:39-51.)

Describing a first embodiment, referring to Figure 1A, Une describes in relevant part:

A fixed electrode 6 ... is mounted on the stepped portion 92 and is fixed thereto, and a diaphragm 4 is mounted with a very small capacitor gap through a ring-shaped dielectric spacer 61 above the fixed electrode 6, thereby constituting a capacitor.

(RX-49 at 5:63-6:1.)

It is clear that the microphone elements listed in Une are separated from the lid (*i.e.* the second member) by an additional ring spacer 41. Further, based upon the foregoing description of the first embodiment of the invention, the microphone elements are mounted to the casing (the first member) and are not “sandwiched” between the first member and the second member. They would be fixed to the casing without the presence of ring spacer 41.

Knowles argues that the stepped surface of the casing is not the surface contemplated in the ‘089 patent, and attempts to establish that Une is an equivalent to the Cote reference distinguished during prosecution of the ‘089 patent; but I find that the argument lacks merit. It is clear from the language of Une that the surface is a step formed in the casing, and is, therefore a “surface of the first member.” Nothing in the ‘089 patent requires that the member to which the microphone is attached have only one surface.

Cote, by contrast, described a structure in which the microphone elements were clearly attached to a surface of the first member *and* the second member, because the cover in Cote clearly wraps around the microphone and the microphone is shown to be attached to both the cover and the base of the assembly. (*See* CX-341 at Fig. 1.)

Analog is correct when it says that the ordinary meaning of the ‘089 patent claim language, which uses “comprising” in conjunction with the article “a,” does not prohibit the

## PUBLIC VERSION

transducer from being attached to more than one surface of the same member. In *Baldwin Graphic Sys., Inc. v. Siebert, Inc.*, 512 F.3d 1338, 1342 (Fed. Cir. 2008), cited by Analog, the Federal Circuit found, *inter alia*, that the term “a pre-soaked fabric roll” was not limited to a single roll. The court elaborated, stating:

“[t]his court has repeatedly emphasized that an indefinite article ‘a’ or ‘an’ in patent parlance carries the meaning of ‘one or more’ in open-ended claims containing the transitional phrase ‘comprising.’” *KCJ Corp. v. Kinetic Concepts, Inc.*, 223 F.3d 1351, 1356 (Fed.Cir.2000). That “a” or “an” can mean “one or more” is best described as a rule, rather than merely as a presumption or even a convention. The exceptions to this rule are extremely limited: a patentee must “evinced [ ] a clear intent” to limit “a” or “an” to “one.” *Id.* The subsequent use of definite articles “the” or “said” in a claim to refer back to the same claim term does not change the general plural rule, but simply reinvokes that non-singular meaning. An exception to the general rule that “a” or “an” means more than one only arises where the language of the claims themselves, the specification, or the prosecution history necessitate a departure from the rule. *See, e.g., Abtox Inc. v. Exitron Corp.*, 122 F.3d 1019 (Fed.Cir.1997); *Insituform Techs., Inc. v. Cat Contracting, Inc.*, 99 F.3d 1098 (Fed.Cir.1996).

*Baldwin*, 512 F.3d at 1342-1343.

In Section III.C.2, *supra*, I found that the term “attached” means “fastened, affixed or joined.” I have already found that, based upon the description of the first embodiment of the invention, *supra*, the microphone elements are mounted to the casing (the first member) and are not “sandwiched” between the first member and the second member. They would be fixed to the casing without the presence of ring spacer 41. Thus, Une teaches that the transducer is attached to a surface formed on one of the first member or the second member.

I have found that Knowles waived its argument that Une does not disclose a patterned conductive layer on the surface of a member. Notwithstanding that finding, it remains Analog’s burden to establish by clear and convincing evidence that Une discloses at least one patterned conductive layer on the surface on which the transducer is mounted. To support its argument that these limitations are met, Analog cites RX-49 at 6:7-9, Fig. 10A; RX-386 at 61:3-7, 64:8-9;

PUBLIC VERSION

RX-353C at Q. 308; and RX-354C at Q. 195.

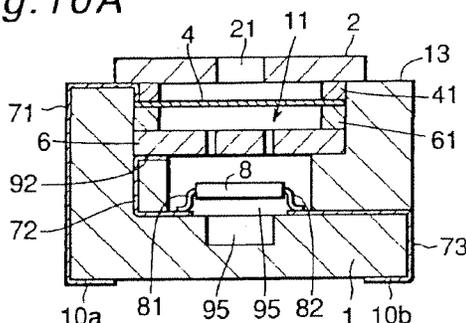
Analog's reference to RX-49 at 6:7-9 errs, because neither the cited language nor the referenced Figure 10A reveals or hints at a patterned conductive layer. Une merely states:

In this example, an input lead 81 and an output lead 82 of the solid state device 8 are directly fixed to conductive paths 72 and 73 applied to the bottom through means such as brazing or conductive adhesion.

(RX-49 at 6:6-9.)

Figure 10A, related to the foregoing language is included:

Fig. 10A



Analog's reference to RX-386, at page 61, lines 3-7, also fails to provide evidence of a patterned conductive layer. Here, Analog's counsel is taking the deposition of Knowles' expert, Dr. Charles Bauer. Analog cites a small portion of the testimony, to wit:

- A To my knowledge, the entirety of element 1 is not conductive.  
Q But there's portions of element 1 on which there is no conductive path?  
A Correct.

Omitted from the reference is the following:

- Q And those are portions on the inside of element 1 that do not have a conductive path? For example, if you look - -  
A On the inside, I guess.

(RX-386 at 61:3-11.)

The reference, therefore, is not to the surface of the member; it is to the inside conductive path. Analog's reference to further discussion on this point by Dr. Bauer during his deposition at

PUBLIC VERSION

page 64, lines 8-9, also fails to provide clear and convincing evidence of the existence of a patterned conductive layer on the surface of the member. The transcript reveals, in relevant part, the following colloquy:

Q Do you have any opinion, sitting here today, that Une failed to disclose a patterned conductive layer for any other reason than because it lacks the requisite surface?

\* \* \* \* \*

A Yes.

Q Why?

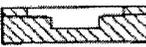
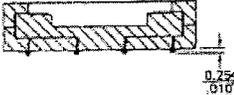
A Because Une discloses multiple patterned conductive layers.

(RX-386 at 63:20-23, 64:5-9.) Dr. Bauer's testimony, when viewed in context, discusses multiple levels of patterned conductive layers; but does not indicate the existence of a patterned conductive layer on the outside surface of a member.

In RX-353C, at Question 308, Analog's expert, Professor Rao R. Tummala, paraphrases the language of RX-49 cited above. He then admits that the referenced paths are "through Une's substrate," and that "Une has these conductive paths throughout the substrate." Professor Tummala then says:

The entire inner surface of casing 1 is not conductive, further supporting my position that Une discloses a "patterned conductive layer." (RX-386, at 61:3-7; RX-49 at Fig. 10A.) The ceramic cavity substrates just like Une's, which are illustrated in the figure below from my book Microelectronics Packaging Handbook: Semiconductor Packaging Part II, are well known with edge and via metalizations and external pads on their surface. All these are fabricated by what is called co-firing of ceramic and metal so as to end up with a single self-contained substrate with one interior surface.

PUBLIC VERSION

CONFIGURATION		PIN/LEAD CENTERLINE SPACING		
		STANDARD	CUSTOM	HDCM
1) CHIP CARRIER (Castellations)		1.27 .050 & 1.016 .040	0.762 .030	0.762 .030
2) CHIP CARRIER (Edge Metallization)		1.27 .050 & 1.016 .040	0.762 .030	0.635 .025
3) CHIP CARRIER (Via Holes)		1.27 .050 & 1.016 .040	0.635 .025	0.508 .020
4) PAD GRID ARRAY	 0.754 .010	1.27 .050	0.635 .025	0.508 .020

Units: mm  
inch

Figure 9-18 Leadless Package I/O Configurations. (Courtesy of Kyocera (sic)

(RX-353C at Q. 308.)

The construction applied herein for the term “patterned conductive layer” is “a single layer of material, the layer being less than the entire surface on which it sits, suitable for carrying electrical current.” Neither the testimony of Professor Tummala nor the publication cited therein reveals anything that meets the construction given herein to “patterned conductive layer.” There is no description of a “single layer of material” which is less than the entire surface on which it sits. Instead, the description is of a single “substrate” rather than surface, and of conductive paths through the substrate with “edge and via metalizations and external pads on their surface.” Dr. Tummala’s testimony makes a leap from his described method involving a single substrate to a single layer of material, which are not the same thing.

In RX-354C at Question 195, Analog’s expert Dr. Michael G. Pecht, testifies that Une reveals a patterned conductive layer. He uses the testimony of Dr. Bauer discussed, *supra*, and references to Une. The relevant part of the first Une reference was discussed, *supra*, and the remaining reference reads:

The casing 1 may have a conductive path 71 provided on the outer surface. The

**PUBLIC VERSION**

conductive path can utilize a conductive paste layer applied on the casing surface and a through hole filled with a conductive paste. A green sheet including the conductive paste is provided so that a conductive film can be formed on a surface or an inner surface.

(RX-49 at 6:26-31.)

The foregoing does not describe a single layer of material which is less than the entire surface on which it sits, suitable for carrying electrical current. Rather, it describes a conductive path that utilizes a conductive paste layer and a through hole filled with a conductive paste, and a green sheet provided so that a conductive film can be formed on a surface or an inner surface.

Based upon the foregoing, I find that the evidence presented by Analog on this point is equivocal and fails to provide clear and convincing evidence that Une discloses “a single layer of material, the layer being less than the entire surface on which it sits, suitable for carrying electrical current.” Therefore, I find that the record lacks evidence that Une discloses each and every limitation of claims 1, 2, 16 and 17 of the ‘089 patent.

Assuming, *arguendo*, that Une is found to disclose the required patterned conductive layer, I find that Une discloses the remaining limitations of the asserted Claims 1, 2, 16, and 17 of the ’089 Patent based upon the unrebutted evidence presented by Analog, to wit:

- a surface mountable package for containing a transducer (RX-386 at 26:23-27:2; RX-49 at 6:57-60, Fig. 10A, 3:30-38, 6:10-13; RX-353C at Q. 292-299; CX-613 at 40);
- the transducer being responsive to sound pressure levels of an acoustic signal to provide an electrical output representative of the acoustic signals (RX-49 at 2:43-49, 5:4-9; RX-353C at Q. 298-299);
- at least a first member and a second member and a chamber being defined by the first member and the second member (RX-49 at Fig. 10A, 10:39-48; RX-353C at Q. 301);
- the transducer residing within the chamber (RX-49 at Fig. 10A, 8:13-15; RX-353C at Q. 306);

## PUBLIC VERSION

- the patterned conductive layer being electrically coupled to the transducer (RX-49 at Fig. 10A, 6:42-46; RX-353C at Q. 310);
- an outside surface of the surface mountable package comprising a plurality of terminal pads (RX-49 at Fig. 10A, 3:30-39, 54-56; RX-353C at Q. 312);
- a plurality of terminal pads electrically coupled to the patterned conductive layer (RX-49 at Fig. 10A, 6:46-51; RX-353C at Q. 314);
- a volume being defined by the transducer and one of the first member or the second member, the volume being acoustically coupled to the transducer (RX-49 at Fig. 10A, 3:13-22, 25-28, 10:28-34; RX-353C at Q. 316 at 73-74; CX-613);
- one of the first member or the second member being formed to include an aperture, the aperture configured to permit the passage of an acoustic signal to the transducer (RX-49 at Fig. 10A, 10:47; RX-353C at Q. 318; CX-613);
- the first member comprises a substrate and the second member comprises a cover coupled to the substrate to define the chamber (RX-49 at Fig. 10A, 2:43, 5:58-62; RX-353C at Q. 322) (Claim 2);
- a metalized region being formed on an exterior surface of the surface mountable package (RX-49 at 6:57-60; RX-353C at Q. 325) (Claim 16);
- the metalized region being electrically coupled to the patterned conductive layer (RX-49 at 6:46-49, 50-51; RX-353C at Q. 327) (Claim 16); and
- one or both of the first member and the second member including a shield against electromagnetic interference (RX-49 at 6:38-41, 50-53; RX-353C at Q. 330; CX-613) (Claim 17).

Based upon the foregoing, if Une were found to disclose the patterned conductive layer required by claim 1, then Une would anticipate each and every element of claims 1, 2, 16, and 17 of the '089 patent, rendering those asserted claims invalid.

### c. Kawamura

**Analog's Position:** Analog argues that U.S. Patent No. 7,080,442 ("Kawamura") (RX-50) anticipates claims 1, 2, and 16 of the '089 patent. Analog says that Knowles only disputes that Kawamura discloses that the "transducer being attached to a surface formed on one of the

## PUBLIC VERSION

first member or the second member.” Analog alleges that all parties agree that Kawamura discloses the remaining claim limitations of claims 1, 2, and 16.

Analog argues that Kawamura discloses that the transducer is “attached to a surface formed on one of the first member or the second member.” (Citing RX-50 at Fig. 6, item 110.) Analog represents that Kawamura shows that acoustic sensor 100 is “mounted” onto “terminals 211, 212, 213, and 214,” which are part of case main body 210. (Citing RX-353C at Q. 347; RX-50 at Fig. 6, 5:13-15.)

Analog says that Knowles argues that the transducer disclosed in Kawamura is “attached” to two members, namely lid 220 and the case main body 210. Yet, Knowles cannot show this is true because the transducer is only “fastened or affixed” at the bottom of case main body 210. (Citing RX-50 at Fig. 6; 5:13-15.) Analog states that the transducer is not “fastened or affixed” to the lid 220. (Citing Tr. at 604:14-19; RX-354C at Q. 219.) Analog adds that the transducer is not “joined connected or bound” to the lid 220. (Citing Tr. at 604:24-605:5; RX-354C at Q. 219.) Analog continues that, assuming *arguendo* that the acoustic sensor 100 is “attached” to bump 221 in Figure 6, the presence of a bump 221 is merely a matter of design. (Citing RX-354C at Q. 219.) Analog says that bump 221 is included to secure the acoustic sensor 100 in the package. (*Id.*) Analog adds that a ring spacer, which was used in Une (RX-49 at element 41 in Figure 10A) or a slider, both of which were known in 2000 by a person having ordinary skill in the art, could easily replace the bump 221. (*Id.*; Tr. at 776:25-777:4, 814:6-14.) Analog says that Kawamura contemplates securing the transducer without the bumps. Analog points to Figure 8 of Kawamura to show the transducer secured within the case main body without the use of any bumps or any other direct or indirect connection to the lid member. (Citing RX-50 at Fig. 8; RX-354C at Q. 219.) Analog contends that a mere matter of design choice does not remove

## PUBLIC VERSION

Kawamura as an invalidating reference. (Citing *Allan Block Corp. v. County Materials Corp.*, 634 F. Supp. 2d 979, 998 (D. Minn. 2008).)

Analog says that Knowles argues that because acoustic sensor 100 is mounted onto four “projecting terminals,” it is attached to a non-planar surface and more than one “surface” of case main body 210. Analog argues that neither the specification nor the prosecution history limit the shape of the substrate member as Knowles advocates.

Analog asserts that the interior surface of case main body 210 is not composed of several surfaces, but composed of one “surface” including the terminals, and the acoustic sensor 100 is “attached” to it. (Citing RX-353C at Q. 354; RX-354C at Q. 222; CX-554 at 4, 5.) Analog states that understanding how ceramic substrates (like Kawamura) are made makes this clear. Analog says ceramic substrates are made by a process “very similar to” that used to create the laminated printed wiring substrate in discussed in the '231 and '089 patents; pattern conductive layers are deposited on individual layers which are subsequently laminated. (Citing RX-353C at Q. 354.) Analog avers that Kawamura’s ceramic substrate is made of alumina ceramic particles in matrix of polymers, thus forming so called “green sheet.” (*Id.*) Analog continues that pattern conductors are made of thick films of conductors and screened using a stencil mask. (*Id.*) Analog concludes that these patterned layers are then laminated and co-sintered at very high temperature so as to fuse the individual ceramic and metal particles among all the layers into one single substrate with one surface. (*Id.*)

Analog asserts that in Kawamura, the substrate is referred to as thin dish type package 210 with four corners inside with four terminals 211, 212, 213 and 214. (Citing RX-50 at 5:1-11.) Analog says rather than being four distinct surfaces, the terminals are all portions of the same surface of the ceramic substrate. (Citing RX-353C at Q. 354; Tr. at 950:7-12.) Analog

## PUBLIC VERSION

concludes, therefore, that rather than being mounted on pedestals, the acoustic sensor 100 is mounted to a single surface that has conductive and non-conductive portions.

Analog contends, even if it is found that the terminals disclosed in Kawamura are multiple surfaces, nothing in the claim language restricts the transducer to being bound to a single surface on the substrate member. (Citing *Baldwin Graphic Sys., Inc.*, 512 F.3d at 1342; *Scanner Techs. Corp.*, 365 F.3d at 1305-1306.) Analog says having separated terminals instead of a continuous shelf around the interior circumference of the package (as disclosed in Une) is merely a matter of design choice and is not a novel or inventive difference. (Citing RX-354C at Q. 222.)

Analog states that Kawamura describes an electrical connection between the acoustic sensor and the terminal pads on the outside surface of the ceramic substrate. Analog reiterates that the case main body 210 has conductive portions on the inside and outside of the substrate. (Citing RX-50 at Figs. 6, 7.) Analog reiterates that these conductive pads on the inside of the substrate are the patterned conductive layer. Analog asserts that an electrical connection can be traced from inside of the substrate to the outside, by following pattern conductive edge connections, which are shown in Figure 7. Analog says the signal from the microphone travels from inside of the ceramic package to the terminal 212 and follows the conductive path over the top of the ceramic substrate and then down to the bottom surface pads. Analog concludes the power flows to the sensor in the opposite direction through terminal 213, starting on the outside of the package, through terminal 213 on the inside of the package and connecting to the acoustic sensor, thus disclosing a plurality of terminal pads electrically coupled to the patterned conductive layer. (Citing RX-353C at Q. 360.)

Analog alleges that the parties do not dispute that Kawamura discloses the remaining

## PUBLIC VERSION

claim limitations of Claims 1, 2, and 16 of the '089 patent and details the evidence supporting its assertion. (Citing RX-50 at Abstract, Figs. 6, 7, 2:34-38, 4:57-62, 4:64-67, 5:1-23, 5:29-43, 7:32-36; RX-353C at Q. 337-343, 345, 351, 353, 354, 356, 358, 360, 362, 364, 368, 371, 373; CX-613 at 41; Tr. at 949:10-950:2, 950:15-21.)

In its reply brief, Analog argues that, based on its latest construction of “surface,” Knowles argues that the four terminals to which the transducer is attached cannot be the claimed “surface.” Analog counters that Knowles did not present this argument in its pre-hearing brief and it should, therefore, be waived. (Citing Ground Rule 8.2.) Analog says that, assuming *arguendo* that the argument is not waived, the argument fails. Analog asserts that, in its claim construction argument, Knowles states that the “surface” must be flat, but may have a hole in it. (Citing CIB at 89, n.9.) Analog reasons that under Knowles’ interpretation the “surface” to which the transducer is attached only has to be planar, but does not have to be contiguous. Analog asserts that the four terminals, as depicted in Figure 7 are co-planar. (Citing RX-50 at Fig. 7.) Analog reiterates that even under Knowles’ most restrictive construction of “surface,” Kawamura discloses this limitation.

Analog contends that Staff’s position on Kawamura is inconsistent with its position on Une. Analog says that although Staff (and Knowles) agrees that Une discloses a “patterned conductive layer” that is distinct from, and electrically coupled to, the terminal pads in that reference, it argues that Kawamura is missing that limitation. Analog asserts that both Une and Kawamura disclose the same type of electrical connection between the patterned conductive layer and the outside terminal pads. (Comparing RX-49 at Fig. 10A, elements 71, 10a with RX-50 at Fig. 7, elements 211, 212, 213, and 214.) Analog alleges that in both cases, the patterned conductive layer on the inside of the package is connected to the outside terminal pads by means

## PUBLIC VERSION

of a patterned conductive edge connection, a strip of metal running from the inside of the package to the outside of the package. (Citing RX-353C at Q. 308, 360.)

Analog continues that Une and Kawamura electrically couple the patterned conductive layer to the terminal pads the same way as depicted in the '089 patent. Analog says Figure 13 of the '089 patent is a bottom member of the claimed package. (Citing JX-2 at 2:24-25.) Analog states that this member has solder pads 70 on the top and bottom of the member. (*Id.* at Fig. 13, 6:16.) Analog asserts these solder pads are electrically coupled by an edge connection, called pin 65. (*Id.* at Fig. 13, 5:28.) Analog alleges in Figure 13, the metallization is a single path of metal that starts on the inside of the package and travels to the outside. (*Id.* at Fig. 13.) Analog concludes the only difference between the '089 patent and Kawamura is that Kawamura does not label the different portions of the substrate's metallization.

**Knowles' Position:** Knowles argues that Analog has failed to produce clear and convincing evidence that Kawamura anticipates claim 1 of the '089 patent (or dependent claims 2 and 16) because Kawamura does not disclose the surface mountable package taught by claim 1. Specifically, Kawamura fails to disclose:

- a microphone attached to the flat surface of a single member of the package.
- a patterned conductive layer formed on the flat surface of the single member of the package.

Knowles contends without these essential elements, Kawamura cannot meet the limitations of “the transducer being attached to a surface formed on one of the first member or the second member,” “the surface being formed with at least one patterned conductive layer,” “a plurality of terminal pads electrically coupled to the patterned conductive layer,” or “a metalized region being formed on an exterior surface of the surface mountable package, the metalized region being electrically coupled to the patterned conductive layer.”



## PUBLIC VERSION

case, but instead it sits up on raised terminals. As I noted in my answer to question 67, the specification doesn't indicate how high these terminals are raised off the base of the case, but it has to be sufficiently high because the space between the sensor and the bottom of the case is the acoustic back chamber for the microphone. Also, like the electret microphone in Cote '543, the Kawamura microphone is held in place by pressing the lid downward against the diaphragm, sandwiching the microphone between the lid and the projecting terminals.

(Citing CX-610 at Q. 115; Tr. at 551:10-17.)

Knowles adds that, to the extent that the "projecting terminals" disclosed in Kawamura could be improperly characterized as a "surface," there are in fact four of these projecting terminals (in each corner of the case). Knowles concludes that, because Kawamura does not disclose a single flat surface to which the microphone is attached, it fails to disclose, by clear and convincing evidence, every limitation of claim 1 (and dependent claims 2 and 16).

Knowles contends that claim 1 of the '089 patent expressly requires a "patterned conductive layer" that is formed on the surface to which the microphone has been attached. Knowles says that Kawamura fails to disclose the required surface, and as such, it cannot disclose a patterned conductive layer on that surface. Knowles alleges this is virtually the same argument used by the inventor in traversing Cote, saying that after pointing out the lack of a single flat surface, the inventor noted:

Cote does not teach or suggest that the transducer is mounted to a surface. As such, Cote cannot teach the further claimed electrical connection between the transducer and the at least one patterned conductive layer formed on the surface to which it is attached. In fact, Cote fails to teach or suggest the formation of a

patterned conductive layer associated with any part of the described electret microphone.

(Citing CX-433, Response to Office Action at 10.)

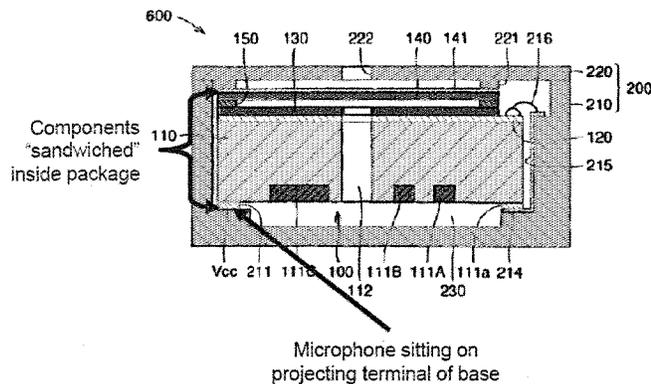
Knowles adds that, to the extent that the conductive material on the projecting terminals could be improperly characterized as a patterned conductive layer, claim 1 of the '089 patent

PUBLIC VERSION

requires that the patterned conductive layer be electrically coupled to a plurality of terminal pads on the outside surface of the package. (Citing JX-2 at “C33-36”.) Knowles says in contrast, the conductive material on the outside of the package is an actual part of the same conductive material as is on top of the projecting terminals. Knowles reasons, therefore, in Kawamura there is no coupling of a patterned conductive layer to a plurality of terminal pad on the outside surface of the package.

In its reply brief, Knowles agrees that whether or not Kawamura anticipates claims 1, 2, and 16 of the ‘089 patent turns on the constructions of “attached” and “surface formed on one of the first member or the second member.” (Citing RIB at 114.) Knowles argues that the same analysis applies to Kawamura as Une, namely that the inventor excluded a configuration where the microphone is sandwiched between raised portion of the package base and a rim portion of the package lid. Knowles contends that Kawamura discloses that excluded configuration and includes an illustration:<sup>37</sup>

CDX-9.8:



Knowles adds that the terminal pads on the outside of the Kawamura package and the patterned conductive layer on the inside of the package are not “electrically coupled” as required by claim 1; they are the same element.

<sup>37</sup> The illustration is a demonstrative exhibit and is not accepted as evidence of the facts it purports to depict.

## PUBLIC VERSION

**Staff's Position:** Staff contends that the Kawamura reference generally relates to an electret condenser microphone encapsulated in a surface-mountable case. (Citing RX-50 at Abstract.) Staff avers that the evidence has shown that Kawamura does not anticipate claims 1, 2, and 16 of the '089 patent. Staff reasons that, because Kawamura fails to teach “a plurality of terminal pads electrically coupled to the patterned conductive layer,” this reference cannot anticipate claims 1, 2, and 16. Staff says the evidence has shown that Kawamura fails to teach this limitation because the terminal pads and the patterned conductive layer are the same component. (Citing RX-50, Figure 7; Tr. at 786:12-788:11.) Staff reasons that it logically follows that the pads and the patterned conductive layer cannot be coupled together if they are one and the same. Staff adds that, because claims 2 and 16 depend on claim 1, the evidence has shown that the Kawamura reference does not anticipate these claims as well.

**Discussion and Conclusion:** Based upon the evidence in the record, I find that Analog has not presented clear and convincing evidence that Kawamura anticipates asserted claims 1, 2 and 16 of the '089 patent.

The dispute is whether or not the invention in Kawamura discloses that the transducer is attached to a surface formed on one of the first member or the second member, said surface being formed with at least one patterned conductive layer. The parties do not dispute whether or not Kawamura reveals the remaining elements of claims 1, 2, and 16.

First, as discussed in detail in Section IV.C.1.b, *supra*, Analog is correct when it argues that the ordinary meaning of the '089 patent claim language, which uses “comprising” in conjunction with the article “a,” does not prohibit the transducer from being attached to more than one surface of the same member. *Baldwin*, 512 F.3d at 1342.

Second, assuming *arguendo* that, as urged by Analog, Kawamura discloses that the

## PUBLIC VERSION

transducer is attached to the four terminals labeled 211, 212, 213 and 214, all of which are on pedestals (i.e. surfaces) extending from the base, then Kawamura discloses that the transducer is attached to “a” surface of the first member. (See RIB at 35; RX-50 at Fig. 7.)

Third, Knowles’ argument is incorrect when it says that, because Kawamura is “sandwiched” between the lid and the base, it is connected to both the first member and the second member. This same argument was raised in Section IV.C.1.b, regarding Une, and was rejected there. I will not repeat the rationale here; but incorporate it by reference. There is no showing in the record that the transducer of Kawamura is “attached” to the lid. While it appears to be in contact with the lid, there is nothing in Kawamura that teaches it is bonded, laminated or otherwise attached, fixed or joined to the lid.

Fourth, assuming *arguendo* that the transducer in Kawamura is attached to a surface of one of the first member or the second member, the Kawamura reference has not been shown to reveal that the surface of the first member to which the transducer is attached is formed with at least one patterned conductive layer. Analog offers the testimony of Dr. Tummala to support this allegation; but his testimony does not support Analog’s position. Dr. Tummala points to the four terminals shown in Figure 7 of RX-50 to illustrate his point; but they are not evidence of “a single layer of material, the layer being less than the entire surface on which it sits ...” as construed herein. It is clear from Figure 7 that the conductive layer covers the entire surface of each pad on which it sits. Dr. Tummala’s testimony actually disproves his point when he says, “... the surface of the package disclosed in Kawamura has a portion of it that is conductive (elements 211, 212, 213, 214 and 215) and a portion of it that is not conductive.” His testimony and the elements in Figure 7 to which he refers clearly indicates that the conductive layers cover the *entire* surface upon which they are laid. (CX-353C, Qs. 353-356; RX-50, Figure 7)

## PUBLIC VERSION

Inspection of Figure 7 of Kawamura confirms that terminals 211, 212, 213 and 214 are four steps or pedestals located in the corners of the hollow portion of the case and do not disclose “at least one patterned conductive layer.” (RX-50 at Fig. 7.) Instead they are merely conductive pads with conductive paths through the casing. For example, referring to Figure 6, Kawamura discloses that:

[I]nside of this case main body 210, a conductive layer 215 is formed. This conductive layer 215 is the portion for connecting the electrode layer 120 of the acoustic sensor 100 and the gate electrode 111a, and it is connected to the gate terminal 214. The conductive layer 215 is connected to the electrode layer 120 through a bonding wire 216.

(RX-50 at 5:18-23.)

Finally, the argument by Staff and Knowles is persuasive when they say that the terminals cannot be patterned conductive layers, because they are, in fact, a single path from inside the package to the outside and are, therefore, the same element.

Based upon the foregoing, I find that Analog has failed to demonstrate by clear and convincing evidence that claim 1 of the '089 patent is anticipated by Kawamura. Further, claims 2 and 16, cannot be found to be anticipated by Kawamura, because each of those claims depend from claim 1 and necessarily contain all of the elements of claim 1. *See In re Royka*, 490 F.2d 981, 983-985 (C.C.P.A. 1974); *In re Fritch*, 972 F.2d 1260, 1266 (Fed. Cir. 1992).

Assuming, *arguendo*, that Kawamura is found to disclose the required patterned conductive layer, I find that Kawamura discloses the remaining limitations of the asserted Claims 1, 2, and 16 of the '089 Patent based upon the unrebutted evidence presented by Analog, to wit:

- a surface mountable package for containing a transducer (RX-50 at Abstract, Figs. 6, 7, 2:34-38, 4:61-62, 4:66-67, 5:1-5, 7:32-36; RX-353C at Q. 337-343; CX-613);
- the transducer being responsive to sound pressure levels of an acoustic signal to provide an electrical output representative of the acoustic signals

## PUBLIC VERSION

(RX-50 at 4:57-61; 5:32-37; RX-353C at Q. 343; CX-613 at 41);

- at least a first member and a second member and a chamber being defined by the first member and the second member (RX-50 at Abstract, Fig. 6, 4:61-62, 4:66-67; RX-353C at Q. 345; Tr. at 949:11-950:2);
- the transducer residing within the chamber (RX-50 at Fig. 6; 4:59-61; RX-353C at Q. 351);
- the patterned conductive layer being electrically coupled to the transducer (RX-50 at Fig. 6, 5:6-8, 5:38-43; RX-353C at Q. 356);
- an outside surface of the surface mountable package comprising a plurality of terminal pads (RX-50 at Fig. 7; RX-353C at Q. 358);
- a plurality of terminal pads electrically coupled to the patterned conductive layer (RX-50 at Fig. 7; RX-353C at Q. 360);
- a volume being defined by the transducer and one of the first member or the second member, the volume being acoustically coupled to the transducer (RX-50 at Fig. 6; 4:64-65; 5:12-17; RX-353C at Q. 362; CX-613 at 41);
- one of the first member or the second member being formed to include an aperture, the aperture configured to permit the passage of an acoustic signal to the transducer (RX-50 at 5:29-31; RX-353C at Q. 364; CX-613 at 41);
- the first member comprises a substrate and the second member comprises a cover coupled to the substrate to define the chamber (RX-50 at Fig. 6, 5:1-5; RX-353C at Q. 368) (Claim 2);
- a metalized region being formed on an exterior surface of the surface mountable package (RX-50 at Fig. 7; RX-353C at Q. 371) (Claim 16); and
- the metalized region being electrically coupled to the patterned conductive layer (RX-50 at Fig. 7; RX-353C at Q. 373) (Claim 16).

Based upon the foregoing, if Kawamura were found to disclose the patterned conductive layer required by claim 1, then Kawamura would anticipate each and every element of claims 1, 2 and 16 of the '089 patent, rendering those asserted claims invalid.

**d. Premachandran**

**Analog’s Position:** Analog contends that Premachandran anticipates claims 1, 2, 7, 16, and 17 of the ’089 patent. Analog says that Knowles admits that Premachandran discloses a package. (Citing RX-341C at 216:17-20; CX-613 at 37; Tr. at 983:16-17.) Analog asserts that the remaining question is whether the package disclosed in Premachandran is “surface mountable.”

Analog states that Premachandran is a lead frame package, and the ends of the lead frames may be formed into a variety of different configurations that make the package ready to be surface mounted to a board, including those illustrated below:

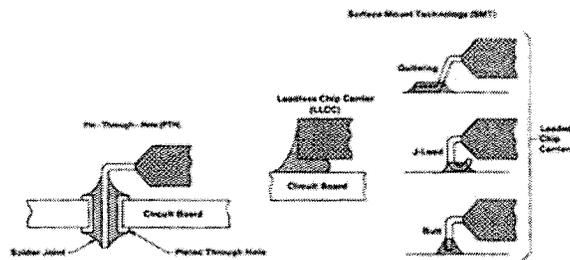


Figure 11-1. Pin-Through-Hole and Surface-Mount Technology (SMT).

(Citing RX-444 at ADI00863601; RX-353C, Q. 379)

Analog alleges that Knowles agrees that a person of ordinary skill would know how to bend the leads to make the package disclosed in Premachandran surface mountable; but contends that Premachandran fails to meet this claim limitation because it does not spell out how to do so. (Citing Tr. at 999:10-16; CX-613 at 58-59; CX-610 at Q. 121.) Analog asserts that Dr. Pecht testified that, for one of ordinary skill in the art, such a disclosure is unnecessary. (Citing RX-354C at Q. 228; RX-361 at ADI00862032.) Analog argues that the Federal Circuit in *Arthrocare Corp. v. Smith & Nephew, Inc.*, 406 F.3d 1365, 1373-74 (Fed. Cir. 2005), held that even if a piece of prior art does not expressly disclose a limitation, it anticipates if a person of ordinary

## PUBLIC VERSION

skill in the art would understand the prior art to disclose the limitation and could combine the prior art description with his own knowledge to make the claimed invention.

Analog says that Premachandran discloses a “transducer attached to the surface of one of the first member or the second member.” Analog offers that Figure 3 of Premachandran shows that the microphone is attached, by wire bonding, to the surface of the lead frame. (Citing RX-422 at ADI00863208; CX-613 at 42; Tr. at 992:24-993:3.) Analog avers that Figure 3 shows that the cover and the lead frame come together to create a space in which the transducer resides, the “chamber.” (*Id.*; Tr. at 994:13-22, 995:13-15.) Analog argues that this is sufficient to demonstrate this limitation is met.

Analog contends that the dispute by Knowles is based on its refusal to consider the lead frame a “member” under the claim language. Analog says that Knowles, to avoid the prior art, arbitrarily asserts that what is labeled the “plastic substrate” in Figure 3 is one of the members and the cover is the second member. Analog asserts that nothing in the ’089 patent defines what the members should be, and nothing in the ’089 patent prevents the lead frame from being a “member.” (Citing Tr. at 949:11-18.) Analog says that Knowles attempts to justify its position by stating that the lead frame is not part of the “housing,” which Dr. Bauer makes synonymous with exterior enclosure around the device. (Citing CX-610 at Q. 121.) Analog counters that there is no requirement that each member make up part of the most exterior portion of the package. Analog concludes in the ’089 patent, the first and second member merely need to create a “chamber” in which the “transducer resides,” and Premachandran discloses this limitation.

Analog states that the lead frame in Premachandran is the claimed “surface” to which the transducer is attached. Analog says that according to the claim language, that “surface” must

## PUBLIC VERSION

have a “patterned conductive layer.” Analog contends that it was well known in the art in 2000 that a lead frame is a metal strip that is chemically etched or mechanically stamped with a pattern to create a pattern of conductive lines along the surface of the lead frame. (Citing RX-069 at ADI00843150; RX-353C at Q. 390; RX-354C at Q. 230; Tr. at 1037:8-9.) Analog says the material is first coated with photoresist film and then exposed to a lead frame pattern with UV light, and the metal material is then etched to create a patterned conductive layer. Analog says this is the manner in which all patterned conductive layers are created in the microelectronics packaging industry, including those made on a printed circuit board or a flexible substrate. (Citing RX-353C at Q. 390.) Analog alleges that Dr. Bauer does not dispute this evidence. (Citing Tr. at 1037:8-9.) Analog adds that Dr. Gilleo agrees that lead frames have a “patterned conductive layer.” (Citing RX-341C at 239:22-240:4.)

Analog argues there can be no dispute that Premachandran discloses terminal pads on the outside of the surface mountable package shown in Figure 3. Analog says that Dr. Bauer agrees that “a variety of things can serve as terminals” including “pins,” “leads” and “pads.” (Citing Tr. at 1014:17-24.) Analog continues that Dr. Bauer agrees that the lead frame package depicted in Figure 3 of Premachandran has “leads [that] are part of the lead frame.” (*Id.* at 998:11-14.) Analog reasons that, therefore, Dr. Bauer agrees that the leads at the end of the lead frame are terminal pads.

Analog says Dr. Bauer argues that there are no terminal pads because he would have the Commission believe that the lead frame is not an integral part of the “package.” Analog argues that nothing in the '089 patent prohibits the lead frame from being part of the “package.” Analog concludes Premachandran discloses “an outside surface of the surface mountable package comprising a plurality of terminal pads.” (Citing RX-353C at Q. 394.)

## PUBLIC VERSION

Analog says that Knowles errs in its argument that Premachandran, a paper directed towards optimizing a shield against electromagnetic interference, does not disclose a “shield against electromagnetic interference.” (Citing RX-422 at ADI00863207.) Referring to its argument in connection with the ’231 patent, Analog argues that this element is clearly met, because the arguments apply equally here. (Citing RX-341C at 239:22-240:4; RX-353C at Q. 382, 384, 386, 392, 396, 399, 401, 404, 408, 410, 413, 415, 418; RX-354C at Q. 231; RX-409 at ADI00859659-60; RX-422 at ADI00863207-08; RX-613 at 42; Tr. at 983:21-984:2, 994:13-22, 995:13-15, 1039:4-5.)

In its reply brief, Analog says that Knowles argues Premachandran does not disclose a “surface mountable package,” is because the leads could be bent to make the disclosed package “surface mountable.” Analog counters that Knowles does not dispute that doing so would be within the knowledge of a person of ordinary skill in the art. (Citing CX-613 at 58-59.) Analog argues that Premachandran discloses this element under the holding of *Arthrocare Corp.* 406 F.3d at 1373-74.

Analog adds that, even without bending the leads, Premachandran discloses a surface mountable package. Analog says the JEDEC standards illustrate a number of surface mountable lead frame packages, including a flat pack package, at illustration F in RX-361. (Citing RX-361 at ADI00862032; RX-385 at 141:19-20.) Analog says illustration F has the same outline as Premachandran’s package without bending the leads. (Comparing RX-422 at ADI00863208, with RX-361 at ADI00862032.)

Analog asserts that at the hearing, Dr. Bauer testified that the MEMS microphone of Premachandran is attached to the lead frame. (Citing Tr. at 992:21-993:3.) Analog says Dr. Bauer agrees that “it’s fine” to define the lead frame as one of the members. (*Id.* at 984:18-20.)

## PUBLIC VERSION

Analog states that this is consistent with the testimony from Analog's experts. (Citing RX-353C at Q. 386; RX-354C at Q. 229.)

Analog avers that three of the four experts in this case have testified that Premachandran discloses a "patterned conductive layer." (Citing RX-353C at Q. 390; RX-354C at Q. 230; RX-341 at 239:22-240:4.) Analog continues that all of the invalidity experts testified that the lead frame is made through an etching or stamping processes. (Citing RX-353C at Q. 390; RX-354C at Q. 230; Tr. at 1037:8-9.) Analog concludes that Dr. Tummala testified that etching or stamping is the same process used to create all patterned conductive layers, including those on printed circuit boards. (Citing RX-353C at Q. 390.)

Analog contends that the assumption upon which Knowles bases its argument that Premachandran does not disclose "terminal pads," is that the lead frame is not part of the package. Analog says that Dr. Bauer agrees that the ends of the lead frame are the leads which create the second level connection. (Citing Tr. at 998:4-999:5; RDX-51, element G.) Analog states that Dr. Bauer agrees that the lead frame is made of metal. (Citing Tr. at 1039:8-9.)

Analog contends that it has adduced evidence that Premachandran was published before November 28, 2000, the date to which the '089 patent claims priority. Analog says it introduced into evidence a print-out from the Public Catalogue of the U.S. Copyright Office stating that the "Date of Creation" of the SPIE Book, including the Premachandran Reference is 2000, the "Date of Publication" of the SPIE Book is May 9, 2000, and the "Registration Date" is July 13, 2000. (Citing RX-430; Tr. at 627:9-12.)

Analog argues that the registration date is the latest date to which the article can be attributed as published, because that's when the SPIE Book was provided to the Copyright Office. Analog contends that the copyright registration, however, is *prima facie* evidence that

## PUBLIC VERSION

the SPIE Book was, in fact, published on May 9, 2000, before the priority date of the '089 patent. (Citing 17 U.S.C. § 410(c).)

**Knowles' Position:** Knowles argues that Analog has failed to produce clear and convincing evidence that Premachandran anticipates claim 1 of the '089 patent (or dependent claims 2, 7, 16, or 17), because Premachandran does not disclose the claimed surface mountable package. Specifically, Knowles asserts that Premachandran:

- Fails to disclose second level packaging interconnections that are surface mounted.
- Fails to disclose a microphone attached to a package member.
- Fails to disclose a patterned conductive layer.
- Fails to disclose a metalized region on the exterior surface of the package.
- Fails to disclose EMI shielding.
- As set forth in [CIB] section III.D.2.c, Analog has not established any date of publication sufficient for Premachandran to be considered prior art in this case.

Knowles argues that the Premachandran paper never discloses how any of the microphone packages were attached to the printed circuit board, and as noted in CIB section III.D.2.c, the package shown in Fig. 3 was never attached to a printed circuit board. Knowles adds that, given the nature of the testing described by the paper (*e.g.*, “Only microphone chip was replaced while keeping the ASIC same,”), “it is unlikely that the authors would have used something as permanent as surface mounting to mount the packages to the printed circuit board.” Knowles says that Dr. Bauer testified, “[r]epeatedly attaching, removing, reattaching, and so on, using surface mount technologies is possible, but it seems to me to be as unnecessarily complicating the test environment.” (Citing CX-610 at Q. 121.)

Knowles states that according to both of Analog's experts, the leads shown in Fig. 3 could be bent into a configuration that could be surface mountable. (Citing RX-354 at Q. 228; RX-353 at Q. 379-380.) Knowles contends that it is clear from their testimony that some modification of the disclosed package would be required. (*Id.*) Knowles argues that, inasmuch

## PUBLIC VERSION

as Analog has not offered a 35 U.S.C. § 103 defense using Premachandran to invalidate claim 1 of the '089 patent, this testimony is irrelevant. Knowles adds that, according to Dr. Tummala, as a result of this modification, Premachandran would have “an outside surface of the surface mountable package comprising a plurality of terminal pads.” (Citing RX-353 at Q. 394.) Knowles argues that, even if this modification resulted in a plurality of terminal pads, these terminal pads would be on the “exterior of the package;” but not on an outside surface of the package as expressly required by claim 1.

Knowles refers to CIB section III.D.2.c, and argues that in Fig. 3 of Premachandran, the microphone is mounted to a “lead frame.” Knowles says Dr. Bauer explained a “lead frame” as follows:

- Q. So could you describe for the Court what a lead frame looks like?
- A. A lead frame is essentially, it is either a stamped or etched piece of metal. And the easiest way to envision it is a set of fingers coming in and surrounding a small, what we call a die attach pad in the center of the lead frame. Those fingers that are coming in are supported by the frame. That's why we call it a lead frame. There is essentially what you could envision as a picture frame to which all -- which is part of that plain sheet of metal that was used to stamp out the lead frame or etch it out of. And those fingers are, as well as that die attach pad in the center, are all connected to that window frame so that the metal stays in place. Then we would attach a device to that die attach pad, wire bond it to connection between the tips of the fingers and the pads on the chip.
- ...
- Q. So the lead frame is made of metal?
- A. Correct, only metal.
- Q. Okay. Is there any part of the lead frame that is not conductive?
- A. No. The lead frame, the lead frame itself is made from metal and it is conductive.

(Citing Tr. at 1037:6-1038:3, 1039:4-9; CX-610 at Q. 53; CDX-9.7.)

Knowles argues that under any of the constructions of “patterned conductive layer” proposed by the parties, the patterned conductive layer sits on or is a part of another surface or substrate and covers only a portion of that surface or substrate. Knowles says that if, as Analog

## PUBLIC VERSION

has asserted, the lead frame is that member, then there is no portion of that member that does not contain electrically conductive material, and it therefore cannot be the patterned conductive layer and the surface of the first or second member because there is no portion of the lead frame that is non-conductive.

Knowles says that claim 16 of the '089 patent teaches "a metalized region being formed on an exterior surface of the surface mountable package." (Citing JX-2 at 12:47-50.) Knowles states that according to Analog's expert Dr. Tummala, the required "metalized region" in Premachandran is found at the end of the lead after the lead has been bent. (Citing RX-353 at Q. 413.) Knowles argues that, as Dr. Tummala admits, the lead disclosed by Premachandran would have to be modified, and this required modification removes it from the scope of invalidity under 35 U.S.C. § 102, and Analog has not offered a 35 U.S.C. § 103 defense against the '089 patent using Premachandran in light of itself. Knowles continues that Dr. Tummala's argument ignores the requirement that this metalized region be found on the exterior surface of the package. Knowles concludes that, even if the lead was bent, it would not be on the exterior surface of the package.

Knowles argues that claim 17 of the '089 patent teaches that the surface mountable package taught in claim 1 should provide EMI shielding. (Citing JX-2 at 12:51-53.) Referring to CIB section III.D.3.a(3), Knowles says that Premachandran fails to disclose a package that provides EMI shielding.

In its reply brief, Knowles argues that Analog has failed to prove that Premachandran was published early enough to be prior art under § 102.

Knowles contends that *Arthrocare Corp. v. Smith & Nephew Inc.*, 406 F.3d 1365, 1373-74 (Fed. Cir. 2005) does not support Analog's argument. Knowles says that in *Arthrocare*, the

## PUBLIC VERSION

patent in suit disclosed wires that connected electrodes to a power source via a probe. (*Id.*) Knowles states that the specification did not expressly state that the wires would exit the back end of the probe, but an expert testified that a person having ordinary skill in the art “would understand that the wires would be attached to the power source after exiting the back end of the probe.” (*Id.*) Knowles argues, in other words, this configuration was required to be a part of the disclosure, even if it was not spelled out in the disclosure. Knowles contrasts that with what it says Analog proposes, that Premachandran could be modified to become surface mountable; but surface mountability is not required. Knowles adds that Premachandran expressly stated that the Fig. 3 package was never mounted to a printed circuit board. (Citing RX-429 at 590.)

Knowles says that Analog argues that Premachandran’s lead frame is the first or second member of the package, claiming that “there is no requirement that each member make up part of the most exterior portion of the package.” (Citing RIB at 121.) Knowles counters that the ‘089 patent specification criticizes configurations that include lead frames, reciting:

The benefits of the microphone packages disclosed herein over microphone packaging utilizing plastic body/lead frames include the ability to process packages in panel form allowing more units to be formed per operation and at much lower cost. The typical lead frame for a similarly functioning package would contain between 40 and 100 devices connected together. The present disclosure would have approximately 14,000 devices connected together (as a panel). Also, the embodiments disclosed herein require minimal ‘hard-tooling.’ This allows the process to adjust to custom layout requirements without having to redesign mold, lead frame, and trim/form tooling.

(Citing JX-2 at 3:11-23.)

Knowles avers that this is the point Dr. Bauer made when commenting on the ‘089 package, quoting: “[T]he Minervini ‘089 package achieves the same functionality as more complicated packages by using a single component to perform the duties performed by multiple components in the prior art packages.” (Citing CX-610 at Q. 28.) Knowles says in other words,

## PUBLIC VERSION

the lead frame, “which Analog would turn into a major functional component of the inventive package, is the same lead frame that the inventor eliminated from the package altogether.”

Knowles argues even if it is possible to have a lead frame that includes a pattern, as Analog suggests, there is no disclosure in Premachandran that its lead frame was an etched lead frame and not a stamped lead frame. Knowles says that Analog relies on speculation, and not clear and convincing evidence, to argue that Premachandran’s lead frame is a patterned conductive layer.

Knowles notes that Analog claims that “Dr. Bauer agrees that the leads at the end of the lead frame are terminal pads.” Knowles says, in fact, what Dr. Bauer actually said was that pads are terminals, but not all terminals are pads, quoting:

- Q. In the context of a piece of electronic equipment, what is a terminal?  
A. Essentially the terminal is the end of a connection somewhere, for making some sort of connection typically.  
Q. Are there different types of terminals?  
A. Yes.  
Q. Could you give some examples?  
A. There are pads would be a terminal, pins could serve as terminals, leads could serve as terminals. And I guess we could call contacts, could serve as terminals, so there are a variety of different things that could serve as terminals or defined as terminals.

(Citing Tr. at 1014:9-23.)

Knowles does not dispute that Premachandran discloses an EMI shield, and says, in fact it discloses two forms of EMI shield, both of which are external to the package. Knowles says there is no ambiguity in Premachandran; the authors mounted a microphone package and an ASIC package onto a printed circuit board. Knowles states that in one instance, the authors used “copper foil ... wound around the packages and the PCB board and connected to the ground of PCB board.” (Citing RX-422 at 590.) Knowles continues in the other instance, the authors placed “[b]ox shields ... made with thick copper plate” around the packages and the PCB board.

## PUBLIC VERSION

(*Id.*) Knowles avers that the authors included schematic views of each configuration so that there would be no confusion that the shields were external to the packages themselves and includes illustrations in its brief, as follows:

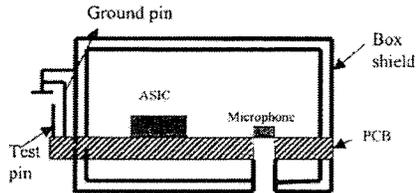


Fig. 5

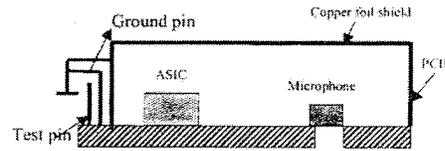


Fig. 6

Knowles contrasts claim 17 of the '089 patent, saying it requires that the shield be integrated into the package itself. (Citing JX-2 at 12:51-53.) Knowles concludes that since the items labeled "ASIC" and "Microphone" in Fig. 5 and Fig. 6 are in fact packages, the external copper box and copper foil cannot be the first and/or second member as required by claim 17.

**Staff's Position:** Staff argues that the evidence has shown that the Premachandran reference does not anticipate claim 1, 2, 7, 16, and 17 of the '089 patent. Staff says as an initial matter, the evidence has shown that Premachandran is not prior art to the '089 patent because Analog has failed to prove a publication date. Staff adds Premachandran fails to anticipate the asserted claims because this reference fails to disclose at least "a chamber being defined by a first member and a second member" and "the surface being formed with at least one patterned conductive layer."

Staff contends that with respect to the first limitation, the evidence has shown that the package of Premachandran is formed by the plastic cap and the plastic substrate. (Citing RX-429 at Fig. 3; CX-610 at Q. 121.) Staff asserts that although Analog contends that the lead frame serves as the second member, the evidence shows that this component is located in the interior of the package and does not form part of the package. (*Id.*; Tr. at 1037:6-1038:21.) Staff concludes

## PUBLIC VERSION

that the Premachandran reference fails to disclose a “chamber” because the lead frame is not the “second member.”

Staff argues that the evidence also showed at the hearing that Premachandran fails to teach “a surface being formed with at least one patterned conductive layer.” Staff argues that in this case, the entire substrate, *i.e.* the lead frame, is made of metal; thus, there is no portion of the substrate that is not conductive. (Citing Tr. at 1039:1-9.) Staff reasons, therefore, the lead frame does not have “at least one patterned conductive layer.”

**Discussion and Conclusion:** Based upon the evidence in the record, I find that Analog has failed to demonstrate by clear and convincing evidence that Premachandran anticipates asserted claims 1, 2, 7, 16, and 17 of the '089 patent.

I have already found, in Section IV.B.1.b, *supra*, that Premachandran was published as of at least July 13, 2000. I will not repeat the rationale for that finding here; but incorporate it by this reference. Inasmuch as the '089 patent application was filed on April 22, 2005, and no evidence has been offered by Knowles to claim an earlier priority date, I find that Premachandran is prior art to the '089 patent.

Among other things, asserted claim 1 of the '089 patent requires a surface mountable package comprising:

at least a first member and a second member and a chamber being defined by the first member and the second member, the transducer being attached to a surface formed on one of the first member or the second member and the transducer residing within the chamber;

the surface being formed with at least one patterned conductive layer, the patterned conductive layer being electrically coupled to the transducer; an outside surface of the surface mountable package comprising a plurality of terminal pads electrically coupled to the patterned conductive layer;

a volume being defined by the transducer and one of the first or the second member, the volume being acoustically coupled to the transducer ...

## PUBLIC VERSION

(JX-2 at 11:21-40.)

First, Knowles is correct when it argues that Premachandran does not disclose that any of the microphone packages were attached to a substrate and that the package shown in Fig. 3 was never attached to a substrate. Figure 3 of Premachandran merely discloses a stand alone microphone package that was used for measuring the sensitivity of a microphone and the noise generated from outside of the package.

The lead frame does not constitute either the first member or the second member, because it does not form a chamber with the first member or the second member. The package, as defined herein, is “a single, self-contained unit which fully encloses a device, and which provides: (1) protection for the device from the external environment, (2) an electrical connection between the device and the package, and (3) an electrical connection between the package and another circuit outside of the package.” Figure 3 of Premachandran demonstrates that the “plastic cap” and the “plastic substrate” perform only part of the required function of fully enclosing the device and providing protection for the device from the external environment. The lead frame interrupts the enclosure and does not represent any part of the “plastic cap” or the “plastic substrate.” In fact, it is described as a set of fingers coming in and surrounding a small die attach pad in the center of the lead frame and supported by the frame. (Tr. at 1037:6-1038:3; CX-610 at Q. 53; CDX-9.7.)

Second, Knowles is also correct when it asserts that the testimony supports a finding that modification of the disclosed package would be required in order to surface mount the Premachandran package. Both of Analog’s experts testified that the leads shown in Fig. 3 could be bent into a configuration that could be surface mountable. (RX-354C at Q. 228; RX-353C at Q. 379-380.) The issue in determining anticipation is what is specifically disclosed by

## PUBLIC VERSION

Premachandran, not whether or not a person of ordinary skill in the art would know what one could or could not do in light of Premachandran. *Schering*, 339 F.3d at 1377 (Fed. Cir. 2003).<sup>38</sup>

In addition, there is no showing that Premachandran in any way suggests that there is an “outside surface of the surface mountable package comprising a plurality of terminal pads electrically coupled to the patterned conductive layer.” Dr. Tummala’s testimony on this point is not supported and lacks credibility when he opines that Premachandran would have “an outside surface of the surface mountable package comprising a plurality of terminal pads.” (RX-353C at Q. 394.) This is a situation similar to that of Kawamura, discussed in Section IV.C.1.c, *supra*, because the lead frame is a single conductive piece that pierces the package from the outside and is, in fact, a single conductive path rather than a patterned conductive layer.

Premachandran also does not disclose that the surface on which the transducer is mounted includes a patterned conductive layer. As construed in Section III.C.4, *supra*, the term patterned conductive layer requires “a single layer of material, the layer being less than the entire surface on which it sits, suitable for carrying electrical current.” The evidence shows that the entire lead frame, on which the transducer is mounted, is made of metal; thus, there is no portion of the substrate that is not conductive. (Tr. at 1039:1-9.) Therefore, assuming *arguendo* that the lead frame was either the first member or the second member, the lead frame does not have “at least one patterned conductive layer.”

Finally, Knowles argues persuasively that, even if this modification resulted in a plurality of terminal pads, these terminal pads would be on the “exterior of the package;” but not on an outside surface of the package as expressly required by claim 1.

Based upon the foregoing, I find that Analog has failed to demonstrate by clear and convincing evidence that Premachandran discloses each and every element of claim 1 of the ‘089

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<sup>38</sup> Analog has not raised the issue of inherency here.

## PUBLIC VERSION

patent. Therefore, I find that Premachandran does not anticipate claim 1 of the '089 patent. Further, claims 2, 7, 16 and 17, cannot be found to be anticipated by Premachandran, because each of those claims depend from claim 1 and necessarily contain all of the elements of claim 1. See *In re Royka*, 490 F.2d 981, 983-985 (C.C.P.A. 1974); *In re Fritch*, 972 F.2d 1260, 1266 (Fed. Cir. 1992).

Assuming *arguendo* that Premachandran did anticipate claim 1, I find that it still would not anticipate claim 17 of the '089 patent, because it does not teach that one or both of the first member or the second member includes a shield against electromagnetic interference. Instead, Premachandran teaches that separate shields are used to protect the microphone from EMI, including "copper foil ... wound around the packages and the PCB board and connected to the ground of PCB board," and "[b]ox shields ... made with thick copper plate" placed around the packages and the PCB board. (RX-422 at ADI00863209.) Based upon the foregoing, I find that Analog has failed to produce clear and convincing evidence that Premachandran anticipates claim 17 of the '089 patent.

### **2. Obviousness**

#### **a. Level of Ordinary Skill in the Art**

In Section IV.B.2.a, *supra*, I found that a person of ordinary skill in the art would have: (1) a degree in engineering or one of the physical sciences; (2) a minimum of one to two years of full-time experience in device packaging; and (3) general knowledge of electronic packaging that would include some understanding of package designs, constructions, functions, attributes, and processes used to produce them and to incorporate the devices into the package. There is no evidence to suggest that the definition differs between the '231 patent and the '089 patent.

The parties have acknowledged that this was the definition of one of ordinary skill in the

## PUBLIC VERSION

art adopted in the 629 investigation. (CX-412 at 92-93.) The parties' experts have used this definition in their analyses, and no party offers an argument opposing this definition. (*See, e.g.*, CX-610 at Q. 15; RX-354C at Q. 31-32.)

### **b. Halteren in View of Sjursen**

**Analog's Position:** Analog argues that if it is found that Halteren does not anticipate the asserted claims of the '089 patent because it does not disclose a "surface mountable package," Halteren still renders the '089 patent invalid for obviousness when combined with Sjursen (Citing RX-15.) Analog asserts that Sjursen discloses all of the purportedly missing elements of the "surface mountable package" of Halteren.

Analog contends that Sjursen discloses many, if not all, of the claim limitations of claim 1 of the '089 patent. (Citing RX-354C at Q. 174; RDX-402C.) Analog argues that Sjursen discloses a "package" for an electret microphone. (Citing RX-15 at Figs. 1, 29, 7:14-41, 20:44-51; RX-354C at Q. 174.) Analog says Sjursen also discloses a first member (a metal cover) and a second member (a PCB substrate). (Citing RX-15 at Fig. 1; Tr. at 927:24-928:4; RX-354C at Q. 174.) Analog continues that the electret microphone is electrically coupled to the patterned conductive layer on the PCB. (Citing RX-15 at 5:22-25; Tr. at 930:9-15; RX-354C at Q. 174.) Analog contends that it is well known to those of ordinary skill in that art that a patterned conductive layer on one side of PCB substrate will be electrically coupled to terminal pads on the opposite side, and that Knowles admits as much. (Citing RX-354C at Q. 174; RX-386 at 235:7-24, 236:5-8; Tr. at 936:24-937:17.) Analog says that Sjursen discloses a volume between the transducer and the cover and apertures in the cover. (Citing RX-15 at Fig. 1, 4:50-60; RX-354C at Q. 174; Tr. at 928:25-929:4.)

Analog asserts that Sjursen discloses a number of different types of terminals that are

## PUBLIC VERSION

typically used in surface mounting. Analog says specifically, in Figures 28 and 29, Sjursen shows butt leads on the bottom of the PCB substrate 106. (Citing RX-15 at Figs. 28-29.) Analog contends that these are well known by persons of ordinary skill in the art to be surface mountable and solderable to a printed circuit board. (Citing RX-354C at Q. 176; RX-361 at ADI00862032; RX-444 at ADI00863601; Tr. at 790:17-20.) Analog adds that Sjursen discloses that the PCB has electrical or terminal pads on the bottom of the PCB. (Citing RX-15 at 7:24-25.) Analog alleges that Knowles agrees that PCB package substrates will typically have solder pads to make a second level connection. (Citing RX-386 at 233:9-24.) Analog adds that a person of ordinary skill in the art “could “speculate” that these terminal pads are on the bottom of the package disclosed in Sjursen to make a second level connection to a board.” (Citing RX-386 at 235:7-24, 236:5-8; Tr. at 936:24-937:17.) Analog says such solder pads are common in the industry, and can be used for example, on BGA packages. (Citing Tr. at 935:19-23.) Analog reasons, therefore, that Sjursen also meets Knowles’ additional requirement that a “surface mountable package” be solderable. Analog concludes that Sjursen states that the package disclosed is suited for “automated assembly of the microphone into the hearing aid electronics.” (Citing RX-15 at 2:3-7.)

Analog argues that Sjursen discloses two different types of leads on the bottom of the package body, both of which could be used to solder the package to a board, and both Sjursen and Halteren disclose that the package can be mounted using automated means. (Citing RX-354C at Q. 165, 176; RX-47 at 1:41-2:5; RX-15 at 2:5-7.)

Analog contends that the motivation to combine Halteren and Sjursen is the same for the ’231 patent as it is for the ’089 patent. Analog says if it is determined that that Halteren and Sjursen do not disclose “surface mountable package,” there is still sufficient motivation to

## PUBLIC VERSION

combine the two reference to create a “surface mountable package” (each reference disclosing information that the other is missing), which results in a combination that has all the claim limitations of the asserted claims. (Citing *Honeywell Int’l, Inc. v. United States*, No. 2008-5181, 2010 WL 2037233, at \*11-13 (Fed. Cir. May 25, 2010).)

In its reply brief, Analog asserts that that Knowles only argues that the combination package does not meet its own new proposed construction of “surface mountable package.” (Citing CIB at 132-34.) Analog alleges that Knowles does not dispute that the combination meets Analog’s construction.

Analog contends that whether the combination discloses a “surface mountable package” under Knowles’ new construction turns on whether Sjurzen discloses that limitation. Analog asserts that it has previously demonstrated that Sjurzen discloses a “package” under Knowles’ latest construction of “package.” Analog says that, “because Knowles collapses its construction of ‘package’ and ‘surface mountable package,’ Analog already explained how Sjurzen discloses two ways to solder the package to a printed circuit board, using electrical pads or butt leads.” Analog refers to Figure 29, which it says Dr. Pecht testified is a surface mountable package. (Citing RX-354C at Q. 176.)

Analog says that Knowles argues that, because Sjurzen does not disclose flat leads or a leadless package, it does not disclose a “surface mountable package.” Analog contends that, because “flat leads” is a requirement of Knowles’ latest construction of package, this argument related to Sjurzen was not included in its pre-hearing brief and should be deemed waived. *See* GR 8.2. Analog argues that it is not true that Sjurzen does not disclose flat leads. Analog says Sjurzen discloses electrical pads that can be mounted flush to a printed circuit board. (Citing

## PUBLIC VERSION

RX-15 at 7:14-28.) Analog adds that Knowles offers no evidence that suggests that “surface mountable packages” must have flat leads.

Analog says that Knowles further supports its position by stating “there is no embodiment or drawing where a surface of the assembly is soldered to the abutting surface of a printed circuit board.” (Citing CIB at 133) Analog contends that Sjurson need not show the package mounted to a printed circuit board; based on the disclosure, a person of ordinary skill in the art would understand that it is “surface mountable.” Analog alleges that Knowles agrees that Kawamura is a “surface mountable package” but that reference does not disclose how the package is soldered to a printed circuit board. (Citing Tr. at 945:4-8.) Analog reasons that if, as Knowles agrees, Kawamura is a “surface mountable package,” then Sjurson must sufficiently disclose one as well.

**Knowles’ Position:** Knowles argues that Analog has failed to produce clear and convincing evidence that the combination of Halteren and Sjurson render claim 1 of the ‘089 patent (or dependent claims 2, 7, 16, 17, 18, and 20) obvious. Specifically Knowles asserts that:

- The combination of the two references fails to disclose a surface mountable package, thus the combination does not meet every limitation of claim 1.
- Analog has not offered substantive reasons demonstrating why a person having ordinary skill in the art would be motivated to combine the two references.

Knowles refers to its argument that neither Halteren nor Sjurson disclose a package, and as such, combining Halteren and Sjurson would not result in the package required by Minervini ‘089 Claim 1.

Knowles refers to CIB section III.D.4.a(1), and says Sjurson expressly discloses that its assembly could be externally connected using either a wire harness or flex circuit, and nowhere does Sjurson disclose or even hint that its assembly could be externally connected using surface

PUBLIC VERSION

mount techniques. Knowles says there is no embodiment or drawing where a surface of the assembly is soldered to the abutting surface of a printed circuit board, which is what a person having ordinary skill in the art would need to see in order to conclude that the Sjursen assembly was surface mountable.

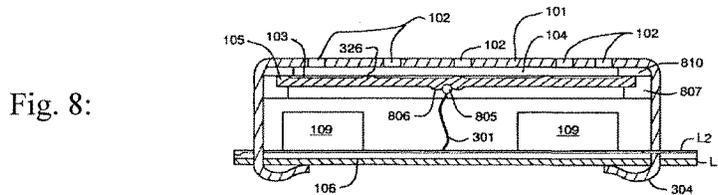
Knowles contends that the only support that Dr. Pecht offers to support his theory is that “Sjursen discloses that the PCB has electrical or terminal pads on the bottom of the PCB.”

(Citing RX-354 at Q. 176) Knowles quotes the patent to say:

The PCB 106 may contain one or more copper layers L1, L2 for making electrical connections to signal components, and to ground. The PCB may either be a rigid board (e.g., glass epoxy FR-4) or a flex-circuit (e.g., polyimide). Other details of PCB construction are well known in the industry. ***Preferably, the PCB contains at least two layers L1, L2*** of which one layer is substantially a power or ground plane, and in conjunction with the metal housing provides electrical shielding of the integral electronics from interference, i.e., EMI. In one embodiment, the PCB extends beyond the metal housing (as shown) in FIG. 8. ***Electrical pads or terminals may be positioned on the PCB.*** In the embodiment shown in FIG. 8, these terminals may be located outside the metal housing to make electrical connections to other components such as a battery 404 or to a receiver (see FIG. 4).

(Citing RX-15 at 7:14-28) (emphasis added by Knowles).

Knowles concludes that what the patent discloses is that the “electrical pads or terminals” may be positioned on copper layer L1 or copper layer L2. Knowles says as can be seen from Fig. 8, L1 is on the bottom of the printed circuit board; but L2 is on the top of the printed circuit board. Knowles includes an illustration of Figure 8:



Knowles says the electrical pads or terminals might be on the top of the PCB or they

## PUBLIC VERSION

might be on the bottom of the PCB, and the drawing does not disclose which alternative is used.

Knowles adds as can be seen from Fig. 8, “tabs 304” extend below the surface of the PCB.

Knowles asserts that Sjurzen does not disclose, and Dr. Pecht does not explain, how a pad on the bottom surface of the PCB could be soldered to the abutting surface of a printed circuit board considering that tabs 304 would interfere with surface mounting. Knowles urges that such an explanation is essential, “especially given that Fig. 8 discloses neither the pads nor the printed circuit board to which Dr. Pecht claims the pads would soldered.”

Knowles refers to CIB section III.D.4.a(2), and argues that a person having ordinary skill in the art would not be motivated to combine Halteren and Sjurzen to create a package as required by claim 1 of the ‘089 patent. Knowles argues that neither Halteren nor Sjurzen disclose a surface mountable package, and the mechanism for mounting the microphone in the Sjurzen assembly is fundamentally different from what is required in claim 1 of the ‘089 patent (*i.e.* in Sjurzen the sides of the microphone are mounted to the sides of the cover while in the ‘089 patent the bottom of the microphone is mounted to top of the substrate). Knowles contends that Analog has failed to offer any evidence of “how to reconcile these fundamental differences,” and Analog has failed to offer any evidence, even conclusory, that a person having ordinary skill in the art would have a reasonable expectation that the combination of such disparate technology would be successful.

In its reply brief, Knowles argues that Analog asserts that “in Figures 28 and 29, Sjurzen shows butt leads on the bottom of the PCB substrate 106.” Knowles says that apparently Analog is pointing to three lines extending downward from the substrate 106. Knowles avers that these lines are unlabeled, and the specification never refers to these lines as “butt leads” or for that matter, any type of lead. Knowles says there are only two types of electrical connections from

## PUBLIC VERSION

the microphone assembly described by the specification, and these are a wire harness and a flex circuit (Citing RX-15 at 6:37, 7:30.)

Knowles says that Analog asserts that the terminal pads on the substrate 106 could be used to surface mount the microphone assembly; but admits that a person having ordinary skill in the art would have to “speculate” that the terminal pads were even on the bottom of the PCB. (Citing RIB at 62.) Knowles argues that this configuration seems unlikely, given that in the only embodiment that references the terminal pads, “the entire bottom of the PCB 106” is covered by a “ground plane 306.” (Citing RX-15 at 12:65-67.) Knowles adds that Dr. Bauer noted that terminal pads have a variety of uses, and not all terminal pads are configured for surface mounting. (Citing Tr. at 1014:9-1015:17.) Knowles offers that it seems unlikely that the terminal pads could be used for surface mounting, since in the only embodiment referencing terminal pads, “tabs 304” extend below the plane of the bottom of the PCB. (Citing RX-15 at 12:52-13:64.) Knowles concludes that Analog has provide no explanation how the bottom surface of the PCB of the assembly would be brought into contact with the surface of another PCB to achieve surface mounting.

Knowles refers to CRB section III.D.2.a and to CIB section III.D.4.a.2 for Knowles’ argument that a person having ordinary skill would lack motivation to combine Halteren and Sjursen.

**Staff’s Position:** Staff’s position is that the evidence has shown that the Halteren reference anticipates the asserted claims. Staff contends that the evidence has not shown that it would have been obvious to combine Halteren and Sjursen because there would have been no motivation to make the suggested modification with a reasonable expectation of success.

Staff says that Analog contends that “[i]f the flexible member 40 was replaced with the

## PUBLIC VERSION

PCB substrate 106 of Sjursen, the combination would result in a ‘surface mountable package’ that meets all the claim limitations of the ‘089 patent.” (Citing RPHB at 119.)

**Discussion and Conclusions:** In Section IV.C.1.a, I found that Analog failed to demonstrate by clear and convincing evidence that Halteren discloses a package that is “surface mountable.” I reaffirm that finding and its rationale here.

In Section IV.B.2.b, I found that Halteren combined with Sjursen discloses a “package” as contemplated herein, and that the evidence clearly and convincingly establishes that a person of ordinary skill in the art would have a reason to combine those two references to solve the problems addressed in the ‘231 patent. I reaffirm my rationale on this point, and I find that the issue of motivation to combine the references does not materially differ between the ‘089 patent and the ‘231 patent.

The sole remaining issue is whether or not clear and convincing evidence establishes that Halteren in view of Sjursen renders obvious the element in claim 1 of the ‘089 patent that requires a package that is “surface mountable.” I conclude that the evidence does not support such a finding.

Sjursen does not teach or suggest a package that is “surface mountable.” The invention in Sjursen is a microphone package that is inserted into a hearing aid. The microphone package contains its own circuit board and is not attached to another substrate to which the package would be electrically connected. This is best shown in Figure 4, which is a partial cross-section view of a disposable hearing aid with the microphone assembly shown. While Figure 19A describes an intermediate PCB shield between the microphone and JFET that forms a separate compartment, it is clear that the two compartments are *within* the package and do not describe a separate substrate on which the package is mounted. (RX-15 at 2:11-21, 2:25-34, 3:11-14, 3:20-

**PUBLIC VERSION**

23, 4:1-6, Figs. 1, 4, 19A.)

Analog argues unpersuasively that a person of ordinary skill in the art “could “speculate” that the terminal pads are on the bottom of the package disclosed in Sjursen to make a second level connection to a printed circuit board. The standard to be applied, however, is “that a person of ordinary skill in the art would have had reason to attempt to make the composition or device, ... and would have had a reasonable expectation of success in doing so.” *PharmaStem*, 491 F.3d at 1360. Analog’s assertion falls well short of the mark.

Inasmuch as the combined references fail to disclose or suggest a surface mountable package, they do not demonstrate that the combination discloses all of the limitations of claim 1 of the ‘089 patent. *See Hearing Components*, 600 F.3d at 1373-1374; *Velandar*, 348 F.3d at 1363. Based upon the foregoing, I find that Analog has failed to provide clear and convincing evidence that Halteren in view of Sjursen renders claim 1 of the ‘089 patent obvious.

A patent is presumed to be valid, and each claim of a patent shall be presumed valid even though dependent on an invalid claim. 35 U.S.C. § 282. If I determined claim 1 to be obvious to a person having ordinary skill in the art and invalid, I could still find that claim 2 is valid. Since, however, I have found asserted claim 1 to be valid and *not* obvious to a person having ordinary skill in the art, asserted claims 2, 7, 16, 17 and 18 are necessarily valid, because they each depend from claim 1 and necessarily contain all of the elements of claim 1. *See In re Fritch*, 972 F.2d 1260, 1266 (Fed. Cir. 1992).

**c. Halteren in View of Une or Kawamura**

**Analog’s Position:** Analog argues that even if Halteren is not found to anticipate the asserted claims of the ‘089 patent because it does not disclose a “surface mountable package,” Halteren renders the asserted claims of the ‘089 patent obvious when combined with either Une

**PUBLIC VERSION**

(RX-49) or with Kawamura (RX-50).

Analog alleges that Knowles agrees that Halteren discloses every asserted claim limitation with the exception of a “surface mountable package.” (Citing RX-386 at 189:21-190:9; CX-610 at Q. 93-105.) Analog asserts that Knowles also admits that Une and Kawamura disclose surface mountable packages. (Citing CX-613 at 40; Tr. at 948:18-22.) Analog concludes that it is undisputed that all of the claim elements of the asserted claims are disclosed in the combination of Halteren and Une and Halteren and Kawamura.

Analog contends that there is motivation to combine the references. Analog says that Dr. Bauer states that a person of ordinary skill in the art would know that the contact pads on the bottom of Halteren can be anywhere along the flexible member, and the position is just a matter of “individual design.” (Citing Tr. at 923:23-924:12.) Analog avers that both Une and Kawamura teach a person of ordinary skill in the art to put the pads directly under the housing. (Citing RX-49 at Fig. 10A, items 10a, 10b; RX-50 at Fig. 7.) Analog reasons that it would be mere common sense to combine the references to move the pads. (Citing *Leapfrog Enters., Inc. v. Fisher-Price, Inc.*, 485 F.3d 1157, 1161 (Fed. Cir. 2007).)

Analog argues that motivation to combine Une with Halteren can also be found in their objectives. Analog says one of the objectives in Une is to create a microphone package suitable for automated assembly onto a printed circuit board. (Citing RX-49 at 2:38-42, 3:54-57.) Analog asserts that Halteren states that his desire is the same. (Citing Tr. at 871:15-872:2; RX-47 at 1:41-51.) Analog concludes that one of ordinary skill in the art would be motivated to look at Une to solve the automation problem contemplated in Halteren. (Citing *Commonwealth Scientific & Indus. Research Org. v. Buffalo Tech., Inc.*, 542 F.3d 1363, 1375 (Fed. Cir. 2008).) Analog says Kawamura and Halteren would be combined because they are both directed to the

**PUBLIC VERSION**

manufacture of microphone packages for the cell phone industry. (Citing RX-50 at 1:20-23; RX-47 at 2:26-31; *Tokyo Keiso Co. v. SMC Corp.*, 307 Fed. Appx. 446, 453 (Fed. Cir. 2009))

Analog says that a person of ordinary skill in the art would know how to surface mount the pads disclosed in Halteren once they were under the housing because Halteren discloses that the pads are to be used to connection to a power source, ground, and provide an exit for the microphone signal. (Citing Tr. at 945:8-946:1; RX-47 at 7:40-64.) Analog adds that Une specifically discloses using solder to mount the package to a printed circuit board. (Citing RX-49 at 3:30-39.)

In its reply brief, Analog alleges that all the parties agree that the combination of Halteren and Une or Halteren and Kawamura disclose all of the elements of each and every asserted claim of the '089 patent. (Citing CIB at 135-136; SIB at 94.) Analog says the only issue is whether there is sufficient motivation to combine the references. Analog avers that in addition to the disclosures in the patents themselves, Dr. Bauer's testimony, elicited for the first time on cross-examination at the hearing, supports Analog's position that there is sufficient motivation to combine the references. (Citing RIB at 127-129.)

**Knowles' Position:** Knowles says that Analog has asserted, without any substantive explanation, that Halteren could be combined with Kawamura to render claims 1, 2, 7, 16, 17, 18, and 20 of the '089 patent obvious. Knowles asserts that the total of Analog's evidence is found in Dr. Pecht's witness statement, quoting:

Dr. Bauer agrees that Halteren discloses every asserted claim limitation with the exception of a "surface mountable package." (RX-386 at 189:21-190:9.) Dr. Bauer also admits that Une and Kawamura disclose surface mountable packages. (Bauer Rpt. at 40-41.) The combination of Halteren and Une or Halteren and Kawamura would disclose all of the asserted claims, rendering them obvious.

(Citing RX-354 at Q. 183.)

**PUBLIC VERSION**

Knowles argues that *KSR*, 550 U.S. at 418 requires, “[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” Knowles asserts that Dr. Pecht’s “mere conclusory statements” offer no “articulated reasoning with some rational underpinning” why a person having ordinary skill in the art would combine Halteren with Kawamura.

Knowles contends that at best, all that Dr. Pecht has demonstrated is that each of the elements of claim 1 “was, independently, known in the prior art,” which falls far short of what is required to prove obviousness. Knowles says that Dr. Pecht’s “mere conclusory statements” offer no “articulated reasoning with some rational underpinning” why a person having ordinary skill in the art would combine Halteren with Une.

In its reply brief, Knowles argues that Analog provided no claim charts or even general explanations of which elements of Une or Kawamura would be combined with which elements of Halteren to yield the asserted claims of the ‘089 patent. Knowles adds that Analog provided no articulable reasoning as to why a person having ordinary skill would be motivated to combine these references. Knowles alleges that now, for the first time, Analog has presented argument of how and why these references could and should be combined. Knowles contends that this argument comes too late and should not be considered.

Knowles argues, even if Analog’s tardy explanation is considered, it is insupportable. Knowles says that Analog implies that Dr. Bauer testified that the contact pads could be moved directly underneath the housing end of the assembly. (Citing RIB at 128.) Knowles says in fact, Dr. Bauer was testifying that because the length of the assembly was indeterminate, the contact pads could be closer to the housing end, but not under the housing, quoting:

## PUBLIC VERSION

- Q. If Halteren wanted the contact pads to be closer to the housing, all it would need to do is move them closer to the housing, right?
- A. That's exactly what indeterminate length means, yes, you can move them wherever he likes along that flexible member.

(Citing Tr. at 923:23-924:3) (emphasis added by Knowles).

Knowles says that Analog claims that motivation to combine Une with Halteren can also be found in their objectives. (Citing RIB at 128.) Knowles counters that one of the objects of Halteren was to provide a “flexible substrate transducer assembly” using a “flexible elongate member.” (Citing RX-47 at 2:26-41.) Knowles asserts that one of the features of the assembly was that the housing could be up to 100 mm away from the connector into which the assembly was plugged. (*Id.* at 8:19-21.) Knowles argues that if the flexible elongate member was replaced by solder pads on the bottom of the housing, it would no longer be flexible, it would no longer be elongated, and it could not be plugged into a connector 100 mm away. Knowles says that Analog has not explained why a person having ordinary skill would be “motivated to remove these features from Halteren.”

Knowles says that Analog claims that a person having ordinary skill in the art “would know how to surface mount the pads disclosed in Halteren once they were under the housing.” (Citing RIB at 128.) Knowles states that the two pad electrodes 10a and 10b in Une are formed on the outside of a case that is made of a ceramic, polymer, or composite material. (Citing RX-49 at 4:60-63, 6:32-60.) Knowles says the terminals 211, 212, and 213 in Kawamura are formed on the outside of a case that is made of alumina. (Citing RX-50 at 5:1-17, Fig. 7b.) Knowles contends that Analog offers no explanation, nor do any of the references offer any explanation, as to how a person having ordinary skill in the art would modify solder pad suitable for ceramic or alumina cases to become suitable for use with a case made out of flex circuit material.

**Staff's Position:** Staff argues that there would be no motivation to combine Halteren

## PUBLIC VERSION

with “Une or Kawamura and Bashir.” Staff asserts that Analog has not provided a reason that would have prompted a person of ordinary skill in the art to modify the Halteren teaching to include the substrate of either Kawamura or Une. Staff contends that Analog has relied solely on the conclusory opinions of its technical expert, Dr. Pecht.

Staff argues that Dr. Pecht failed to establish that given the very different disclosures of these three patents, a reason why one would have selected a substrate with a multi-tiered substrate surface to use in package with a flat, flexible substrate. Staff says that given the complex nature of MEMS packaging at the time of the invention, the evidence has shown that such a combination would have been far from obvious.

**Discussion and Conclusions:** In Section IV.C.1.a, I found that Analog failed to demonstrate by clear and convincing evidence that Halteren discloses a package that is “surface mountable.” I reaffirm that finding and its rationale here. In Section IV.C.1.a, I also found that Halteren was shown by clear and convincing evidence to disclose each and every remaining limitation of the asserted claims, 1, 2, 7, 16, 17, 18, and 20. I reaffirm that finding and rationale here.

In Section IV.C.1.b, I found that Analog failed to provide clear and convincing evidence that Une discloses “a single layer of material, the layer being less than the entire surface on which it sits, suitable for carrying electrical current.” Therefore, I found that the record lacks evidence that Une discloses each and every limitation of claims 1, 2, 16 and 17 of the ‘089 patent. I reaffirm that finding and rationale here. In Section IV.C.1.b, I also found that Une discloses a surface mountable package for containing a transducer. I reaffirm that finding and rationale here.

Based upon the foregoing, if one were to combine Halteren with Une, all of the

**PUBLIC VERSION**

limitations of asserted claims 1, 2, 7, 16, 17, 18 and 20 would be disclosed by the combined references.

The remaining issue is whether or not a person of ordinary skill in the art would be moved to combine Halteren with Une. First, Knowles errs when it complains that, for the first time, Analog has presented argument of how and why these references could and should be combined. Analog clearly stated in both its prehearing brief and in the Joint Stipulation of Contested Issues that it intended to demonstrate that a person of ordinary skill in the art would be moved to combine these references. Second, Dr. Bauer testified credibly that a person of ordinary skill in the art would know that the contact pads on the bottom of Halteren can be anywhere along the flexible member, and the position is just a matter of “individual design.” (Tr. at 923:23-924:12.) Analog argues persuasively that motivation to combine Une with Halteren can also be found in their objectives. One of the objectives in both Halteren and Une is to create a microphone package suitable for automated assembly onto a printed circuit board. (RX-49 at 2:38-42, 3:54-57; Tr. at 871:15-872:2; RX-47 at 1:41-51.)

I find that there is clear and convincing evidence that a person of ordinary skill in the art would be moved to combine Halteren with Une.

Based upon the foregoing I find that Halteren viewed in light of Une renders obvious asserted claims 1, 2, 7, 16, 17, 18 and 20 of the ‘089 patent.

In Section IV.C.1.c, I found that Analog failed to provide clear and convincing evidence that Kawamura discloses that the transducer is attached to a surface formed on one of the first member or the second member, said surface being formed with at least one patterned conductive layer. In Section IV.C.1.c, I also found that Kawamura discloses a surface mountable package for containing a transducer. I reaffirm those findings and rationales here.

## PUBLIC VERSION

Based upon the foregoing, if one were to combine Halteren with Kawamura, all of the limitations of asserted claims 1, 2, 7, 16, 17, 18 and 20 would be disclosed by the combined references.

The remaining issue is whether or not a person of ordinary skill in the art would be moved to combine Halteren with Kawamura. Knowles' complaint regarding Analog's timing of its argument regarding combining Halteren and Une is equally applicable to the combination of Halteren and Kawamura. The result, too, is identical, because Analog disclosed in both its pre hearing brief and the Joint Stipulation of Contested Issues that motivation to combine these two references was at issue. Further, it appears, as Analog argues, that a person of ordinary skill in the art would be moved to combine Kawamura and Halteren, because they are both directed to solving similar problems in the same industry.

Part of the reasoning of the Supreme Court in *KSR* appears applicable here, when the Court explained, “[u]nder the correct analysis, any need or problem known in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining the elements in the manner claimed” and “[c]ommon sense teaches ... that familiar items may have obvious uses beyond their primary purposes, and in many cases a person of ordinary skill will be able to fit the teachings of multiple patents together like pieces of a puzzle.” *KSR*, 550 U.S. at 420.

In addition to the foregoing, in the case of Halteren, a stated objective is to “provide a flexible substrate transducer assembly suitable of integration within compact electronic equipment, such as ... mobile phones ...” and to provide such an assembly “suitable for manufacture by application of existing standard production equipment and processes to provide a low cost device.” (RX-47 at 2:26-35.) In Kawamura, the field of endeavor is “mobile

## PUBLIC VERSION

telephones,” and addresses an objective to “develop an acoustic sensor capable of substantially reducing the size of the semiconductor electret condenser microphone, a manufacturing method for the acoustic sensor, and a semiconductor electret condenser microphone using the acoustic sensor.” (RX-50 at 1:20-23, 1:38-43.) While the packages differ, the industry is the same and the objectives of the inventions are similar. I find that the evidence clearly and convincingly establishes that a person of ordinary skill in the art would be moved to combine Halteren and Kawamura to produce a smaller, easily constructed package capable of use in mobile phones.

Based upon the foregoing, I find that Halteren in light of Kawamura, renders obvious asserted claims 1, 2, 7, 16, 17, 18 and 20.

### **d. Ohta in View of Une, Premachandran, & Bashir**

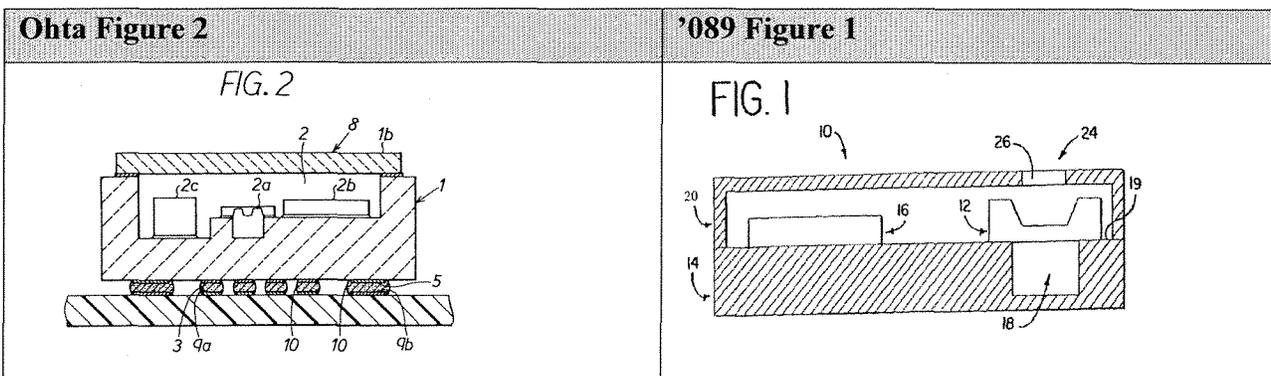
**Analog’s Position:** Analog argues that the combination of Ohta (RX-29) with Une and/or Premachandran, in light of U.S. Patent No. 6,012,335 (“Bashir”) (RX-28) discloses all of the elements Claims 1, 2, 16 and 17 of the ‘089 patent.

Analog says the focus of Ohta is the surface mountable package that it discloses. (Citing RX-29 at 1:15-16; Tr. at 1002:8-13.) Analog asserts that Ohta discloses a package for a type of transducer, an acceleration sensor; but the reference states the package can be used for pressure sensors, temperature sensors, magnetic sensors, radiation sensors and the like. (Citing RX-29 at 9:8-13; Tr. at 1002:24-1003:4.) Analog continues that the package can have a ceramic, aluminum, or plastic package body 1, and is sealed with a cover 1b. (Citing RX-29 at Fig. 3, 4:2-4, 49-53; Tr. at 1004:6-12.) Analog says that Ohta further discloses a first member and a second member, which together create a “chamber” within which MEMS device resides; the MEMS device is attached to the surface of one of the members, a ceramic substrate. (Citing RX-29 at 3:28-30, 4:2-4, 49-57; Tr. at 1004:6-12; RX-354C at Q. 209.)

PUBLIC VERSION

Analog states that the MEMS device of Ohta is electrically coupled via wire bonds to a patterned conductive layer, made of terminals 1c on the ceramic substrate. Analog says the patterned conductive layer is electrically coupled to signal electrodes 3 on the outside surface of the package, and the pads are ready for surface mounting using solder reflow. Analog concludes that the device of Ohta also creates a volume with the member to which it is attached. (Citing RX-29 at Figs. 2, 5 & 6D, 1:15-16, 4:37-48, 4:53-57, 5:9-18; Tr. at 1005:13-15; RX-354C at Q. 209; Tr. at 1006:13-16, 1007:4-8, 1009:1-8.)

Analog says that Knowles argues that Ohta does not disclose the requisite “surface” of claim 1 of the ‘089 patent because the sensor would be “sitting on a raised section of the case and not on the bottom surface of the case.” (Citing CX-610 at Q. 137.) Analog repeats that Knowles’ argument about the shape of the claimed surface is meritless. Analog notes “the similarity between the surface disclosed in Figure 2 in Ohta and Figure 1 of the ‘089 patent.” Analog avers that both disclose a sensor bound to a “raised surface” and it is thus not a distinguishing feature between the ‘089 patent and the prior art. Analog includes Ohta Figure 2 and the ‘089 patent’s Figure 1:



(Citing RX-29 at Fig. 2; JX-002 at Fig. 1.)

Analog states that the combination package is created by starting with the package disclosed in Ohta. Analog avers that all Knowles’ experts agree that if a microphone was placed

## PUBLIC VERSION

inside the package, a person of ordinary skill in the art would know that the package should contain a hole for sound energy to enter the package. (Citing Tr. at 275:5-11, 359:6-10, 360:4-10, 817:22-818:8, 836:21-837:6, 850:14-18.) Analog contends that one of ordinary skill in the art would replace the cover 1b of Ohta with metal cover 2 of Une, and the resulting package would have the claimed “aperture.” (Citing RX-354C at Q. 211.) Analog continues that a “grounding metal cover 2 is taught in Une, thereby establishing EMI shielding.” (Citing RX-49 at 6:50-55; RX-354C at Q. 211.) Analog says the sensor in Ohta can be replaced with either the electret microphone disclosed in Une or the silicon microphone disclosed in Premachandran, satisfying transducer requirement. (Citing RX-422 at Fig. 1; RX-354C at Q. 211.) Analog concludes this would have been obvious since certain electret microphones and MEMS microphones have the same performance. (Citing RX-387C at 63:14-20; RX-354C at Q. 211.)

Analog asserts that Ohta teaches that the sensor can be wire bonded to terminals 1c on the surface of package body 1. (Citing RX-29 at Fig. 5, 4:53-57.) Analog says that Premachandran also discloses wire bonding the MEMS microphone to its substrate. (Citing RX-422 at Fig. 3.) Analog argues that from the teaching in these two references, one of ordinary skill in the art would know how to wire bond the MEMS microphone in Premachandran to the substrate disclosed in Ohta. Analog adds that the MEMS microphone mounted on package body 1 would create an enclosed “volume being acoustically coupled to the transducer” defined by the transducer and the substrate member. (Citing RX-29 at Fig. 2.) Analog refers the reader to RDX-406C for illustration of the details.

Analog argues that for multiple reasons, and in view of the respective disclosures of Ohta, Une, and Premachandran, one of ordinary skill in the art could have easily combined these references to create the alleged invention(s) claimed in Claims 1, 2, 16, and 17 of the ‘089

**PUBLIC VERSION**

patent. Analog asserts that the packaging technology between Ohta, Une, and Premachandran is similar, because each reference discloses the use of a ceramic package to package a MEMS device. (Citing RX-29 at Fig. 5, 4: 53-57; RX-422 at ADI00863208; RX-341 at 239:22-240:4; RX-49 at Fig. 10A, 6:4-9; RX-354C at Q. 213.) Analog concludes that the packaging technology within the references is interchangeable.

Analog contends that one of ordinary skill in the art would certainly have been motivated to replace the acceleration sensor of Ohta with the microphone disclosed in either Une or Premachandran because the package disclosed in Ohta can be used for pressure sensors. (Citing RX-29 at 9:8-13; RX-354C at Q. 213.) Analog says that Bashir explicitly discloses that acoustic transducers are the same as pressure sensors:

Pressure sensors are used to detect variations in the pressure exerted on a surface or to measure the absolute value of the pressure exerted, and to convert the measured quantity into an electrical signal. A common use of such sensors is in the form of an acoustic transducer. Acoustic transducers detect changes in the pressure applied by sound waves and convert such changes into a varying electrical signal. Acoustic transducers may also be used in a reverse sense to convert electrical signals to pressure waves. When connected to an amplifier which drives a second transducer which reproduces the applied sound wave, an acoustic transducer can be made to function as a microphone.

(Citing RX-28 at 1:16-28 (emphasis added by Analog); RX-354C at Q. 206.) Analog says a number of references indicate that pressure sensors and microphones are the same thing. Analog states that Dr. Loeppert, Knowles' corporate representative, calls Knowles' MEMS microphone a differential pressure sensor. (Citing CX-388 at 29.) Analog adds that Dr. Pecht testified that all pressure sensors are responsive to acoustic signals. (Citing Tr. at 783:4-6.) Analog says that his testimony is corroborated by evidence in the record. Analog alleges that Kawamura states that the acoustic sensor disclosed within it may be used as a pressure sensor and an acceleration sensor. (Citing RX-50 at 5:43-45.) Analog says even Dr. Loeppert testified that an acceleration

## PUBLIC VERSION

sensor could be used as a microphone. (Citing RX-424C at KE0456542; RX-387C at 78:16-80:8; RX-354C at Q. 213.) Analog argues that it is clear that acceleration sensors, pressure sensors, and microphones are all sensors that are closely related. Analog asserts that the packaging requirements for each of these sensors are very similar, as Dr. Gileo testified. (Citing RX-385 at 57:20-62:16.) Analog says that Knowles presented no testimony in rebuttal to these facts. Analog contends that given the interchangeability and relatedness of these sensors, one of ordinary skill in the art would have been motivated to package a microphone in a package originally created for an acceleration sensor. (Citing RX-354C at Q. 213.)

Analog says the assertion that a package for a MEMS device is specific to a device and cannot be used for any other devices is meritless. Analog points to Dr. Bauer's citation to books about the "specificity of MEMS packages;" but says he never discusses the requirements for a MEMS microphone package versus MEMS acceleration sensor package. Analog asserts that the requirements for a pressure sensor or microphone package are almost identical to those of an acceleration sensor package; the packages for these devices are interchangeable. (Citing RX-385C at 57:11-58:3, 59:17-62:16; RX-354C at Q. 205.) Analog adds that Ohta explicitly states his package can be used for other types of sensors. (Citing RX-29 at 9:7-14.) Analog concludes that one of ordinary skill in the art would understand that packages are not specific to any MEMS device, and that for any given MEMS device, there are any number of packages that will suffice. (Citing RX-354C at Q. 213.)

In its reply brief, Analog argues that Knowles only argued in its prehearing brief that there was no motivation to combine these references, and Knowles never argued that the combination was missing any elements. (Citing CPHB at 48-50.) Analog argues that, as a result, Knowles should be deemed to have waived "its new argument, made for the first time in

## PUBLIC VERSION

its post-hearing brief, that the combination package does not disclose a ‘surface formed with at least one patterned conductive layer.’” (Citing Ground Rule 8.2.) Analog alleges that Staff does not dispute that all the elements are disclosed in this combination.

Analog says that whether the combination package discloses a “surface formed with at least one patterned conductive layer” turns on whether the package disclosed in Ohta discloses this limitation. Analog avers that Dr. Bauer agreed that Ohta discloses a “patterned conductive layer” at terminals 1c, and Dr. Bauer indicated that the patterned conductive layer was on the same tier as the sensor. (Citing Tr. at 1005:13-1006:12; RX-29 at Figs. 2, 5; RDX-53, item D.) Analog says that Knowles argues, contrary to its own expert’s testimony, that the patterned conductive layer is not on the same tier as the sensor. (Citing CIB at 137.) Analog contends that Knowles’ argument is untenable.

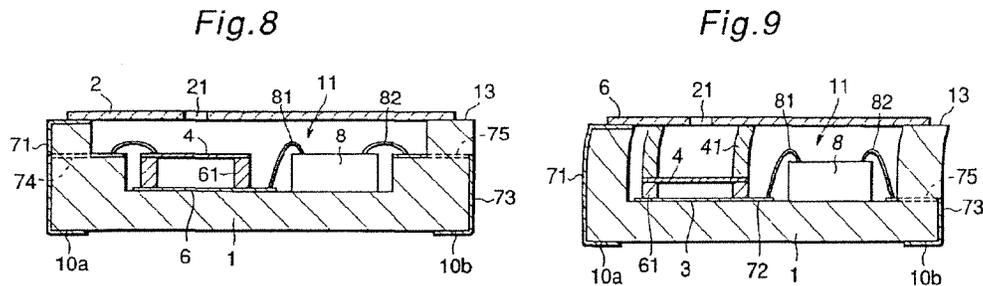
Analog says Staff and Knowles challenge whether there is a motivation to combine the references because:

- every pressure sensor is not interchangeable with every microphone;
- a person of ordinary skill would not know how to sandwich Une’s microphone in Ohta’s package;
- a person of ordinary skill would not know how to wire bond Premachandran’s MEMS microphone in Ohta’s package; and
- because MEMS packaging is specific, there would be no motivation to use an accelerometer package to enclose a microphone.

Analog says that Bashir clearly states that a common use for pressure sensors is as an acoustic transducer. (Citing RX-28 at 1:16-21.) Analog adds that Knowles even stated that its MEMS microphone is a pressure sensor. (Citing CX-388 at 29.) Analog argues that it does not have to prove that every microphone is interchangeable with a pressure sensor. It is enough that a MEMS microphone is a pressure sensor and that pressure sensors are commonly used as microphones.

PUBLIC VERSION

Analog states that Knowles argues, without support, that a person of ordinary skill would not know how to secure Une's electret microphone (composed of items 6, 61, and 4) in Ohta's package. Analog asserts that Une discloses attaching the electret microphone to the surface of a ceramic substrate, just like Ohta's, without sandwiching the transducer in the package. (Citing RX-49 at Fig. 8.) Analog adds that Une discloses securing the electret microphone to the surface of the substrate with a large spacer. (Citing RX-49 at Fig. 9, item 41.) Analog includes the relevant figures for comparison:



Analog says that Knowles argues that a person of ordinary skill in the art would not know how to wire bond Premachandran's wire bonded microphone to the patterned conductive layer in Ohta, which also teaches wire bonding. Analog counters that Knowles does not articulate the difference between wire bonding to a lead frame or to a ceramic base; it merely mentions that the substrates are composed of different material, which is irrelevant. (Citing CX-580 at KE1667635.) Analog adds that Knowles stated that wire bonding is discussed in no less than six textbooks known to persons of ordinary skill in the art. (Citing CIB at 15.)

Analog states that Knowles argues that, when it comes to MEMS devices, the device defines the package, and Dr. Tummala agrees. (Citing Tr. at 552:15.) Analog says this does not mean that each device defines a different package. Analog asserts that, because the needs of an accelerometer sensor, a pressure sensor, and a microphone sensor are similar, if not identical, there is no support for the suggestion that the Ohta package would not satisfy the needs of a

## PUBLIC VERSION

MEMS microphone. (Citing RIB at 133-34.)

Analog says that Knowles and Staff suggest that Analog has failed to meet its burden to establish that one of ordinary skill in the art would have a “reasonable expectation” that the combination package would be successful (*i.e.*, result in a working microphone). Analog avers that Dr. Pecht testified that one of ordinary skill in the art would replace the cover 1b of Ohta with metal cover 2 of Une, and the resulting package would have the claimed “aperture.” (Citing RX-354C at Q. 211.) Analog states that Knowles does not present any evidence that the metal covers of these two patents are not interchangeable. Analog adds that the sensor in Ohta can be replaced with either the electret microphone disclosed in Une or the silicon microphone disclosed in Premachandran, satisfying transducer requirement. (Citing RX-354C at Q. 211.) Analog contends that Knowles presents no evidence to dispute the testimony of the head of its R&D department, which states that certain electret microphones and MEMS microphones have the same performance. (Citing RX-387C at 63:14-20; RX-354C at Q. 211.) Analog asserts that these are the only modifications necessary to create the claimed package. Analog concludes that, because the technologies of the references are “interchangeable,” one of ordinary skill in the art would certainly believe that they could be combined successfully. (Citing RIB at 132-134.)

**Knowles’ Position:** Knowles contends that Analog has failed to produce clear and convincing evidence that the combination of Ohta, in light of Bashir and Une or Premachandran renders claim 1 (or dependent claims 2, 7, 16, 17, 18, and 20) of the ‘089 patent obvious.

Knowles says:

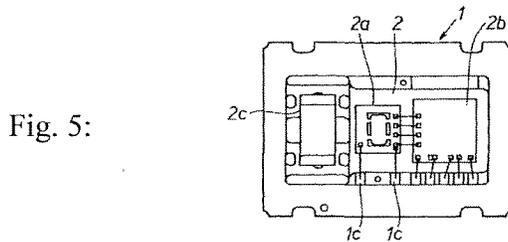
- The combination of Ohta, Bashir, and Une or Premachandran would not meet all of the elements of claims 1, 2, 16, 17.
- There is insufficient motivation to combine Ohta, Bashir, and Une or Premachandran.

Knowles says that according to Analog’s expert Dr. Pecht, a person having ordinary skill

**PUBLIC VERSION**

in the art would replace the acceleration sensor of Ohta with the microphone of Une (or optionally with the microphone of Premachandran), and then add an aperture to Ohta as disclosed by Une. Knowles refers to CIB section IV.D.2.c, saying that Ohta discloses a package for an acceleration sensor that sits on an raised portion of the package body. Referring to CIB section IV.A.5, Knowles reiterates that, during prosecution of the application that became the '089 patent, the inventor distinguished his invention from a package where the sensor was mounted on a raised portion of the package body. Knowles concludes that merely replacing the acceleration sensor of Ohta with a microphone (and adding an aperture) would result in a microphone package of a style that the inventor distinguished during prosecution.

Knowles adds that, according to the Ohta specification, the acceleration sensor circuit 2 is electrically connected to terminals 1c by wire bonding. (Citing RX-29 at "C53-55".) Knowles says, "[w]hile it isn't entirely clear, it appears from Fig. 5 that terminals 1c are on the lower surface of the base and not on the raised surface to which the sensor is attached." Knowles includes Figure 5 to illustrate its point:



Knowles reasons that merely replacing the acceleration sensor with the Une microphone would result in a package that lacks a patterned conductive layer formed on the surface to which the microphone was attached. Knowles concludes that the resulting package would not invalidate claim 1 (or dependent claims 2, 16, and 17) of the '089 patent because it would fail to disclose all of the required elements of claim 1.

## PUBLIC VERSION

Knowles reiterates that Ohta discloses a package with a more reliable mechanism for securing a surface mount package to a printed circuit board. Knowles asserts that one of the last paragraphs in the specification “vaguely alludes that the package could be used with other types of sensors.” Knowles says there is no disclosure of a MEMS device as is disclosed by Bashir and Premachandran. Knowles refers to CIB section IV.D.2.d, and says Bashir discloses a particular MEMS sensor (unpackaged) that is suitable for use as a pressure sensor or a microphone; however, there is no disclosure that every pressure sensor is interchangeable with every microphone. Referring to CIB section IV.D.2.b, Knowles says Une discloses a “sandwich” style package for an electret microphone; however, there is no disclosure of how the Une microphone would be mounted to a raised portion of the package base alone. Knowles refers to CIB section III.D.2.c, and says Premachandran discloses a MEMS microphone in a lead frame package; but there is no disclosure of how its MEMS microphone would be mounted or connected without a lead frame.

Knowles argues that at best, Dr. Pecht has shown that various elements of claim 1 of the ‘089 patent were independently known in the prior art. Knowles repeats its argument based upon *KSR* that “a patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art.” Knowles contends that Dr. Pecht has offered no reason that a person having ordinary skill in the art would use Ohta, which doesn’t even disclose a MEMS device, as a starting point. Knowles avers that Dr. Bauer testified:

[T]he only suggestion that the acceleration sensor in Ohta ‘046 with anything else is a bare statement that the package “it may hold therein a sensor circuit capable of converting a dynamic amount such as pressure into an electrical signal as a dynamic amount sensor package, and may hold therein the other circuit for a temperature sensor, a magnetic sensor, a radiation sensor, or the like.” RX-29 at C9:L8-13. The specification offers no clues to the person having ordinary skill in the art on how to modify the package for such disparate sensors, including pressure sensors, temperature sensors, magnetic sensors, or radiation sensors.

## PUBLIC VERSION

Inasmuch as the invention of Ohta '046 is a way to strengthen the surface mount connection between the package and the circuit board (see Claim 1), it seems likely that this sentence suggested that the surface mountable connection on a package for a pressure sensor, temperature sensor, magnetic sensor, or radiation sensor could be made stronger using the disclosed technique.

(Citing CX-610 at Q. 137.)

Knowles continues that Dr. Pecht has offered no explanation of how he goes from a patent showing that a particular MEMS sensor could be used as either a microphone or a pressure sensor to the conclusion that all MEMS microphones are interchangeable with all pressure sensors. Knowles asserts that Dr. Pecht has offered no explanation of how a person having ordinary skill in the art would modify the Une electret microphone, built out of discrete components intended to be held in place by sandwiching the components against the base, walls, and lid of a case, so that it could be used in a package where the microphone was intended to be mounted only on the bottom of the microphone. Knowles says Dr. Pecht has offered no explanation of how a person having ordinary skill in the art would modify the Premachandran microphone, physically mounted on a lead frame paddle and electrically connected to the lead frame fingers, into a package that does not have a lead frame. Knowles concludes that Dr. Bauer testified that packaging a MEMS device is device and application specific, and thus a person having ordinary skill would not have a reasonable expectation that merely combining these disparate references would result in creating the package taught by claim 1 of the '089 patent.

(Citing CX-610 at Q. 137.)

In its reply brief, Knowles says that Analog premises its argument that Ohta, in light of Bashir and Une or Premachandran, render claims 1, 2, 16, and 17 of the '089 patent obvious, on this statement: “[i]n view of the respective disclosures of Ohta, Une, and Premachandran, one of ordinary skill in the art could have easily combined these references to create the alleged

## PUBLIC VERSION

invention(s) claimed in Claims 1, 2, 16, and 17 of the '089 patent.” (Citing RIB at 131.)

Knowles contends that Analog cites to no evidence demonstrating “easily.” Knowles says, in contrast its expert, Dr. Bauer, cited to numerous extrinsic references which uniformly declare how difficult it is to design a package a MEMS devices such as the microphone disclosed by the '089 patent. (Citing CX-610 at Q. 137.) Knowles cites for example, Ramesham *et al.* noted that:

Packaging of MEMS devices is more complex [than IC packaging] since in some cases it needs to provide protection from the environment while in some cases allowing access to the environment to measure or affect the desired physical or chemical parameters.

(Citing CX-619 at p. 666.)

Knowles says Maluf noted that:

In the integrated circuit industry, electronic packaging must provide reliable, dense interconnections to the multitude of high frequency electrical signals. In contrast, MEMS packaging must account for a far more complex and diverse set of parameters. It must first protect the micromachined parts in broad-ranging environments; it must also provide interconnects to electrical signals, and, in some cases, access to and interaction with the external environment.

(Citing CX-586 at pp. 201-202.)

Knowles adds that in Dr. Tummala's Fundamentals book he said:

In the IC industry, electronic packaging must provide reliable, dense interconnections to a multitude of high-frequency electrical signals. In contrast, MEMS packaging must account for a far more complex and diverse set of parameters, as shown schematically in Figure 14.13. It must first protect the micromachined parts in broad ranging environments; it must also provide interconnects to electrical signals, and in some cases, access to and interaction with the external environment.

(Citing CX-620 at p. 556.)

Knowles argues that Analog has failed to show how a person having ordinary skill in the art would cobble the disparate set of prior art into the package taught by claims 1, 2, 16, and 17 of the '089 patent. Knowles says that Analog starts with a package, Ohta, that is not intended for

## PUBLIC VERSION

a microphone or even for a MEMS device. Knowles states that it then steps through a series of replacements of various parts of the non-microphone, non-MEMS package, taking pieces from a package for a side-mounted electret microphone, a patent that does not disclose any kind of a microphone, and a package for a bottom-mounted MEMS microphone. (Citing RIB at 131-132) Knowles asserts that, through this string of substitutions, Analog never actually says how a person of ordinary skill in the art would perform any of these substitutions. Knowles says, for example, Analog never explains how one might take the discrete components of an electret microphone, meant to be held together by sandwiching them between a lid and base, and mount them into a package intended for a bottom-mounted acceleration sensor.

Knowles adds that, after making all of these substitutions, Analog has failed to show that the resulting device would in fact be the claimed package, since the Ohta package uses the multi-tier base that was distinguished by the inventor during prosecution of the application that would become the '089 patent. (Citing CIB at § IV.D.4d.1.)

**Staff's Position:** Staff argues that the evidence has shown that the combination of Ohta in view of Une, Premachandran, and Bashir does not render the asserted claims obvious. Staff says that Ohta discloses a package body for holding an acceleration sensor circuit. (Citing RX-29 at Abstract.) Staff asserts that, because it discloses a package for an acceleration sensor circuit, this reference fails to disclose a microphone and an aperture (as required by the asserted claims). Staff states that Analog contends that it would have been obvious to modify the cover 1b of Ohta with the metal cover 2 of Une in order to create a package with the claimed "aperture." (Citing RPHB at 123.) Staff continues that Analog then contends that the acceleration sensor in Ohta could be replaced with either the electret microphone in Une or the silicone microphone in Premachandran. (*Id.*) Staff says that Analog contends that a motivation

## PUBLIC VERSION

would have existed to make these modifications to the Ohta reference because Bashir discloses that MEMS acoustic transducers are the same as MEMS pressure sensors. (Citing RPHB at 124.)

Staff contends that the evidence has shown that there would have been no motivation to make the modifications that Analog suggests. (Citing CX-610 at Q. 137.) Staff says the evidence has shown that, although microphones are a type of pressure sensor, not every pressure sensor is a microphone. (*Id.*) Staff concludes that Analog's reliance on Bashir is misplaced as this reference does not suggest that all microphones and fluid pressure sensors are interchangeable. (*Id.*) Staff adds that, given the differences between Bashir, Une, and Premachandran, Analog has failed to provide clear and convincing evidence that demonstrate that it would have been obvious to combine these references to arrive at the claimed invention.

**Discussion and Conclusions:** Based on the evidence in the record, I find that Analog failed to offer clear and convincing evidence that Ohta in combination with Une, Premachandran, or Bashir renders obvious any of the asserted claims of the '089 patent.

First, Analog is correct when it argues that Ohta discloses a surface mountable package. Analog's argument is supported by the testimony of Knowles' expert, Dr. Bauer, who admitted that fact on cross-examination. Ohta states clearly, "[t]he present invention relates to a surface mount type package unit ..." and "... an object of the present invention is to provide a surface mount type package unit having a package body mounted on to a circuit board with a simple structure and high reliability, and a method for mounting the package body on the circuit board by simple processes." (RX-29 at 1:15-16, 2:6-11; Tr. at 1002:8-13.)

Second, Analog is accurate when it says that Ohta describes a first member and a second member, which together create a "chamber" within which MEMS device resides. This is

## PUBLIC VERSION

supported by the clear and specific testimony of Knowles' expert, Dr. Bauer. (Tr. at 1004:9-12; RX-29 at 3:28-30, 4:2-4, 4:49-50.)

Third, the evidence shows that the MEMS device of Ohta is electrically coupled via wire bonds to a patterned conductive layer on the ceramic substrate. This is clearly supported by the testimony of Knowles' expert, Dr. Bauer. (Tr. at 1005:13-15.) Dr. Bauer agreed on cross-examination that the patterned conductive layer is electrically coupled to signal electrodes 3 on the outside surface of the package. (Tr. at 1006:13-16, 1007:4-8.)

Finally, the evidence supports a finding that there is a space defined by the MEMS device of Ohta and one member of the package. Dr. Bauer admitted this fact on cross-examination. (Tr. at 1009:1-9.) It is evident from viewing Figure 2 of Ohta that the space described in Dr. Bauer's cross-examination is, in fact, identical to the "volume" shown in Figure 1 of the '089 patent. I conclude that Ohta discloses a volume defined by the transducer and one of the first member or the second member as described in claim 1 of the '089 patent. (RX-29 at Fig. 2, 4:37-39; JX-2 at Fig. 1.)

In Section IV.C.1.b, I found that Analog failed to provide clear and convincing evidence that Une discloses a patterned conductive layer (i.e. "a single layer of material, the layer being less than the entire surface on which it sits, suitable for carrying electrical current"). Therefore, I found that the record lacks evidence that Une discloses each and every limitation of claims 1, 2, 16 and 17 of the '089 patent. I also found that assuming *arguendo* that Une discloses at least one patterned conductive layer on the surface on which the transducer is mounted, then Une would disclose all of the limitations of the asserted claims 1, 2, 16, and 17 of the '089 patent, rendering them invalid. I reaffirm those findings and their rationales here.

Similar to Une, Analog has not provided clear and convincing evidence that Ohta

## PUBLIC VERSION

discloses at least one patterned conductive layer on the surface on which the transducer is mounted, which is required by the first and second elements of claim 1 of the '089 patent, which state in relevant part:

“... the transducer being attached to a surface formed on one of the first member or the second member ...”; and

“the surface being formed with at least one patterned conductive layer, the patterned conductive layer being electrically coupled to the transducer;”

(JX-2 at 11:28-30, 11:32-34.)

Analog cites to the cross-examination of Dr. Bauer to support its argument; but Dr. Bauer actually testified that it was not clear to him that the accelerometer of Ohta sits on the patterned conductive layer. (Tr. at 1005:2-5.) So, while it is clear that Ohta discloses a patterned conductive layer within the package and that the transducer is electrically connected to it, Analog has not shown by clear and convincing evidence that the surface to which the transducer is attached is “formed with at least one patterned conductive layer.”

In Sections IV.B.1.b and IV.C.1.d, I found that Premachandran is prior art to the '089 patent. I reaffirm that finding and its rationale here.

In Section IV.C.1.d, I found that: (1) Premachandran does not disclose that any of the microphone packages were attached to a substrate; (2) modification of the disclosed package would be required in order to surface mount the Premachandran package; (3) there has been no showing that Premachandran in any way suggests that there is an “outside surface of the surface mountable package comprising a plurality of terminal pads electrically coupled to the patterned conductive layer,” because the lead frame is a single conductive piece that pierces the package from the outside and is, in fact, a single conductive path rather than a patterned conductive layer; (4) Premachandran does not disclose that the surface on which the transducer is mounted

## PUBLIC VERSION

includes a patterned conductive layer; and (5) even if the suggested modification resulted in a plurality of terminal pads, those terminal pads would be on the “exterior of the package;” but not on an outside surface of the package as expressly required by claim 1.

In Section IV.C.1.d, I also found that assuming *arguendo* that Premachandran did anticipate claim 1, it still would not anticipate claim 17 of the ‘089 patent, because it does not teach that one or both of the first member or the second member includes a shield against electromagnetic interference.

Here I will not repeat the entire rationale for the foregoing findings regarding Premachandran set forth at Section IV.C.1.d; but I reaffirm those findings and rationales.

While Analog lists Bashir among the references it alleges renders the ‘089 patent obvious, it offers no evidence of that allegation. Rather Analog merely uses a citation from the Background of the Invention portion of Bashir to support its argument that acoustic transducers are pressure sensors.

Inasmuch as, the combined references of Ohta in view of Une, Premachandran and Bashir fail to disclose or suggest at least one patterned conductive layer ***on the surface on which the transducer is mounted***, they do not demonstrate that the combination discloses all of the limitations of claim 1 of the ‘089 patent. *See Hearing Components*, 600 F.3d at 1373-1374; *Velander*, 348 F.3d at 1363.

A patent is presumed to be valid, and each claim of a patent shall be presumed valid even though dependent on an invalid claim. 35 U.S.C. § 282. If I determined claim 1 to be obvious to a person having ordinary skill in the art and invalid, I could still find that claim 2 is valid. Since, however, I have found asserted claim 1 to be valid and ***not*** obvious to a person having ordinary skill in the art, asserted claims 2, 16 and 17 are necessarily valid, because they each depend from

## PUBLIC VERSION

claim 1 and necessarily contain all of the elements of claim 1. *See In re Fritch*, 972 F.2d 1260, 1266 (Fed. Cir. 1992).

I have found that Ohta in view of Une, Premachandran and Bashir does not render the asserted claims of the '089 patent invalid as obvious. Nevertheless, assuming *arguendo* that one found that the combined references did render those asserted claims invalid, it is Analog's burden to provide clear and convincing evidence that a person of ordinary skill in the art would be moved to combine those references. I conclude that Analog has not met its burden.

Analog overstates its case when it argues that it does not have to prove that every microphone is interchangeable with a pressure sensor, and it is enough that a MEMS microphone is a pressure sensor and that pressure sensors are commonly used as microphones. It has been shown that, although microphones are a type of pressure sensor, not every pressure sensor is a microphone. (CX-610 at Q. 137.)

Analog has also failed to provide clear and convincing evidence that one would combine Premachandran with Ohta or with Une to solve the problems contemplated in the '089 patent. Premachandran is directed to silicon-based microphone testing methodology and noise reduction. It is, therefore within the field contemplated by the '089 patent, and it briefly addresses packaging of MEMS microphones while discussing the testing of those microphones. Similarly, one of the objectives in Une is to create a microphone package suitable for automated assembly onto a printed circuit board. (Citing RX-49 at 2:38-42, 3:54-57.)

Nevertheless, Ohta, while it does mention packaging for a transducer, arises in the narrow context of automotive acceleration sensor packages. (RX-29 at 3:28-29.) The problem addressed in the '089 patent is surface mountable packages for microphones. Ohta lacks the detail necessary to cause one of ordinary skill in the art to adapt it to an *acoustic* MEMS

## PUBLIC VERSION

package. Examining RX-29, I note only two references to changing the packaging scheme. First, it says, “it will be apparent to those skilled in the art that the other changes in form and detail may be made therein without departing from the scope of the invention as defined in the appended claims.” (RX-29 at 8:47-50.) This language, while referring to other changes in form and detail, actually serves to limit the field addressed to that of its specific invention. Second, Ohta’s specification clearly contemplates modifications to Ohta that are wholly within the realm of sensors that measure amounts and are not remotely connected to the field of acoustic MEMS devices taught by the ‘089 patent. Dr. Bauer testified credibly:

[T]he only suggestion that the acceleration sensor in Ohta ‘046 with anything else is a bare statement that the package “it may hold therein a sensor circuit capable of converting a dynamic amount such as pressure into an electrical signal as a dynamic amount sensor package, and may hold therein the other circuit for a temperature sensor, a magnetic sensor, a radiation sensor, or the like.” RX-29 at C9:L8-13. The specification offers no clues to the person having ordinary skill in the art on how to modify the package for such disparate sensors, including pressure sensors, temperature sensors, magnetic sensors, or radiation sensors. Inasmuch as the invention of Ohta ‘046 is a way to strengthen the surface mount connection between the package and the circuit board (see Claim 1), it seems likely that this sentence suggested that the surface mountable connection on a package for a pressure sensor, temperature sensor, magnetic sensor, or radiation sensor could be made stronger using the disclosed technique.

(CX-610 at Q. 137; RX-29 at 9:1-14.)

Ohta’s specification also teaches away from a microphone configuration when it describes, “... the opening of the package body 1 is hermetically sealed with a cover 1b shown in FIGS. 1 and 2, thereby completing an acceleration sensor package ...” (RX-29 at 4:50-52.)

I find that the record lacks clear and convincing evidence that a person of ordinary skill in the art would be moved to combine Ohta with either Une or Premachandran to solve the problems addressed by the ‘089 patent.

**e. Secondary Considerations**

**Knowles' Position:** In its initial brief, Knowles states that secondary considerations were addressed in CIB section III.D.4 and will not be repeated here.

In its reply brief, Knowles says that Analog makes similar arguments to those made with regard to the '231 patent that Knowles has failed to establish that secondary considerations of commercial success, licensing activities of Knowles and copying by others apply to the '089 patent. (Citing RIB at 134-136.) Knowles says all of its arguments regarding the secondary considerations of the SiSonic's commercial success, Knowles' licensing activity and copying by others as to the '231 patent apply equally to the '089 patent. Knowles adds that only the arguments made by Analog regarding commercial success will be addressed here as Analog presents no additional argument on Knowles' licensing activity and copying by others.

Knowles says that Analog first argues that Knowles has failed to show that its SiSonic products are packages under Knowles' proposed construction. (Citing RIB at 134.) Knowles argues that it has shown that its SiSonic products provide mechanical and environmental protection, including protection against mechanical shock and vibration. (Citing CRB section IV.C) Knowles argues that, in view of the evidence of the success of the SiSonic microphone in the marketplace, Knowles is entitled to a presumption that the commercial success of the SiSonic products is attributable to the patents-in-suit. (Citing CX-412 at 166-67.)

Knowles argues that it introduced evidence that the patented "package" design was "key" to the commercial success of the SiSonic. (Citing CIB at 69-70.) Knowles avers that Mr. Niew testified that surface mountability of the package was the primary factor in its success. (Citing Tr. at 662:18-23.) Knowles contends that it has shown the requisite nexus between the patented

## PUBLIC VERSION

technology and the success of the SiSonic, and Analog has failed rebut that presumption.

**Analog's Position:** Analog argues that, as with the '231 patent, Knowles cannot rebut Analog's strong showing of obviousness. (Citing *Brown & Williamson Tobacco Co. v. Phillip Morris, Inc.*, 229 F.3d 1120, 1131 (Fed. Cir. 2000).) Analog then adds, regardless of the strength of Analog's obviousness argument, Knowles will not be able to demonstrate any of the indicia of non-obviousness regarding the '089 patent.

Analog reiterates that Knowles has failed to show how the SiSonic products protect against "mechanical shock and vibration." Analog argues that, if Knowles is successful in its claim construction for "package," it will fail to establish commercial success as a secondary consideration of non-obviousness.

Analog says that Knowles has not proven that the sales of its SiSonic microphone were driven by the embodied claim limitations of the '089 patent. Analog counters that Dr. Loeppert and Mr. Niew testified that there were numerous factors that they attributed to the "commercial success" of the SiSonic products, and they could not say which was more important than any other. (Citing Tr. at 112:16-22, 1058:4-9.)

Analog contends that the low cost of the SiSonic, which was a result of the small MEMS die (and not the package), contributed to product's success. (Citing Tr. at 108:3-8, 109:5-12, 111:9-12.) Analog says another reason for the SiSonic's success was that the MEMS microphone used in the package developed by Mr. Minervini had a MEMS microphone with a free-floating diaphragm; a feature that is not related to any claim limitations of the '089 patent. (Citing Tr. at 1052:20-1035:2, 1059:3-6; RX-388C at 75:12-15.) Analog adds that a MEMS microphone is not required for the asserted claims of the '089 patent. (Citing JX-2 at 11:20-44, 11:20-48, 11:62-67, 12:47-59, 12:64-65; RX-386 at 29:15-20, 36:21-37:2.) Analog argues that

## PUBLIC VERSION

the surface mountability of the Knowles microphone package rested on the incorporation of a MEMS microphone into the package. (Citing RX-387C at 69:24-70:8.)

Analog avers that Knowles' witnesses articulated additional reasons for the commercial success of the SiSonic, none of which relate to any asserted claim of the '089 patent. Analog concludes that, not only has Knowles failed to prove that the SiSonic products meet its proposed construction of "package;" but it has also failed to present sufficient evidence that there is a nexus between the commercial success of its products and the asserted claims (under any party's proposed claim constructions).

Analog reiterates its arguments made with respect to the '231 patent, that Knowles has not met its burden to prove licensing as a secondary consideration of non-obviousness for the '089 patent, and Knowles has not met its burden to prove copying as a secondary consideration of non-obviousness for the '089 patent.

Analog repeats its argument made with respect to the '231 patent, that Knowles has not met its burden to prove earlier failure by others as a secondary consideration of non-obviousness for the '089 patent.

**Staff's Position:** Staff states that its analysis of secondary considerations of obviousness is addressed with respect to the '231 patent. Staff notes, however, that unlike the '231 patent, the '089 patent claims allow for the housing to be formed from three members. (Citing JX-2 at claim 1, 4:20-29.) Staff concludes that the SiSonic products practice the asserted claims of the '089 patent.

Staff says the evidence shows that the SiSonic products have been commercially successful as Knowles has made significant sales in the market and has a 90% market share. (Citing CX-608C at Q. 21-27; CX-155C at KE1408526; CX-193C.)

## PUBLIC VERSION

In its reply brief, Staff argues that the evidence has shown that Knowles has proven a nexus between the sales of the SiSonic product and the '089 patent.

Staff contends that a presumption of nexus exists “if the marketed product embodies the claim features, and is coextensive with them.” (Citing *Brown & Williamson Tobacco Corp. v. Philip Morris Inc.*, 229 F.3d 1120, 1130 (Fed. Cir. 2000).) Staff reasons, therefore, Knowles is entitled to a presumption that the sales of the SiSonic products, which are covered by the '089 patent claims, are due to the patented features.

Staff recounts that, in this case, the evidence has shown that Knowles has sold a significant number of SiSonic devices since these packages were first introduced into the market. Staff reiterates that Knowles also has been the leading supplier of MEMS microphones for the past 4 years and has about 90% of the silicon microphone market, and the revenue for the SiSonic products account for almost one-half of Knowles annual sales. (Citing CX-608 at Q. 20-26.) Staff concludes that the evidence has shown that SiSonic products are commercially successful and that success is due to the '089 patent.

**Discussion and Conclusions:** Based on the evidence in the record, I find that Knowles has introduced evidence of industry praise, but that such evidence is insufficient to overcome Analog's *prima facie* showing of obviousness described *supra*.

In Section VI.C.2, *infra*, I find that Knowles' SiSonic products practice claim 1 of the '089 patent. While I will not repeat the detailed discussion or rationale here, I incorporate it here by reference. In Section IV.B.2.e, I discussed in detail the parties' argument and evidence regarding secondary considerations as they applied to the '231 patent. It is undisputed that the arguments made in Section IV.B.2.e related to the '231 patent are equally applicable here, as the evidence relied upon by Knowles was not specific to the '231 patent. I reaffirm that discussion

## PUBLIC VERSION

and those findings and rationales.

The only evidence in the record that supports Knowles' assertion of secondary considerations consists of a single award given to Knowles related to packaging technology. (CX-397 at KE0534385; *see also* CX-398 at KE0534394.) All of the other alleged evidence of secondary considerations does not support Knowles' position for the reasons discussed in Section IV.B.2.e *supra*. I find that a single award given to Knowles to recognize the SiSonic packaging is not enough to overcome the *prima facie* case of obviousness presented by Analog. *See Leapfrog Enters., Inc.*, 485 F.3d at 1162.

### 3. Written Description & Enablement

**Staff's Position:** Staff argues that with respect to the written description requirement, the test for compliance with § 112 has always required sufficient information in the original disclosure to show that the inventor possessed the invention at the time of the original filing. (Citing *Pandrol USA, LP v. Airboss Ry. Products, Inc.*, 424 F.3d 1161, 1165 (Fed. Cir. 2005).) Staff posits that a written description must "clearly allow persons of ordinary skill in the art to recognize that [the inventor] invented what is claimed." (Citing *Ariad Pharm., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010) (*en banc*).) Staff says that descriptions that merely render the claimed invention obvious do not suffice to satisfy the written description requirement. (Citing *Tronzo v. Biomet, Inc.*, 156 F.3d 1154, 1158 (Fed. Cir. 1998).) Staff contends that the written description requirement is not satisfied by describing the result to be achieved with the claimed invention, without describing the particular way in which the claimed invention will achieve the result. (Citing *Regents of the University of California v. Eli Lilly & Co.*, 119 F.3d 1559, 1568 (Fed. Cir. 1997).)

Staff says that it agrees with Analog's contention that if Knowles' preferred construction

## PUBLIC VERSION

of “volume” is adopted, the ‘089 patent would be rendered invalid as not enabled and/or lacking sufficient written description. (Citing RPHB at 128.)

Staff says that to the extent that the term “volume” is construed to mean “a volume being defined by the transducer and one of the first member or second member,” Staff is of the view that the ‘089 specification does not provide any description or enable one to skilled in the art to make a package where this construction would include a front volume. Staff says that while Knowles points to Figures 9, 10, 26, and 27, and the associated text, as a basis for proving that one skilled in the art would know how to make or use such a configuration, Staff disagrees. (Citing JX-2 at Figs. 9, 10, 26, 27.) Staff states that in those figures, the front volume is defined by the transducer, the substrate, and the aperture. (*Id.*) Staff avers that there are no figures or description of a configuration where a front volume is defined only by the transducer or one of the first member or second member. Staff concludes that the evidence has shown that claim 1 is invalid for lack of written description or enablement.

In its reply brief, Staff says that it does not disagree that one skilled in the art knows how to create a package with a front volume or a package with a back volume. Rather, Staff takes issue as to whether one skilled in the art would know how to make and use a package having a front volume defined by the transducer and one of the first member or the second member. Staff contends that the ‘089 patent does not describe a configuration where the front volume is defined in such a manner. Staff says that in each figure, the front volume is defined by the transducer, the cover or the substrate, and the aperture. (Citing JX-2 at Figs. 9, 10, 26, 27.) Staff argues that the ‘089 patent itself provides no description of a configuration of a front volume required by the ‘089 patent claims.

Staff argues that, contrary to Knowles’ arguments, the evidence has not shown how to

## PUBLIC VERSION

make or use a package having a front volume defined by the transducer and one of the first member or the second member. Staff continues that such a configuration would not be possible as the very purpose of the front volume is to allow the acoustic signal to reach the microphone. (Citing CX-460C at Q. 27.) Staff concludes that the evidence has shown that claim 1 is invalid for lack of written description or enablement if the patent claim includes a front volume.

**Knowles' Position:** Knowles says that Analog's expert Dr. Pecht opined, for the first time in his rebuttal expert report, that claim 1 of the '089 patent is invalid to the extent that it includes a configuration where the required "volume" is a "front volume" because the specification fails to "discuss, describe or even mention a 'front volume.'" (Citing RX-407 at ¶ 34.) Knowles avers that for this reason, Dr. Pecht believed that the '089 patent was not enabled or lacked adequate written description. (*Id.*) Knowles says that in his direct witness statement, Dr. Pecht further claims that packaging engineers would have no knowledge of the functionality and performance attributes of the devices that they are packaging. (Citing RX-354C at Q. 33; RX-470 at Qs. 6-9.) Knowles states this was the basis for his argument that the '089 patent is not enabled and lacks adequate written description. (Citing RX-354C at Q. 155, 184.)

Knowles argues that Dr. Pecht's opinion is wrong, because he does not apply the appropriate tests. Knowles says, in his initial expert report, Dr. Pecht stated his understanding is that the "written description" requirement "means that [the invention] must be sufficiently described in the specification so that one of skill in the art can make and use it." (Citing RX-393C at ¶ 30.) Knowles avers that Dr. Pecht testified that this was the test that he used, in part, for his enablement analysis. (Citing Tr. at 680:2-18.) Knowles states that Dr. Pecht used the same test for his written description analysis. (Citing Tr. at 681:6-8; 686:12-22.) Knowles contends that this is the test for enablement, and the two issues and tests are separate and distinct.

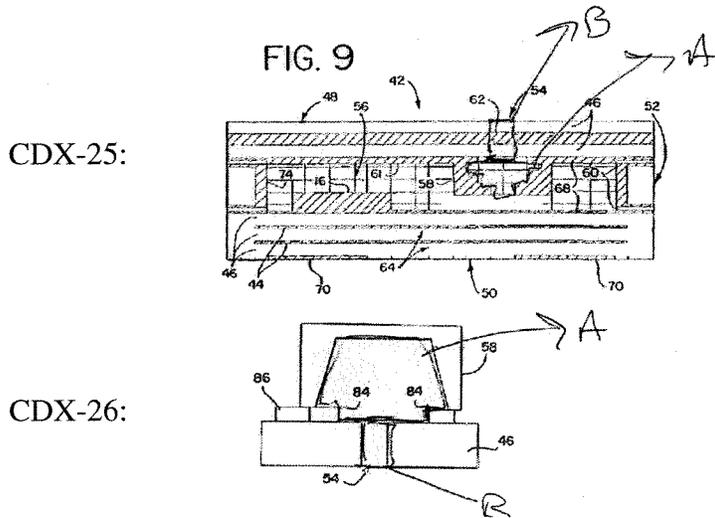
**PUBLIC VERSION**

(Citing *Ariad*, 598 F.3d at 1351.)

Knowles emphasizes that the only test Dr. Pecht claims to have used in his written reports and direct witness statements is the test for enablement. (Citing Tr. at 683:15-685:8.) Knowles argues, however, that Dr. Pecht's witness statement does not even apply the test that he claims to have used. Knowles contends that at no time does Dr. Pecht opine that a person of skill in the art would not be able to make and use the invention without undue experimentation, rather he merely says that a person of skill in the art would not know what a "front volume" is, because the specification only expressly mentions and describes a "back volume." (Citing RX-354C at Q. 184.) Knowles concludes that Dr. Pecht does not even apply the test for enablement which he recites in his expert report, although calling it a test for "written description," and then does not apply any proper test for the written description requirement.

Knowles argues that, apart from this failure to properly apply the tests for the enablement and written description requirements, Dr. Pecht is wrong that the "volume" limitation as to claim 1 of the '089 patent, if defined to include a "front volume," is not enabled or lacks adequate written description applying the appropriate standards. Knowles avers that Dr. Pecht agrees that the '089 patent discloses embodiments in Figures 9 and 27 where there is a space or volume (area labeled "A" in CDX-25 and CDX-26 shown below) underneath the transducer element 58 mounted directly over the aperture element 54 (area labeled "B" in CDX-25 and CDX-26). (Citing Tr. at 687:9-689:20; JX-2 at Figs. 9, 27.)

PUBLIC VERSION

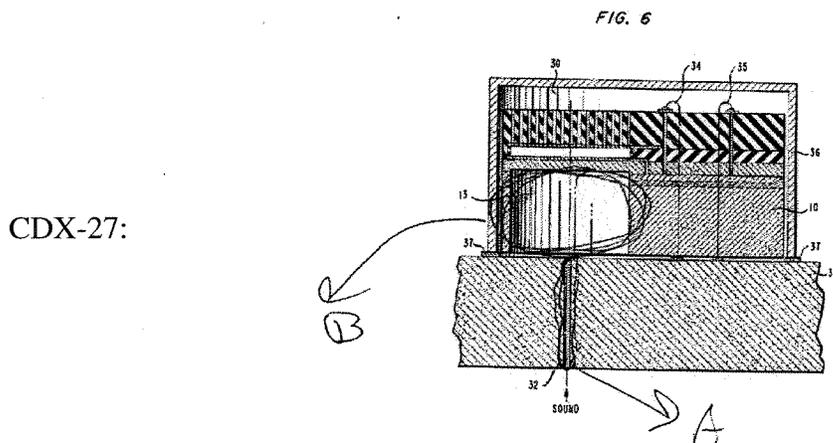


Knowles states that Dr. Pecht agrees that the '089 patent describes how a MEMS microphone element can be attached to the substrate over the acoustic port, that it goes into great detail about the materials used to construct a package, and that it discusses how to electrically connect the transducer to the substrate and to the outside of the package. (Citing Tr. at 689:21-691:13.) Knowles says that essentially, the '089 patent describes in detail how a person of skill in the art can construct a package having a "front volume" defined by the transducer and the substrate and how it can be used by attaching it via solder reflow process to an end-user's board. (Citing Tr. at 693:4-19.) Knowles concludes that a person of skill in the art could make and use an embodiment of the package disclosed in the '089 patent where the space defined by the transducer and one of the first member or the second member is a "front volume" with little or no experimentation whatsoever.

Knowles asserts that Dr. Pecht agrees that a person of skill in the art would have known of the Baumhauer reference (RX-48) (cited by the applicant in the '089 patent) at the time of the filing of the application for the '089 patent. (Citing Tr. at 694:1-18; JX-2 at References Cited, U.S. Patent Documents.) Knowles contends that Baumhauer Figure 6 discloses and describes a front volume made from a MEMS microphone mounted directly over an acoustic port element

PUBLIC VERSION

32 (area labeled “A” in CDX-27) in the printed wiring board or substrate 31, shown below:

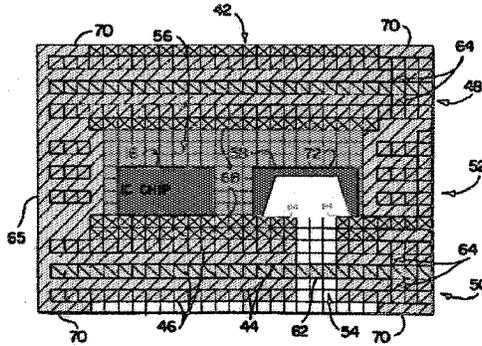


Knowles argues that a person of skill in the art, having reviewed only Baumhauer, would gain an understanding of the “front” and “back” acoustic cavities or volumes of encased silicon condenser microphones. (Citing RX-48 at Background of the Invention and Detailed Description.) Knowles says that Baumhauer makes repeated references to “front” and/or “back” acoustic cavities, including the function of the “front” acoustic cavity which allows passage of the acoustic signal to the diaphragm. (*Id.* at 2:65-3:9, 3:55-59, 4:27-29, 9:12-27, 9:49-61.)

Knowles continues that the drawings and cited references also confirm that that the applicant was in possession of the invention including a “volume” which could be a “front” or “back” volume depending on the configuration of the microphone or transducer in relation to the position of the aperture. Referring to its argument in the infringement portion of its initial brief, Knowles states that the ‘089 patent teaches multiple configurations of the package where the “volume” is a “front volume.” Knowles cites as an example that Figures 26 and 27 disclose an embodiment of claim 7 of the ‘089 patent where “volume” is a “front volume.” (Citing CX-462C at Q. 71; CX-460C at Q. 21; CDX-6C.34 (depicted below); JX-2 at Figs. 9, 10.)

PUBLIC VERSION

CDX-6C.34:



Knowles argues that these figures, and the text describing them, clearly show that the inventor “had possession of the claimed subject matter as of the filing date,” as required for the written description requirement.

Knowles asserts that Dr. Gilileo’s entire rebuttal witness statement, which came in without any cross-examination, was directed solely to the issues of enablement and written description. (Citing CX-611.) Knowles says that Dr. Gilileo notes that Dr. Pecht fails to apply any particular or proper test to his assertion that the ‘089 patent is not enabled or lacks adequate written description. (*Id.* at Q. 9.) Knowles continues that Dr. Gilileo then recites the proper tests that he is applying for his analysis of the enablement and written description requirements and the proper procedure to follow for claim construction as he understands it. (*Id.* at Q. 13.)

Knowles contends that in view of the applied definition of a person having ordinary in the art, Dr. Gilileo notes that device packaging is application specific and that packaging engineers must have some understanding of the device they are packaging in order properly package the device. (Citing CX-611 at Q. 14, 16.) Knowles states that Dr. Tummala agrees that the device dictates the package requirements. (*Id.* at Q. 16 (citing CX-420C at 180:9-15).) Knowles argues if it were otherwise, a person of skill in the art in packaging may not produce a functioning device as a result of his efforts, let alone a device with optimal performance which would be a goal of any such person. (*Id.*) Knowles adds that Dr. Gilileo opines that a person of

**PUBLIC VERSION**

skill in the art with regard to the '089 patent would have a basic understanding of microphones, particularly since the '089 patent incorporates by reference U.S. Patent 5,780,482 to Loeppert which is a patent for a MEMS microphone. (*Id.* at Q. 17, 18; CX-278.)

Knowles asserts that Dr. Gilleo reiterates his understanding of “volume” in the context of the '089 patent and the functions of the “front volume” and “back volume” for encased or enclosed microphones. (Citing CX-611 at Q. 19.) Knowles says Dr. Gilleo opined that since claim 1 must include the narrowing limitations of claims 7, 8, 9 and 12, “volume” can mean either “back volume” or “front volume” which are both acoustically coupled to the transducer. (*Id.*)

Knowles continues that with this background, Dr. Gilleo opined that a person of ordinary skill in the art would know how to use and make the claimed invention with little or no experimentation. (Citing CX-611 at Q. 22, 23.) Knowles says that according to Dr. Gilleo, the '089 patent serves as a virtual “blue print” for anyone desiring to build and test a package having a “front volume” being defined by one of the first or second members. (*Id.* at Q. 23.) Knowles asserts that Dr. Gilleo also finds that, if claim 1 of the '089 patent is interpreted to include a “front volume,” the patent shows that the applicant had possession of the claimed subject matter as of the filing date and that he had an understanding of the basic configurations of encased microphones. (*Id.* at Q. 24, 25.) Knowles adds that an article by Knowles' employee Dr. Stephen C. Thompson published in August 2000 describes “front” and “back” volumes and their functions in encased non-directional microphones. (*Id.* (citing CX-573 p. 2).) Knowles concludes that Dr. Gilleo notes that both Baumhauer (RX-48) and Mullenborn (RX-19), listed in the '089 patent as References Cited, disclose “front” acoustic chambers or cavities which allow an acoustic signal to reach the microphone. (*Id.* at Q. 25.)

## PUBLIC VERSION

Knowles says that Dr. Bauer also disagreed with Dr. Pecht and opined that Minervini '089 is enabled and provides adequate written description of "front volume" within the meaning of the "volume" of claim 1. (Citing CX-610 at Q. 140, 141.)

Knowles argues that a person of ordinary skill in the art could make and use a package of the '089 patent having a "front volume" within the meaning of claim 1 with little or no experimentation. Knowles asserts that there is a wealth of guidance in the '089 patent on how to construct such a package' along with examples and drawings depicting such a configuration. Knowles notes that claim 7 of the '089 patent is directed to this very configuration. Knowles contends that the prior art and other relevant industry information shows that a person packaging a microphone would have some understanding of the functions and performance attributes of the microphone. Knowles argues that a packaging engineer would need to have some understanding of the necessary functions of the housing or package to incorporate the device into the package.

In its reply brief, Knowles notes that Analog has not briefed the issue of whether claim 1 of the '089 patent is not enabled or lacks adequate written description. Knowles asserts that Analog, therefore, has waived such invalidity arguments. (Citing Ground Rule 11.1; *Certain Flooring Products*, Inv. No. 337-TA-443, Comm'n Determination, 2002 WL 7321 16, at 6 and n. 12 (April 23, 2002); *Certain Integrated Circuits, Processes for Making Same, and Products Containing Same*, Inv. No. 337-TA-450, Comm'n Opinion at 32, 44-45, 54-55 (July 24, 2003).)

Knowles addresses the Staff's argument saying that, having stated the tests for enablement and written description, the Staff provides no analysis based on any expert testimony that a person of ordinary skill would be unable to make and use the invention having a "front volume" without undue experimentation. Knowles adds that Staff fails to cite to any evidence to show that a person of ordinary skill in the art would not recognize such a "front volume" and that

## PUBLIC VERSION

the inventor did not possess the claimed invention at the time of the filing of the application.

Knowles argues that it has shown through credible and substantial expert testimony that the '089 patent is enabled and provides adequate written description of a "front volume" under these tests. Knowles asserts that it has shown that the '089 patent not only discloses, but claims (in claim 7), a configuration having a volume defined by the transducer and substrate where the transducer is mounted directly over the aperture or sound port.

Knowles says that Staff's argument is that the "front volume," to the extent it is the "volume" of claim 1, is defined by the transducer, the substrate and the aperture. Knowles states that according to Staff, "[t]here are no figures or description of a configuration where a front volume is defined only by the transducer or one of the first member or second member." Knowles argues that Staff is attempting to add word "only," an additional limitation, to the proposed construction that "volume" is "a space defined by the transducer and one of the first or second member." Knowles contends there is no requirement that the "volume" be defined only by the transducer and one of the first member or second member.

Knowles cites as an example, in the configuration of claim 7 of the '089 patent in which the transducer is mounted directly over the aperture, the "front volume" is defined by the transducer and the substrate which is one of the first member or second member. Knowles says it is not defined by both the first member and the second member. Knowles argues that the fact that the substrate contains an aperture does not diminish the fact that the "front volume" meets the limitation of a "a space defined by one of the first member or the second member." Knowles says that Mr. Harney testified that the "front volume" in the accused devices is the "space from the bottom of the back plate (of the transducer) to the virtual surface created by the surface of the substrate." (Citing Tr. at 394:25-395:5.) Knowles avers that Analog's expert, Dr. Bauer,

## PUBLIC VERSION

admitted that he did not understand claim 7, and Analog did not attempt to rehabilitate this testimony on redirect. (Citing Tr. at 692:9-11.) Knowles argues that Dr. Bauer has no credibility on this issue.

Knowles asserts that the specification of the '089 patent reflects that the aperture is merely a part of the first or second member. Knowles says that the '089 patent has numerous references to the fact that the cover or substrate, which make up the housing, "includes" an aperture. (Citing JX-2 at Abstract, 1:55-57, 3:66, 4:22-23, 4:37-39.) Knowles says in fact, claim 1 of the '089 patent itself requires "one of the first member or the second member [be] formed to include an aperture ...." (*Id.* at 11:41-42) (emphasis added by Knowles). Knowles concludes that Staff's argument that the aperture is a third element defining the "volume," and that such a configuration is not enabled or lacks adequate written description, simply has no merit.

**Analog's Position:** Analog has not offered a position on the issues of written description or enablement.

**Discussion and Conclusions:** Based on the evidence in the record, I find that the '089 patent meets the enablement and written description requirements of the first paragraph of 35 U.S.C. § 112.

The first paragraph of 35 U.S.C. § 112 states:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art ... to make and use the same ...

The first paragraph of § 112 contains three separate requirements: enablement, written description,<sup>39</sup> and best mode. *Univ. of Rochester v. G.D. Searle & Co.*, 358 F.3d 916, 921 (Fed. Cir. 2004) (describing the "[t]hree separate requirements" of § 112, ¶ 1); *Standard Oil Co. v. Am.*

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<sup>39</sup> The Federal Circuit recently reaffirmed in an *en banc* decision that § 112, ¶ 1 contains a written description requirement separate from the enablement requirement. *Ariad Pharm., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1340 (Fed. Cir. 2010) (*en banc*).

## PUBLIC VERSION

*Cyanamid Co.*, 774 F.2d 448, 452 (Fed. Cir. 1985) (stating that § 112, ¶ 1 “requires that the inventor adequately disclose three separate items”).

Regarding the written description requirement, the Federal Circuit has interpreted 35 U.S.C. § 112, ¶ 1, to require the patent specification to “describe the claimed invention so that one skilled in the art can recognize what is claimed.” *Enzo Biochem, Inc. v. Gen-Probe Inc.*, 323 F.3d 956, 968 (Fed.Cir.2002). In evaluating whether a patentee has fulfilled this requirement, the standard is that the patent’s “disclosure must allow one skilled in the art ‘to visualize or recognize the identity of’ the subject matter purportedly described.” *Id.* (quoting *Regents of Univ. of Cal. v. Eli Lilly & Co.*, 119 F.3d 1559, 1573 (Fed.Cir.1997)); *see also Cordis Corp. v. Medtronic Ave, Inc.*, 339 F.3d 1352, 1364 (Fed. Cir. 2003).

Terms need not be used *in haec verba*. *Eiselstein v. Frank*, 52 F.3d 1035, 1038 (Fed.Cir.1995). The written description requirement can be satisfied by “words, structures, figures, diagrams, formulas, etc.” *Lockwood v. Am. Airlines, Inc.*, 107 F.3d 1565, 1572 (Fed.Cir.1997).

The Federal Circuit has found that the enablement requirement is satisfied when the inventor provides sufficient information about the claimed invention so that one skilled in the art, after reading the specification, could practice the claimed invention without undue experimentation. *AK Steel Corp. v. Sollac*, 344 F.3d 1234, 1243-1244 (Fed. Cir. 2003); *Sitrick v. Dreamworks, LLC*, 516 F.3d 993, 999 (Fed. Cir. 2008); *In re Wands*, 858 F.2d 731, 736-737 (Fed. Cir. 1988). Enablement is determined from the viewpoint of persons of ordinary skill in the field of the invention at the time the patent application was filed. *Ajinomoto Co., Inc. v. Archer-Daniels-Midland Co.*, 228 F.3d 1338, 1345 (Fed. Cir. 2000).

Staff’s argument focuses entirely on distinguishing a “front” volume from a “back”

## PUBLIC VERSION

volume, saying alternatively that a person having skill in the art would not recognize what is claimed in the '089 patent based upon the construction adopted here (and in the '629 investigation), to wit: "a space being defined by the transducer and one of the first member or second member."

Knowles' expert, Dr. Gilleo, testified that a person of ordinary skill in the art with regard to the '089 patent would have some understanding of microphones and how they operate. (CX-611 at Q. 17-18, 20.) As set forth in detail in Section, III.C.5, *supra*, both Dr. Egolf and Dr. Gilleo testified in depth regarding the structure and function of a microphone as related to a volume, and they described "front volumes" and "back volumes" in their testimony. I will not repeat the details here; but incorporate them by reference. (*See also* CX-611 at Q. 19.)

Dr. Gilleo testified credibly that if the "volume" of the '089 patent claim 1 is interpreted to include "front" volume, the patent demonstrates that the inventor had possession of the claimed subject matter as of the filing date. Dr. Gilleo said that the inventor introduces acoustics and acoustic packaging in the background and throughout the specification demonstrating that he knew what he was doing and why he was doing it. Dr. Gilleo testified that, at the time of the invention and earlier, the term "front volume" (aka front chamber, front cavity, front acoustic cavity, and other equivalents) was applied to microphones, hearing aids and to their packages. (CX-611 at Q. 24-25.)

Dr. Gilleo's testimony is supported by the '089 patent, which shows in Figure 27, a cross-sectional view of a microphone mounted over an acoustic port or aperture 54. This is an example of a volume that does not meet the definition of "back" volume, because it is not airtight and does not, therefore, provide the resistance to the deflection of the diaphragm required of a

## PUBLIC VERSION

back volume. (JX-2 at 7:29-37, Fig. 27; CX-462C at Q. 71; Section III.C.5, *supra* discussing the construction of the term “volume”.)

Figure 27 of the ‘089 patent illustrates the configuration shown in claim 7, which teaches:

The surface mountable package of claim 1, the aperture being formed in the respective one of the first member and the second member, the surface being formed on the respective one of the first member and the second member and the transducer being attached to the surface completely covering the aperture.

(JX-2 at 11:62-67.)

I conclude that the ‘089 patent clearly demonstrates that the inventor described the claimed invention so that one skilled in the art can recognize what is claimed using the construction of “volume” set forth herein.

Regarding the issue of enablement, staff errs when it contends that the ‘089 patent “does not provide any description or enable one to skilled in the art to make a package where this construction would include a front volume.” Staff’s argument is based in part on its belief that, in JX-2, Figures 9, 10, 26, 27, the front volume is defined by the transducer, the substrate, and the aperture. This is incorrect.

The ‘089 patent consistently describes the acoustic aperture as being “in” the respective first member or second member. It is, therefore, merely a part of the respective first member or second member in which it is situated. In addition to claim 7, described *supra*, claim 1 teaches “once of the first member or the second member being formed to **include** an aperture, the aperture being configured to permit the passage of an acoustic signal to the transducer.” (JX-2 at 11:41-44) (emphasis added). Claims 8, 9, 10, 11, 13, 25 all describe that the aperture as being formed “in the respective one of the first member and the second member.”

Knowles has correctly pointed out other examples of specific reference to the aperture being a part of the structure to include, JX-2 at Abstract, 1:55-57, “[t]he cover is placed over the

## PUBLIC VERSION

transducer and includes an aperture adapted for allowing sound waves to reach the silicon condenser transducer”; 3:66, “[t]he cover 20 contains an aperture ...”; and 4:22-23, “[t]he housing 42 further includes an aperture or acoustic port 54 for receiving an acoustic signal ...”

I conclude that the aperture described in the ‘089 patent is part of the respective first member and the second member and is not a separate element that defines the volume.

Dr. Gilleo testified credibly that incorporating the transducer devices into the package of the ‘089 patent is something that a person would know having completed “a few semesters of college physics or other course work that included some material on acoustics,” and that a person degreed in engineering would learn on the job with “no problem.” (CX-611 at Q. 20.) Dr. Gilleo listed references to support his position, including CX-297, CX-573, CX-574.

Dr. Gilleo testified that the ‘089 patent thoroughly describes the requirements that the successful package invention must achieve while pointing out deficiencies in earlier packaging art. He said the generous use of figures effectively provides a “blue print” for anyone who desires to practice and test the invention. He detailed some of the contents of the ‘089 patent that teach how to make the invention, what materials to use, what processes can be applied and why it makes sense. Dr. Gilleo stated that the patent provides “extraordinary details for materials, dimensions, processes and for fabricating the packages, right down to plating thicknesses of the various finishes. He opined that the ‘089 patent provides a person of ordinary skill in the art sufficient detail to build microphone packages using the patent figures and supporting material descriptions to include a front volume as defined herein. (CX-611 at Q. 22, 23.)

By contrast, in reaching his opinion, Dr. Pecht appeared not to understand or to have applied the correct standard for determining the issue of written description. (Tr. at 680:2-18, 681:6-8, 686:12-22.) His credibility suffers as a result.

## PUBLIC VERSION

I conclude that the evidence supports a finding that the '089 patent provides sufficient information about the claimed invention so that one skilled in the art, after reading the specification, could practice the claimed invention without undue experimentation.

Based upon the foregoing, I find that the '089 patent meets the enablement and written description requirements of the first paragraph of 35 U.S.C. § 112.

### V. INFRINGEMENT

#### A. Applicable Law

A complainant must prove either literal infringement or infringement under the doctrine of equivalents. Infringement must be proven by a preponderance of the evidence. *SmithKline Diagnostics, Inc. v. Helena Labs. Corp.*, 859 F.2d 878, 889 (Fed. Cir. 1988). A preponderance of the evidence standard “requires proving that infringement was more likely than not to have occurred.” *Warner-Lambert Co. v. Teva Pharm. USA, Inc.*, 418 F.3d 1326, 1341 n. 15 (Fed. Cir. 2005).

Literal infringement is a question of fact. *Finisar Corp. v. DirecTV Group, Inc.*, 523 F.3d 1323, 1332 (Fed. Cir. 2008). Literal infringement requires the patentee to prove that the accused device contains each and every limitation of the asserted claim(s). *Frank's Casing Crew & Rental Tools, Inc. v. Weatherford Int'l, Inc.*, 389 F.3d 1370, 1378 (Fed. Cir. 2004).

As for the doctrine of equivalents:

Infringement under the doctrine of equivalents may be found when the accused device contains an “insubstantial” change from the claimed invention. Whether equivalency exists may be determined based on the “insubstantial differences” test or based on the “triple identity” test, namely, whether the element of the accused device “performs substantially the same function in substantially the same way to obtain the same result.” The essential inquiry is whether “the accused product or process contain elements identical or equivalent to each claimed element of the patented invention[.]”

*TIP Sys., LLC v. Phillips & Brooks/Gladwin, Inc.*, 529 F.3d 1364, 1376-77 (Fed. Cir. 2008)

## PUBLIC VERSION

(citations omitted).

Thus, if an element is missing or not satisfied, infringement cannot be found under the doctrine of equivalents as a matter of law. *London v. Carson Pirie Scott & Co.*, 946 F.2d 1534, 1538-39 (Fed. Cir. 1991). Determining infringement under the doctrine of equivalents “requires an intensely factual inquiry.” *Veicular Techs. Corp. v. Titan Wheel Int’l, Inc.*, 212 F.3d 1377, 1381 (Fed. Cir. 2000).

### **B. The ‘231 Patent**

Claim 1 of the ‘231 patent recites:

1. A microelectromechanical system package comprising:

a microelectromechanical system microphone;

a substrate comprising a surface for supporting the microelectromechanical microphone;

a cover comprising a conductive layer having a center portion bounded by a peripheral edge portion;

and a housing formed by connecting the peripheral edge portion of the cover to the substrate, the center portion of the cover spaced from the surface of the substrate to accommodate the microelectromechanical system microphone, the housing including an acoustic port for allowing an acoustic signal to reach the microelectromechanical system microphone wherein the housing provides protection from an interference signal.

**Knowles’ Position:** Knowles contends that the accused devices infringe claim 1.

Knowles argues that the accused products are microelectromechanical system packages. Knowles states that the accused products include a first and second level connection from the microphone die and ASIC to an end-user product by direct mounting onto a printed circuit board. Knowles claims that the second level electrical and mechanical connection to the printed circuit board is made directly beneath the package and the devices within it. According to Knowles, the package and the connections protect the internal circuitry from mechanical and environmental

**PUBLIC VERSION**

stress. (Citing CX-462C at Q. 36, 46; Tr. at. 388:9-399:24.) Knowles notes that the data sheets for the accused products refer to the device as a “package” which includes a “MEMS microphone element.” (Citing CX-462C at Q. 36.)

Knowles states that based on Dr. Gilleo’s examination of the accused devices, it is clear that each accused device contains a MEMS microphone element. (Citing CPX-1 through CPX-6; CX-462C at Q. 39.) Knowles claims that there is no dispute that the “microelectromechanical system microphone” element is satisfied. (Citing CX-371C.)

Knowles asserts that it is undisputed that the MEMS microphone in the accused products is mounted on the substrate portion of the package. (Citing CX-462C at Q. 40.) Knowles notes that a document entitled {

} (Citing CX-366C.) Knowles claims that Dr. Gilleo’s physical examination confirmed that the MEMS microphone is supported by the package substrate. (Citing CPX-1 through CPX-6.)

Knowles claims that the accused products have a cover comprising a conductive layer having a center portion bounded by a peripheral edge portion. (Citing CX-462C at Q. 41.) Knowles asserts that the cover is made of { } and is therefore conductive. (Citing CX-462C at Q. 41.) Knowles claims that Analog’s product data sheets corroborate that the cover element is satisfied. (Citing CX-462C at Q. 41.)

Knowles states that the peripheral edge portion of the cover in the accused products is connected to the substrate. (Citing CX-462C at Q. 42.) Knowles claims that Analog’s product data sheets corroborate that the housing element is satisfied. (Citing CX-462C at Q. 42.) According to Knowles, Dr. Gilleo’s inspection confirmed that the housing is formed by attaching the peripheral edge portion of the cover to the substrate. (Citing CPX-1 through CPX-6; CDX-

**PUBLIC VERSION**

462C at Q. 42.)

Knowles asserts that the center portion of the cover in the accused devices is spaced from the surface of the substrate to accommodate the MEMS microphone. (Citing CX-462C at Q. 43.) According to Knowles, Dr. Gilleo's physical examination confirmed the presence of this element. (Citing CPX-1 through CPX-6; CX-462C at Q. 43.)

Knowles claims that the accused devices contain an opening through the substrate below the MEMS die labeled the "aperture" or "sound port." (Citing CX-462C at Q. 44.) Knowles states that the opening allows an acoustic signal to reach the MEMS die. (Citing CX-462C at Q. 44.) According to Knowles, Dr. Gilleo's physical examination confirmed the presence of this element. (Citing CPX-1 through CPX-6; CX-462C at Q. 44.) Knowles claims that even under Analog's proposed construction of "acoustic port," the accused devices meet this claim limitation. (Citing CX-462C at Q. 44; JX-1 at 4:20-23.)

Knowles argues that the housing of the accused devices provides electrical grounding and isolates the package from external signal interferences. (Citing CX-462C at Q. 45.) Knowles notes that wiring diagrams in the data sheets for the accused devices include the symbol for shielding or grounding. (Citing CX-462C at Q. 45.) Knowles states that Mr. Plante of Analog testified that { } (Citing CX-22C at 29:25-30:3.) Knowles claims that physical examination of, and tests performed on, the accused devices confirm that the metallic cover is connected to { } which is a method of creating an electromagnetic shield. (Citing CX-462C at Q. 45.)

In its reply brief, Knowles claims that Analog is wrong to argue that Knowles failed to prove infringement under Knowles' proposed construction of "package." Knowles notes that Dr. Gilleo offered sufficient testimony regarding the needed protection provided by a package.

**PUBLIC VERSION**

(Citing CX-462C at Q. 36, 46; Tr. at 252:23-253:10, 255:5-25, 324:13-325:2.) Knowles asserts that Mr. Harney testified that {  
} (Citing Tr. at 388:9-399:24.)

**Analog's Position:** Analog contends that Knowles failed to demonstrate infringement of claim 1.

Analog states that under Knowles' proposed construction of "package," the package must provide protection against mechanical shock and vibration. (Citing CX-461 at Q. 21, 32; CX-613 at 11, 19.) Analog argues that Dr. Gilileo's testimony failed to demonstrate this feature, as Dr. Gilileo merely testified that the package lid is bonded to the substrate and the MEMS microphone is soldered to the substrate. (Citing Tr. at 245:6-13, 250:3-252:8, 255:16-25; RX-385 at 110:3-111:1, 181:17-19.) Analog thus argues that to the extent that Knowles' proposed construction of "package" is adopted, Knowles has failed to prove infringement.

Analog additionally argues that the accused devices lack an "acoustic port" under Analog's proposed claim construction because there is no way for acoustic energy to enter the chamber. (Citing RX-355C at Q. 49-57.) Analog states that because the MEMS microphone in the accused products completely covers the sound hole where sound enters the package, no relevant amount of acoustic energy ever reaches the chamber. (Citing RX-355C at Q. 49-57.) Thus, Analog concludes that the sound hole is not an "acoustic port" under Analog's proposed construction.

**Staff's Position:** Staff contends that the evidence demonstrates that the accused products literally infringe claim 1 of the '231 patent.

Staff asserts that the accused products are "microelectromechanical system package[s]."

## PUBLIC VERSION

Staff argues that the packages provided the required first level connection, second level connection, and protection. (Citing CX-462C at Q. 36.0)

Staff claims that the accused products contain a MEMS microphone element. Staff bases this belief on internal Analog documents and the testing performed by Dr. Gilleo. (Citing CX-462C at Q. 39; CX-485C; CX-537C; CX-540C; CX-481C; CX-480C; CX-542C.)

Staff states that the accused products include a “substrate comprising a surface for supporting the microelectromechanical microphone.” Staff notes that the accused products contain a microphone { } (Citing CX-462C at Q. 40; CX-14C; CX-137C; CX-366C.)

Staff argues that the accused products include the claimed cover. Staff claims that the evidence demonstrates that the cover in the accused products is composed of {

} which is a conductive material. (Citing CX-462C at Q. 41.) Staff states that the cover has a center portion that is separate from the substrate and a peripheral edge portion that is attached to the substrate. (Citing CX-462C at Q. 41.)

Staff asserts that the accused products include the claimed housing. According to Staff, the evidence shows that the housing is formed by connecting the peripheral edge portion of the cover to the substrate. (Citing CX-462C at Q. 42.)

Staff claims that the center portion of the cover is spaced from the surface of the substrate to accommodate a MEMS microphone. Staff states that the evidence shows that the accused products include a metal lid with a raised shape that creates space for the MEMS microphone. (Citing CX-462C at Q. 43; CX-14C; CX-137C.)

Staff asserts that the housing of the accused products includes the claimed acoustic port. Staff states that the substrate contains a port that allows the sound from the outside to enter into

## PUBLIC VERSION

the package and reach the MEMS microphone. (Citing CX-462C at Q. 44.) Staff argues that Analog's non-infringement argument related to this claim element is based on its faulty construction of "acoustic port." Staff asserts that there is no requirement in claim 1 for the acoustic signal to enter the chamber.

Staff claims that the housing of the accused products provides protection from an interference signal. Staff notes that the cover of the accused products is electrically conductive and connected to the ground terminal in the package. (Citing CX-462C at Q. 45.) Staff claims that the electrical grounding protects the package from external signal interferences. (Citing CX-462C at Q. 45.)

**Discussion and Conclusion:** In Section IV.B *supra*, I have concluded that claim 1 of the '231 patent is invalid. Assuming *arguendo* that claim 1 is found to be valid, I find that Knowles has proven by a preponderance of the evidence that Analog's accused products literally infringe claim 1 of the '231 patent.<sup>40</sup>

I find that the accused products are microelectromechanical system packages. (CX-462C at Q. 36-38.) I construed the term "package" to mean "a single, self-contained unit which fully encloses a device, and which provides: (1) protection for the device from the external environment, (2) an electrical connection between the device and the package, and (3) an electrical connection between the package and another circuit outside of the package." The accused products are "microelectromechanical system packages" under this construction. (*Id.*; CX-485C; CX-536C; CX-353C; CX-537C; CX-540C; CX-480C; CX-481C; CX-542C; CX-600C; CX-486C; CX-487C; CX-488C.)

I find that the accused products contain a microelectromechanical system microphone.

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<sup>40</sup> I find that the accused products can be treated in a single analysis for purposes of the '231 patent. (CX-462C at Q. 21-22, 35; CX-203C at 46-48; CX-134C; CX-138C at ¶¶ 55.)

**PUBLIC VERSION**

(CX-462C at Q. 39.) This is supported by various Analog documents. (*See, e.g.*, CX-485C; CX-536C; CX-537C; CX-540C; CX-480C; CX-481C; CX-542C.) Furthermore, Mr. Harney acknowledged the existence of a MEMS microphone in the accused products. (CX-138C at ¶¶ 55-57.)

I find that the accused products contain a substrate comprising a surface for supporting the microelectromechanical microphone. (CX-462C at Q. 40.) In the accused devices, the substrate supports the MEMS microphone. (CX-14C; CX-137C.) Specifically, the MEMS microphone is { } (CX-366C.)

I find that the accused products contain a cover comprising a conductive layer having a center portion bounded by a peripheral edge portion. (CX-462C at Q. 41; CX-14C.) The cover is composed of { } meaning that it is electrically conductive. (CX-462C at Q. 41; CX-367C.)

I find that the accused products contain a housing formed by connecting the peripheral edge portion of the cover to the substrate, the center portion of the cover spaced from the surface of the substrate to accommodate the microelectromechanical system microphone. (CX-462C at Q. 42-43.) The evidence demonstrates that the peripheral edge portion of the metal cover is connected to the substrate to form a housing, as an internal Analog document {

} (CX-366C.) The center portion of the cover is spaced from the substrate to accommodate a MEMS microphone. (CX-14C.)

I find that the housing of the accused products includes an acoustic port for allowing an acoustic signal to reach the microelectromechanical system microphone. I construed “acoustic port” to mean “an opening that allows the passage of an acoustic signal.” Based on this

**PUBLIC VERSION**

construction, I find that the housing of the accused products includes the necessary acoustic port. (CX-462C at Q. 44.) I note that the Analog data sheets for the accused products refer to the acoustic port as the “microphone sound port,” “microphone port,” “microphone hole,” and/or “sound port of the microphone.” (See, e.g., CX-485C; CX-536C; CX-480C; CX-481C.)

Finally, I find that the housing provides protection from an interference signal. (CX-462C at Q. 45.) An Analog internal document {  
} (CX-366C.) Stephen Plante, a product engineering manager for MEMS microphones at Analog, testified that {  
} (CX-22C at 28:16-30:5.)

Analog offers two non-infringement arguments. The first is based on Knowles’ proposed construction of “package.” (RIB at 30-31.) The second is based on Analog’s proposed construction of “acoustic port.” (*Id.* at 31.) Because I have not adopted Knowles’ proposed construction of “package” or Analog’s proposed construction of “acoustic port,” I find that Analog’s non-infringement arguments fail.

Based on the foregoing, I find that Knowles has proven by a preponderance of the evidence that Analog’s accused products literally infringe claim 1 of the ‘231 patent.

**C. The ‘089 Patent**

**1. Claim 1**

Claim 1 of the ‘089 patent recites:

1. A surface mountable package for containing a transducer, the transducer being responsive to sound pressure levels of an acoustic signal to provide an electrical output representative of the acoustic signals, the surfacemountable package comprising:

## PUBLIC VERSION

at least a first member and a second member and a chamber being defined by the first member and the second member, the transducer being attached to a surface formed on one of the first member or the second member and the transducer residing within the chamber;

the surface being formed with at least one patterned conductive layer, the patterned conductive layer being electrically coupled to the transducer;

an outside surface of the surface mountable package comprising a plurality of terminal pads electrically coupled to the patterned conductive layer;

a volume being defined by the transducer and one of the first member or the second member, the volume being acoustically coupled to the transducer;

and one of the first member or the second member being formed to include an aperture, the aperture configured to permit the passage of an acoustic signal to the transducer.

**Knowles' Position:** Knowles begins with a general argument applicable to all of the asserted claims. Knowles says it presented the witness statement of its expert Dr. Gilleo (CX-462C) in support of its claim that the accused devices infringe the '089 patent. Knowles adds that it offered the witness statement of its expert Dr. Egolf (CX-460C) in support of its claim that the accused devices infringe claim 1 of the '089 patent by meeting the "volume" limitation, either literally or under the doctrine of equivalents. Knowles notes that both Drs. Gilleo and Egolf were subjected to cross-examination and re-direct examination; but Analog offered no expert testimony whatsoever in rebuttal.

Knowles asserts that in performing his analysis, Dr. Gilleo used "the agreed-upon" construction for "substrate" and "surface," the constructions applied in the 629 investigation for "transducer" and "electrically coupled," and Knowles' proposed constructions for the disputed terms for "surface mountable," "package," "patterned conductive layer," "surface mountable package," "attached," "surface/surface formed on one of the first member or the second member," and "volume." (Citing CX-462C at Q. 18.) Knowles says as an alternative, Dr. Gilleo

## PUBLIC VERSION

also considered the accused devices using the constructions proposed by Analog and the Staff in CX-554 and those adopted in the TEO ID, and found that the accused devices infringe the asserted claims of the patents-in-suit. (Citing CX-462C at Q. 54, 55.) Knowles argues that regardless of the construction applied, Dr. Gilleo ended up with the same result – the accused devices infringe either literally or under the doctrine of equivalents. (Citing Tr. at 235:3-11, 252:9-19.) Knowles adds that in his limited role of analyzing whether the accused devices met the *volume* limitation of claim 1, Dr. Egolf used the definitions of “transducer” to be a “microphone” and “volume” to be “a space defined by the transducer and one of the first member or second member” as construed in the 629 investigation. (Citing CX-460C at Q. 16.)

Knowles asserts that Dr. Gilleo reviewed Minervini ‘089 and its prosecution history and numerous Analog documents related to the accused devices. (Citing CX-462C at Q. 20.) Knowles referred to Dr. Gilleo’s technical analysis of the accused devices is described in CIB section III.B.2.

Knowles says that Dr. Egolf’s review was limited to whether there is a “volume” as required by claim 1 of the ‘089 patent. (Citing CX-460C at Q. 2, 24.) Knowles avers that Dr. Egolf reviewed the ‘089 patent, described the basic features of a microphone as disclosed in the ‘089 patent and further analyzed the basic features of encased microphones having “front” and “back” volumes, chambers or cavities and the functions of such spaces or volumes. (Citing CX-460C at Q. 11-14, 17, 19, 21.) Knowles contends that based on his review of the product data sheets and other materials related to the configuration of the accused devices, including the ADMP401, ADMP402, ADMP403, ADMP404, ADMP405 and ADMP421, Dr. Egolf found that the accused devices have a “front” volume defined by the transducer and the substrate. *Id.* at (Citing CX-460C at Q. 25-27.) Knowles says that Dr. Egolf further found that the accused

**PUBLIC VERSION**

devices have an enclosed “back” volume defined by the transducer, the cover and the substrate. (Citing CX-460C at Q. 28, 29.) Knowles argues that the “back” volume of the accused devices is functionally equivalent to an enclosed “back” volume formed by the transducer and substrate only. (Citing CX-460C at Q. 30-33.)

Knowles argues that the accused devices are clearly packages with first and second level connections that contain a MEMS microphone element. (Citing CX-462C at Q. 65.) Knowles contends that Analog’s product data sheets in the “General Description” expressly refer to the accused devices as “surface mount packages” that are “reflow solder compatible,” and in the “Handling Instructions” state that they can be used with “standard pick-and-place and chip shooting equipment,” as well as “standard reflow solder conditions,” evidencing that the accused devices are to be used with automated, surface mount assembly processes to attach the package to a printed circuit board. (*Id.*)

Knowles adds that Dr. Gilleo’s physical examination of the accused devices confirms that they are surface mountable packages for a microphone, providing a protective enclosure and two levels of interconnection. (Citing CX-462C at Q. 65.) Knowles states that by referring back to his answer to Q. 36 regarding whether the accused devices were “packages” within the meaning of the ‘231 patent, Dr. Gilleo further testified that the terminal pads, solid vias, and connections provide the needed mechanical support which protects the MEMS die and ASIC. (Citing Tr. at 252:23-253:10.) Knowles asserts that these second level connections are directly under the device. (Citing CX-462C at Q. 46.) Knowles says in fact, the ADMP403 which Dr. Gilleo { }

(Citing CX-462C at Q. 65.) Knowles argues that the fact that the second level connections provided mechanical support and protection for the device was further illustrated by Dr. Gilleo

PUBLIC VERSION

when he testified at trial {

} (Citing Tr. at 255:5-25; 324:13-325:2, 388:9-399:24.)

Knowles avers that although the evidence shows that the accused devices are “surface mountable packages” under Knowles’ proposed definitions of “package,” “surface mountable,” and “surface mountable package,” Dr. Gilleo alternatively testified that the accused devices are “surface mountable packages” under the constructions proposed by Analog and the Staff and under the construction adopted in the TEO ID. (Citing CX-462 at Q. 66, 67.) Knowles concludes that this element is met regardless of whose proposed construction is applied.

Knowles asserts that the accused devices include a substrate (which is a first or second member) and a cover (which is a first of second member), which when joined together, form an interior region or space which is the chamber. (Citing CX-462C at Q. 68.) Knowles says the microphone in the accused devices is attached to the upper surface of the substrate, and the cover is attached to the substrate. (*Id.*) Knowles adds that Dr. Gilleo’s physical examination of the accused devices establishes that the substrate and cover come together to form a chamber and that the MEMS microphone resides in the chamber attached to the surface of the substrate. (*Id.*) Knowles avers that Analog’s data sheets and other documents confirm that this element is met by the accused devices. (*Id.*)

Knowles alleges {

} (Citing CX-462C at Q. 69.) Knowles says that

consistent with the specification of the ‘089 patent, {

} constitute a “patterned conductive layer.” (*Id.*) Knowles argues that

Analog’s documents show {

} (*Id.*) Knowles reasons that this is consistent with the

**PUBLIC VERSION**

construction of “electrically coupled” to be one or more devices “arranged so that electrical signals may be passed either directly, or indirectly *via* intervening circuitry, from one component to another.” (*Id.*) Knowles adds that Dr. Gilleo’s physical examination confirmed that each of the accused devices has a patterned conductive layer {

} (*Id.*) Other Analog bonding diagrams and documents corroborate this finding.

(Citing CX-462C at Q. 69; CX-486C; CX-487C; CX-488C; CX-489C; CX-556C; CX-560C; CX-565C; CX-597C; CX-598C; CX-599C; CX-600C.)

Knowles contends that the data sheets for the accused devices and functional block diagrams contained therein establish that there are terminal pads on the bottom surface of the package substrate which are electrically connected to the patterned conductive layer on the upper surface of the substrate and, thus, to the ASIC and the MEMS die. (Citing CX-462C at Q. 70.)

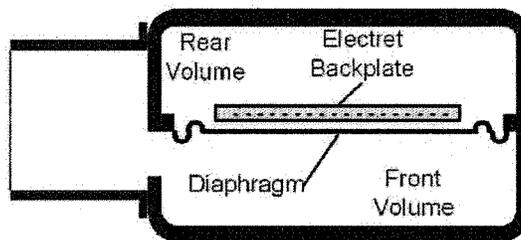
Knowles continues, Dr. Gilleo’s physical examination of, and tests performed on, the accused devices show that {

} (*Id.*)

Knowles says that it established that a “transducer” (or microphone) responsive to an acoustic signal contained in an enclosed housing or package is basically divided into two volumes, chambers or cavities as they may sometimes be called, a “front” volume which provides a pathway for the sound to reach the diaphragm of the transducer and a “back” volume which provides resistance to the deflection of the diaphragm (a pressure reference). (Citing CX-462C at Q. 71; CX-460C at Q. 19.)

## PUBLIC VERSION

Thompson (CX-574) Figure 2:



Omnidirectional Microphone

Knowles argues that the '089 patent teaches various configurations of the placement of the transducer in relation to the aperture which allows the designer of the encased or packaged microphone to alter the geometry of the front and back volumes. (Citing CX-462C at Q. 71; CX-460C at Q. 20, 21.) Knowles says for instance, claim 7 (dependent on claim 1) teaches a configuration in which the transducer is mounted directly over the aperture, and claim 9 (also dependent on claim 1) teaches a configuration where the aperture is located in the cover and the transducer is mounted to the substrate. (Citing CX-462C at Q. 71.) Knowles asserts that Figures 26 and 27 disclose an embodiment of claim 7, and Figures 23 and 28 disclose an embodiment of claim 9. (Citing CX-462C at Q. 71; CX-460C at Q. 21.)

Knowles contends that based on this understanding of “volume” as used in claim 1 and the definition proposed by Knowles identical to the construction given “volume” in the 629 investigation (“a space defined by the transducer and one of the first member or second member”), the accused devices have a “front” volume within the meaning of claim 1. (Citing CX-462C at Q. 74; CDX-3.39<sup>41</sup> (ADMP401); CDX-6C.43 (ADMP402); CDX-6C.47 (ADMP403); CDX-6C.51 (ADMP404); CDX-6C.55 (ADMP405); CDX-6C.59 (ADMP421).) Knowles says for example, the ADMP421 model has a “front” volume as shown in Dr. Gilleo’s demonstrative and includes an illustration:

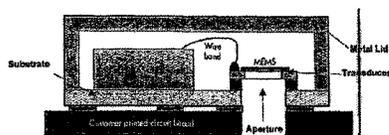
<sup>41</sup> Knowles notes that the page labeled CDX-3.39 is a typographical error and should have been labeled CDX-6C.39. I note that CDX exhibits are demonstratives and will not be considered as evidence of the facts they purport to depict. They are merely considered as illustrations to assist the testimony of a witness.

PUBLIC VERSION

Knowles argues that the fact that the accused devices have a “front” volume defined by the back hole of the transducer and the surface of the substrate {

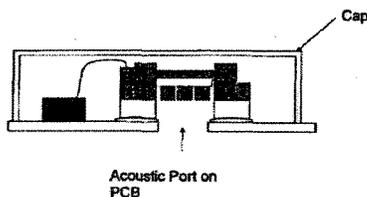
} (Citing CX-462C at Q. 74.) Knowles avers that various Analog documents further corroborate the presence of a “front” volume in the accused devices defined by the transducer and the substrate. (*Id.*)

Knowles says that Dr. Gilleo also noted that the accused devices have a configuration nearly identical to the Memstech MSM2RM6 which was found to infringe in the 629 investigation. (Citing CX-462C at Q. 74.) Knowles states that one of Dr. Gilleo’s demonstratives compared the two packages and included an illustration:



ADMP configuration (Decl. Harney)

CDX-6C.4



MSM2RM6 configuration (ID, Inv. No. 337-TA-629)

Knowles avers that Dr. Egolf agreed that the accused devices have a “front” volume or space defined by the transducer and the substrate that is acoustically coupled to the transducer.

PUBLIC VERSION

(Citing CX-460C at Q. 26, 27.) Knowles says that Dr. Egolf in his analysis first compared several high level schematics of the accused devices, reviewed numerous product data sheets and CAD drawings, and the testimony of Analog’s corporate representative to confirm {

} (Citing CX-138C at ¶55; CX-14C at ADI00001932; CX-483C; CX-485C; CX-532C; CX-535C; CX-538C; CX-539C; CX-541C; CX-542C; CX-543C; CX-544C; CX-545C; CX-558C; CX-559C; CX-561C; CX-203C at 180:4-11; CX-460C at Q. 26.) Knowles contends that this configuration of a volume or space defined by the transducer and the upper surface of the substrate is further verified by the document {

} and with photographs of the accused devices taken by Dr. Gileo. (*Id.*) Knowles argues that the evidence clearly shows that the “front” volume in the accused devices is “a space defined by the transducer and one of the first member or second member.”

Knowles asserts that Dr. Egolf noted that {

} (Citing CX-460C at Q. 26.) Knowles argues that the reference {

}

Knowles contends that even under Analog’s construction of “volume” (“an enclosed space defined by the transducer and one of the first member or second member”), Analog’s products still infringe under the doctrine of equivalents. Knowles says that functionally, a “back”

## PUBLIC VERSION

volume defined by the substrate, the cover, and the transducer, as in the accused devices, performs substantially the same function (regulating the movement of the diaphragm), operates in substantially the same way (by providing pressure to the back of the diaphragm), and achieves substantially the same result (the microphone produces an electrical signal representative of the acoustic signal) as would a “back” volume defined exclusively by the microphone and the substrate. (Citing CX-462C at Q. 74; CX-460C at Q. 29-33.) Knowles reasons that since the back volume expands and shrinks based on the movement of the diaphragm, and the diaphragm moves based on the acoustic signal, the back volume is necessarily acoustically coupled to the microphone. (Citing CX-462C at Q. 74; CX-460C at Q. 29.) Knowles concludes that, under the doctrine of equivalents, the accused devices have the “volume” required by this element of claim 1 even under Analog’s construction.

Knowles argues that the accused devices have an opening in the substrate labeled an “aperture” or “sound port” which allows an acoustic signal to pass through to the transducer. (Citing CX-462C at Q. 75.) Knowles asserts that Analog emails, drawings, and data sheets all show that the accused devices have a sound “port” or “aperture” which allows an acoustic signal to reach the MEMS microphone. (*Id.*) Knowles concludes that Dr. Gilleo’s physical examination of the accused devices further confirms that this element is satisfied. (*Id.*)

In its reply brief, Knowles says that Analog makes the same argument as it does regarding claim 1 of the ‘231 patent, namely that Knowles failed to show that the accused devices provide the needed mechanical and environmental protection under Knowles’ proposed construction of *package*. (Citing RIB at 95.) Knowles contends that it has already briefed this issue and has shown that the accused devices are *packages* under Knowles’ proposed construction. (Citing CIB at 98-99; and CRB section III.B.1) Knowles contends that the

## PUBLIC VERSION

evidence shows that the accused devices provide protection from mechanical shock and vibration through the second-level packaging interconnects made with the terminal pads directly underneath the package housing, and such showing is consistent with how Knowles has distinguished Halteren as a non-package.

Knowles says that Analog's non-infringement argument regarding claim 1 is dependent on its proposed construction of *volume* requiring an "enclosed" space or volume. (Citing RIB at 95-96.) Knowles argues that since its proposed construction is incorrect, (citing CRB section IV.A.6) Analog's non-infringement argument fails.

Knowles continues, Staff has a different approach to the argument that the accused devices do not literally infringe because they lack a "volume." Knowles contends that Staff's position, however, is inconsistent with its position on claim construction. Knowles says that Staff agrees with Knowles' proposed definition of "volume" as "a space defined by the transducer and one of the first member or second member," stating that "[n]otably, the claim language also does *not* state that the volume must be enclosed." (Citing SIB at 71 (emphasis added by Knowles).) Knowles argues that Staff then contradicts itself and argues that a "front volume" which includes an opening or aperture cannot be the "volume" of claim 1. (Citing SIB at 74-75.) Knowles says this "makes no sense."

Knowles points to Staff's statement, in discussing the "back volume" and "front volume" of the accused devices, that "none of the 'volumes' are defined only by the transducer and either the first member or the second member." (Citing SIB at 75.) Knowles argues that Staff is attempting to add the word "only," an additional limitation, to the proposed construction of "volume." Knowles says in the configuration of the accused devices where the microphone is mounted directly over the aperture, the "front volume" is defined by the transducer and one of

## PUBLIC VERSION

the first member or the second member, not both members.

Knowles contends that the fact that the substrate contains an aperture does not diminish the fact that the “front volume” meets the limitation of a “a space defined by one of the first member or the second member.” Knowles says to further its argument, Staff relies on a snippet of testimony from Dr. Gilleo that the front volume “ends at the sound port” without any context, but ignores the wealth of testimony from Dr. Gilleo and Dr. Egolf that the accused devices have a “front volume” defined by the transducer and the substrate. (Citing SIB at 75; CIB at 101-104.) Knowles adds that Mr. Harney testified that {

} (Citing Tr. at 394:25-395:5.)

Knowles adds that the specification of the ‘089 patent reflects that the aperture is merely a part of the first or second member. Knowles says that the ‘089 patent has numerous references to the fact that the cover or substrate, which make up the housing, “includes” an aperture. (Citing JX-2 at Abstract, 1:55-57, 3:66, 4:22-23, 4:37-39.) Knowles asserts that, in fact, claim 1 itself requires “one of the first member or the second member [be] formed to *include* an aperture ....” (Citing JX-2 at 11:41-42 (emphasis added by Knowles).) Knowles argues that the aperture or sound port in the accused devices is merely part of the substrate, and not a third element defining the *volume* of the accused devices.

Knowles avers that its experts, Dr. Gilleo and Dr. Egolf, both testified that a “back” volume defined by the substrate, the cover, and the transducer, as in the accused products, performs substantially the same function (regulating the movement of the diaphragm), operates in substantially the same way (by providing pressure to the back of the diaphragm), and achieves substantially the same result (the microphone produces an electrical signal representative of the

PUBLIC VERSION

acoustic signal) as would a “back” volume defined exclusively by the microphone and the substrate. (Citing CX-462C at Q. 74; CX-460C at Q. 29-33.) Knowles argues that, “as noted by Analog, ‘[a]n element in the accused product is equivalent to a claim limitation if the differences between the two are ‘insubstantial’ to one of ordinary skill in the art.’” (Citing RIB at 96.)

Knowles contends that the only evidence from any testifying expert is that the result, production of an electrical signal representative of the acoustic signal, is substantially the same. Knowles says while Dr. Egolf admitted that there may be a difference in sensitivity between encased microphones having larger versus smaller “back volumes,” Dr. Egolf also testified that back volume geometry is just one of many factors that can affect sensitivity of the microphone, including the diaphragm mass, stiffness and compliance, the applied charge voltage, the way the diaphragm is mounted on the silicon structure, the size of the transducer, the materials used, air temperature, barometric pressure and humidity. (Citing Tr. at 376:19-24, 379:4-16.) Knowles asserts that the only other evidence of any difference in performance came from Mr. Harney, a non-expert, who presented evidence of { } (Citing RX-469C at Q. 14, 18.) Knowles avers there is no testimony from Mr. Harney { }

Knowles says that Staff argues that Knowles cannot use the doctrine of equivalents to establish infringement of the ‘089 patent because the of disclosure dedication rule, citing *PSC Computer Prods. Inc. v. Foxconn Int’l Inc.*, 355 F.3d 1353 (Fed. Cir. 2004). (Citing SIB at 74.) Knowles argues that before unclaimed subject matter is deemed to have been dedicated to the public, that subject matter “must have been identified by the patentee as *an alternative to a claim limitation*.” (Citing *Pfizer Inc. v. Teva Pharm. USA Inc.*, 429 F.3d 1364, 1379 (Fed. Cir. 2005) (emphasis added by Knowles).) Knowles posits that a generic reference in a written

## PUBLIC VERSION

specification does not necessarily dedicate all members of that particular genus to the public.

(Citing *PSC Computer*, 355 F.3d at 1360.) Knowles says the disclosure must be of such specificity that one of skill in the art could identify the subject matter that had been disclosed and not claimed. (*Id.*)

Knowles asserts that the '089 patent does not state or imply that a volume defined by the transducer, the first member and the second member would be a clear alternative to the claimed volume. Knowles avers that the written description's only discussion of a volume formed by the transducer, the first member and the second member appears within the context of a claimed embodiment, Figure 26. (Citing JX-2 at 7:20-23.) Knowles argues that the context of the discussion alone indicates that the inventor considered that volume configuration to be part of the invention, rather than part of the prior art, thereby eliminating any inference from context that this configuration was not claimed. Knowles adds that, at no point does the specification identify that the claimed volume can alternatively be formed from the substrate, lid, and transducer. Knowles says the enclosed space in Figure 26 is not the claimed volume, as the Staff implies, but rather is the back volume. Knowles states that the "volume" claim limitation can be either a front volume or a back volume, and as noted in Staff's discussion of volume, need not be enclosed. Knowles concludes that the fact that the back volume of Figure 26 is formed from both the first and second members is irrelevant because Figure 26 also contains the claimed volume in the form of a front volume defined by the transducer and the substrate.

Knowles argues that Analog errs in its reliance on *Decisioning.com Inc. v. Federated Dep't Stores Inc.*, 527 F.3d 1300 (Fed. Cir. 2008) to argue that Knowles cannot use the doctrine of equivalents to recapture claim scope lost through claim construction. (Citing RIB at 97) Knowles says that by attempting to add the limitation "enclosed" to the construction of "volume"

## PUBLIC VERSION

as “a space defined by the transducer and one of the first member or second member,” as found in the 629 investigation, Analog is implicitly rejecting the construction of “volume” from the 629 investigation. (Citing RIB at 92.) Knowles says it only asserts the doctrine of equivalents because of Analog’s proposed construction, and Knowles should not be bound by what may have been decided or said about “volume” in the 629 investigation since Analog is now arguing for a different construction.

Knowles adds that, to the extent this may be viewed as issue preclusion, collateral estoppel would not apply as a matter of law where, as was the case in the 629 investigation, a claim is held valid and infringed on a narrower claim construction from the one proposed by the plaintiff. (Citing *Jackson Jordan, Inc. v. Plasser Am. Corp.*, 747 F.2d 1567, 1577-78 (Fed. Cir. 1984).) Knowles says it had no independent basis to appeal the claim construction of “volume,” because in the 629 investigation, the ‘089 patent was found to be valid and infringed by a configuration of a Memstech microphone package nearly identical to the configuration of Analog’s microphone package. Knowles concludes that, because of Analog’s proposed construction of “volume” which differs from that reached in the 629 investigation, Knowles is not bound by any purported loss of claim scope and should be entitled to assert the infringement under the doctrine of equivalents.

**Analog’s Position:** Analog begins that, as with the ’231 patent, Knowles has not adduced sufficient evidence to demonstrate that Analog’s MEMS microphones have a “package” under Knowles’ suggested construction of “package.” Analog says Knowles wants to construe “package” to *require* protection against “mechanical shock and vibration.” (Citing CX-461 at Q. 32; CX-613 at 11.) Analog says, “[w]ith respect to the prior art, Knowles argues that a cover and a substrate enclosing the microphone is insufficient to protect against ‘mechanical vibration and

## PUBLIC VERSION

shock.” (Citing CX-613 at 19-20.) Analog says, “with respect to infringement, Dr. Gilleo has offered the opinion that protection against such environmental stress is *not* part of its definition of ‘package.’” (Citing CX-551C at 28; RX-385 at 110:3-111:19, 181:17-20.) Analog adds that Knowles has not offered sufficient evidence to show that Analog’s products meet its construction. (Citing Tr. at 250:3-252:8.)

Analog argues that if the Commission determines that a “package” requires protection from “mechanical shock and vibration,” then, as demonstrated previously, Knowles has not sufficiently demonstrated that Analog’s products meet this claim limitation.

Analog avers that Knowles has admitted that it cannot prove infringement of the ‘089 patent if the Commission adopts Analog’s proposed construction of “volume.” (Citing RX-385 at 22:3-12.) Analog says that Knowles points to the “front volume” in Analog’s MEMS microphones as meeting the “volume” limitation of claim 1, and admits that the “back volume” or “chamber” cannot meet the claim limitation. (Citing CX-462C at Q. 71, 74; RX-385 at 10:8-25.) Analog argues that because the back volume of Analog’s products is the only enclosed space and it is bounded by both the first and the second members, under Analog’s “volume” construction, it does not infringe. (Citing RX-355C at Q. 49-52; RDX-18C.)

Analog contends that Knowles’ doctrine of equivalents argument does not save its infringement case. Analog says according to Knowles, if the Commission determines that the “front volume” of Analog’s products cannot be the claimed “volume” then, under the doctrine of equivalents, the “back volume,” bounded by two members in Analog’s products, is the claimed “volume.” Analog argues that the doctrine of equivalents does not allow a patentee to recapture claim scope that was lost during claim construction. (Citing *Decisioning.com, Inc. v. Federated Dept. Stores, Inc.*, 527 F.3d 1300, 1315 (Fed. Cir. 2008).) Analog notes that the Commission, in

## PUBLIC VERSION

the 629 investigation, found that the claimed “volume” is “a space defined by the transducer and one of the first member or the second member,” but not both members. (Citing RX-56 at 52.)

Analog argues that Knowles may not try to reclaim claim scope lost in claim construction through the doctrine of equivalents. (Citing *Decisioning.com, Inc.*, 527 F.3d at 1315.)

Analog argues that even if the Commission permits Knowles to expand the definition of “volume” to include a space bounded by two members, Knowles has not proven that Analog’s products meet the function-way-result test. Analog says that Dr. Egolf testified that a back volume bounded by the transducer and two members is always larger than a back volume just bounded by the transducer and one member. (Citing CX-460C at Q. 31.) Analog contends that although Dr. Egolf offers an opinion that a large back volume and a small back volume provide the same function – they act as a “pressure reference” for the microphone – none of Knowles’ experts offer an opinion that large and small back volumes produce the same *result*. (Citing CX-460C at Q. 31-33; Tr. at 273:7-274:4.)

Analog avers that Dr. Egolf admits that the difference in the size of the back volume affects the sensitivity of the microphone; the larger the back volume, the more sensitive the microphone is. (Citing Tr. at 376:6-378:14.) Analog says that Mr. Harney testified that {

} (Citing RX-469C at Q. 14-18.)

In its reply brief, Analog argues that Knowles’ pre-hearing brief offers no argument or evidentiary support to suggest that Analog’s accused products literally infringe any asserted claim of the ‘089 patent, if the Commission adopts Analog’s proposed construction of “volume.” (Citing CIB at 105; CX-462C at Q. 71, 74; RX-385 at 10:8-25.) Analog argues that Knowles has waived any opportunity to argue otherwise. (Citing Ground Rule 11.1.)

## PUBLIC VERSION

Analog argues that Knowles' doctrine of equivalents argument fails to satisfy the three-prong test. Analog admits that the parties agree that a large back volume (defined by the substrate, the cover, and the transducer) serves the same function as a small back volume (defined by the substrate and the transducer) – both are pressure references. Analog reiterates that Knowles failed to present any evidence that such back volumes produce the same results. Analog asserts that while Knowles argues that both produce working microphones, that is not the question. Analog says the issue is how well such a microphone would work, not merely that both “produce[] an electrical signal representative of the acoustic signal.” Indeed, Analog states that the evidence shows that a large back volume would result in a more sensitive microphone. (Citing Tr. at 273:7-274:4, 376:6-378:14; RX-469C at Q.14-18.)

**Staff's Position:** Staff argues that the accused products have a substrate with an opening for sound to enter and reach the MEMS microphone product. (Citing CX-462C at Q. 22.) Staff says the MEMS transducer element is placed directly over and completely covers the aperture, and therefore the accused products do not include a “volume being defined by the transducer and one of the first member or the second member” as required by claim 1. Staff argues that the front volume is defined by the transducer, substrate, and aperture. Staff says that Dr. Gilleo testified that the front volume in all the accused products begins at the diaphragm of the microphone and ends at the aperture. (Citing Tr. at 312:10-313:24.) Staff adds that the evidence has shown that the back volume of the Analog products is defined by the transducer, first member, and second member. (Citing CX-460C at Q. 29.) Staff concludes, in either case, none of the “volumes” are defined only by the transducer and either the first member or the second member.

Staff disagrees with Knowles' doctrine of equivalents argument. Staff argues that the

## PUBLIC VERSION

evidence has shown that a “volume” formed by a substrate, lid and a cover cannot be found to infringe the ‘089 patent claims because that configuration was dedicated to the public. Staff contends that Federal Circuit law has limited the doctrine of equivalents where the patentee disclosed a particular embodiment in the specification and then did not claim that embodiment in the claims. (Citing *PSC Computer Products, Inc. v. Foxconn Intern., Inc.*, 355 F.3d 1353, 1360 (Fed. Cir. 2004).) Staff says the dedication rule prevents a patentee from prosecuting narrow claims in order to obtain allowance and then attempting to broaden these claims in court using the doctrine of equivalence.

Staff contends that Knowles drafted its claims narrowly - covering only a volume “defined by the transducer and one of the first member or second member.” (Citing JX-2 at claim 1; Tr. at 317:20-25.) Staff avers that the specification includes embodiments, for example Figure 26, where the volume is defined by the transducer, the first member, and the second member. (Citing Tr. at 316:17-23.) Staff argues that Knowles cannot now regain through the doctrine of equivalents what it disclosed and decided not to claim during prosecution.

**Discussion and Conclusions:** In Section IV.C *supra*, I have concluded that claim 1 of the ‘089 patent is invalid. Assuming *arguendo* that claim 1 is found to be valid, I find that Knowles has proven by a preponderance of the evidence that Analog’s accused products literally infringe claim 1 of the ‘089 patent.

A determination of whether or not the accused products practice the elements of asserted claim 1 turns on two issues: (1) whether or not the accused products comprise a “package” as construed herein; and (2) whether or not the accused products practice a “volume” as construed herein.

**PUBLIC VERSION**

Regarding the first issue, I note that Analog continues to contend that Knowles' argument must fail, because it is based on the position that the term "package" must be construed to include reference to protection from "shock and vibration." As I noted in Section VI.C.1, however, the proper construction of the term "package" does not reflect Knowles' construction, and Analog's argument is rendered moot.

Notwithstanding the foregoing, Dr. Gilleo testified that the terminal pads, solid vias, and connections provide the needed mechanical support which protects the MEMS die and ASIC.

(Tr. at 252:23-253:10.) In fact, the ADMP403 which Dr. Gilleo

} (CX-462C at Q. 65.) The

fact that the second level connections provided mechanical support and protection for the device was dramatically and credibly illustrated by Dr. Gilleo when he testified at trial at {

} (Tr. at 255:5-25; 324:13-325:2.)

I note, too, that Analog's witness, Mr. Harney, {

} (Tr. at 388:9-399:24.)

Next, I find that Knowles has met its burden to provide a preponderance of evidence establishing that the accused products practice the limitation in claim 1 that teaches, "a volume being defined by the transducer and one of the first member or the second member." Analog's argument erroneously relies on its own construction of the term "volume" to include a requirement that it be "enclosed." In Section III.C.5, I construed the term to mean "a space defined by the transducer and one of the first member or the second member," and I did not include the additional requirement that the volume be "enclosed." Here, I reaffirm that construction finding and the rationale for it.

Staff's argument is based in part on its belief that, in JX-2, Figures 9, 10, 26, 27, the front

PUBLIC VERSION

volume is defined by the transducer, the substrate, *and the aperture*. This is incorrect. In fact, the front volume is clearly shown to be defined only by the transducer and the substrate.

The '089 patent consistently describes the acoustic aperture as being “in” the respective first member or second member. It is, therefore, merely a part of the respective first member or second member in which it is situated. In addition to claim 7, described *supra*, claim 1 teaches “once of the first member or the second member being formed to *include* an aperture, the aperture being configured to permit the passage of an acoustic signal to the transducer.” (JX-2 at 11:41-44) (emphasis added). Claims 8, 9, 10, 11, 13, 25 all describe that the aperture as being formed “in the respective one of the first member and the second member.”

Knowles has correctly pointed out other examples of specific reference to the aperture being a part of the structure to include, JX-2 at Abstract, 1:55-57, “[t]he cover is placed over the transducer and includes an aperture adapted for allowing sound waves to reach the silicon condenser transducer”; 3:66, “[t]he cover 20 contains an aperture ...”; and 4:22-23, “[t]he housing 42 further includes an aperture or acoustic port 54 for receiving an acoustic signal ...”

I conclude that the aperture described in the '089 patent is part of the respective first member and the second member and is not a separate element that defines the volume. Dr. Gilleo did not testify that the aperture is an element that defines the volume. Dr. Gilleo was asked, in reference to Exhibit CDX-6C.1, if the front volume was represented by the “white space that appears underneath the diaphragm.” He responded, “[t]hat is my interpretation. Others may include the walls of the sound port.” (Tr. at 313:9-12.) I note that CDX-6C.1 depicts a cross-section of the ADMP403 which is representative of the accused products. The diagram from which CDX-6C.1 is taken appears in the record as a part of CX-14C at ADI00001932. It is readily apparent that { }

PUBLIC VERSION

{

} In addition, Dr. Egolf, Knowles' expert, testified credibly and in detail that the accused products depicted in, for example, CX-14C at ADI00001932, practice a front volume that is defined by the transducer and the substrate. (CX-460C at Qs 26, 27)

Knowles has provided unrebutted evidence to show that the accused products practice the remainder of the elements required in claim 1 of the '089 patent, to wit:

- “A surface mountable package for containing a transducer, the transducer being responsive to sound pressure levels of an acoustic signal to provide an electrical output representative of the acoustic signals, the surface mountable package comprising:” (CX-462C at Q. 36, 46, 65, 66, 67; Tr. at 252:23-253:10, 255:5-25, 324:13-325:2, 388:9-399:24);
- “at least a first member and a second member and a chamber being defined by the first member and the second member, the transducer being attached to a surface formed on one of the first member or the second member and the transducer residing within the chamber;” (CX-462C at Q. 68);
- “the surface being formed with at least one patterned conductive layer, the patterned conductive layer being electrically coupled to the transducer;” (CX-462C at Q. 69);
- “an outside surface of the surface mountable package comprising a plurality of terminal pads electrically coupled to the patterned conductive layer;” (CX-462C at Q. 70);
- “a volume being defined by the transducer and one of the first member or the second member, the volume being acoustically coupled to the transducer;” (CX-462C at Q. 71; CX-460C at Q. 19; CX-460C at Q. 26, 27);<sup>42</sup>
- “and one of the first member or the second member being formed to include an aperture, the aperture configured to permit the passage of an acoustic signal to the transducer.” (CX-462C at Q. 75).

Based upon the foregoing, I find that the accused products practice each and every element of asserted claim 1 of the '089 patent. Therefore, the accused products infringe claim 1

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<sup>42</sup> While the first portion of this element is treated in detail, *supra*, the evidence cited here supports the remaining limitation that the volume be “acoustically coupled to the transducer.”

## PUBLIC VERSION

of the '089 patent.

### 2. Claim 2

Claim 2 of the '089 patent recites:

2. The surface mountable package of claim 1, wherein the first member comprises a substrate and the second member comprises a cover coupled to the substrate to define the chamber.

**Knowles' Position:** Knowles contends that Analog's representative, high-level schematic drawings show that all accused devices have a first member which is a substrate and a second member which is a cover, that when joined together, define an interior region or chamber. (Citing CX-462C at Q. 76.) Knowles says that Dr. Gilleo's physical examination of the accused devices (CPX-1, CPX-2, CPX-3, CPX-4, CPX-5, CPX-6) confirms that the cover and substrate come together to form a chamber which is clearly seen in his cross-sectional photographs showing the ASIC and MEMS die inside the chamber. (Citing CX-462C at Q. 76; CDX-6C.36; CDX-6C.40; CDX-6C.44; CDX-6C.48; CDX-6C.52; CDX-6C.56.) Knowles concludes that Analog's product data sheets and other documents further confirm that claim 2 is practiced by the accused devices. (Citing CX-462C at Q. 76.)

**Analog's Position:** Analog offers no position directed to this claim.

**Staff's Position:** Staff argues that, because the remaining claims all depends from claim 1, without infringement of claim 1 there can be no infringement of claim 2, 7 and 16-20 with regard to any of the accused products.

**Discussion and Conclusions:** In Section IV.C *supra*, I have concluded that claim 2 of the '089 patent is invalid. Assuming *arguendo* that claim 2 is found to be valid, I find that Knowles has proven by a preponderance of the evidence that Analog's accused products literally infringe claim 2 of the '089 patent.

## PUBLIC VERSION

I have already found that the accused devices practice each and every element of claim 1 of the '089 patent, from which claim 2 depends. The evidence cited by Knowles, *supra*, is unrebutted and establishes that the accused devices practice each and every element set forth in claim 2 of the '089 patent.

### 3. Claim 7

Claim 7 of the '089 patent recites:

7. The surface mountable package of claim 1, the aperture being formed in the respective one of the first member and the second member, the surface being formed on the respective one of the first member and the second member and the transducer being attached to the surface completely covering the aperture.

**Knowles' Position:** Knowles argues that Analog's representative, high-level schematic drawings show that all accused devices have a configuration where the microphone and aperture are both on the substrate with the microphone mounted directly over the aperture. (Citing CX-462C at Q. 77.) Knowles states that Dr. Gilleo's physical examination of the accused devices (CPX-1, CPX-2, CPX-3, CPX-4, CPX-5, CPX-6) confirms that the microphone is mounted to the surface of the substrate directly over the aperture as can be seen in his cross-sectional photographs. (Citing CX-462C at Q. 77; CDX-6C.36; CDX-6C.39; CDX-6C.40; CDX-6C.43; CDX-6C.44; CDX-6C.47; CDX-6C.48; CDX-6C.51; CDX-6C.52; CDX-6C.55; CDX-6C.56; CDX-6C.59.) Knowles concludes that Analog's product data sheets and other documents further corroborate that Claim 7 is practiced by the accused devices. (CX-462C at Q. 77.)

**Analog's Position:** Analog offers no position directed to this claim.

**Staff's Position:** Staff takes the position that, because the remaining claims all depends from claim 1, without infringement of claim 1 there can be no infringement of claim 2, 7 and 16-20 with regard to any of the accused products.

**Discussion and Conclusions:** In Section IV.C *supra*, I have concluded that claim 7 of

PUBLIC VERSION

the '089 patent is invalid. Assuming *arguendo* that claim 7 is found to be valid, I find that Knowles has proven by a preponderance of the evidence that Analog's accused products literally infringe claim 7 of the '089 patent.

I have already found that the accused devices practice each and every element of claim 1 of the '089 patent, from which claim 7 depends. The evidence cited by Knowles, *supra*, is unrebutted and establishes that the accused devices practice each and every element set forth in claim 7 of the '089 patent.

**4. Claim 16**

Claim 16 of the '089 patent recites:

- 16. The surface mountable package of claim 1, a metalized region being formed on an exterior surface of the surface mountable package, the metalized region being electrically coupled to the patterned conductive layer.

**Knowles' Position:** Knowles says that the covers of the accused devices are made of { } providing electrical grounding. (Citing CX-462 at Q. 78.)

Knowles continues, according to {

} (*Id.*) Knowles avers that Dr. Gilleo's physical examination of the accused devices (CPX-1, CPX-2, CPX-3, CPX-4, CPX-5, CPX-6) and testing with an ohmmeter {

} (*Id.*) Knowles adds that, after disassembly, there was {

} (*Id.*) Knowles says that {

} of the accused devices that {

} (*Id.*)

**PUBLIC VERSION**

**Analog's Position:** Analog offers no position directed to this claim.

**Staff's Position:** Staff says that because the remaining claims all depends from claim 1, without infringement of claim 1 there can be no infringement of claim 2, 7 and 16-20 with regard to any of the accused products.

**Discussion and Conclusions:** In Section IV.C *supra*, I have concluded that claim 16 of the '089 patent is invalid. Assuming *arguendo* that claim 16 is found to be valid, I find that Knowles has proven by a preponderance of the evidence that Analog's accused products literally infringe claim 16 of the '089 patent.

I have already found that the accused devices practice each and every element of claim 1 of the '089 patent, from which claim 16 depends. The evidence cited by Knowles, *supra*, is un rebutted and establishes that the accused devices practice each and every element set forth in claim 16 of the '089 patent.

**5. Claim 17**

Claim 17 of the '089 patent recites:

17. The surface mountable package of claim 1, one or both of the first member and the second member including a shield against electromagnetic interference.

**Knowles' Position:** Knowles contends that the covers of the accused devices are made of { } providing electrical grounding. (Citing CX-462 at Q. 79.) Knowles notes that according to {

{ } (*Id.*) Knowles states that Dr. Gilleo's physical examination of the accused devices (CPX-1, CPX-2, CPX-3, CPX-4, CPX-5, CPX-6) confirmed that the { } which is a method of creating an

## PUBLIC VERSION

electromagnetic shield. (*Id.*) Knowles adds that {  
} which could be seen in the  
ADMP401. (*Id.*) Knowles concludes that Analog product data sheets and other documents  
further corroborate that the accused devices practice Claim 17 in that the one or both of the  
substrate (first member) and cover (second member) provide a shield against electromagnetic  
interference. (*Id.*)

**Analog's Position:** Analog offers no position directed to this claim.

**Staff's Position:** Staff posits that because the remaining claims all depends from claim  
1, without infringement of claim 1 there can be no infringement of claim 2, 7 and 16-20 with  
regard to any of the accused products.

**Discussion and Conclusions:** In Section IV.C *supra*, I have concluded that claim 17 of  
the '089 patent is invalid. Assuming *arguendo* that claim 17 is found to be valid, I find that  
Knowles has proven by a preponderance of the evidence that Analog's accused products literally  
infringe claim 17 of the '089 patent.

I have already found that the accused devices practice each and every element of claim 1  
of the '089 patent, from which claim 17 depends. The evidence cited by Knowles, *supra*, is  
unrebutted and establishes that the accused devices practice each and every element set forth in  
claim 17 of the '089 patent.

### 6. Claim 18

Claim 18 of the '089 patent recites:

18. The surface mountable package of claim 1, the first member including a first  
conductive portion, the second member including a second conductive  
portion, an electromagnetic interference shield being formed by the coupling  
of the first conductive portion and the second conductive portion.

**Knowles' Position:** Knowles reiterates that the substrate (first member) of the accused

## PUBLIC VERSION

products has a patterned conductive layer for grounding, the cover (second member) is conductive, and the two (the substrate and cover) are electrically coupled to ground to form an electromagnetic interference shield. (Citing CX-462C at Q. 80.) Knowles adds that the functional block diagrams of Analog's product data sheets and other documents corroborate that the accused devices provide an electromagnetic interference shield as required by Claim 18.

(*Id.*)

**Analog's Position:** Analog offers no position directed to this claim.

**Staff's Position:** Staff contends that because the remaining claims all depends from claim 1, without infringement of claim 1 there can be no infringement of claim 2, 7 and 16-20 with regard to any of the accused products.

**Discussion and Conclusions:** In Section IV.C *supra*, I have concluded that claim 18 of the '089 patent is invalid. Assuming *arguendo* that claim 18 is found to be valid, I find that Knowles has proven by a preponderance of the evidence that Analog's accused products literally infringe claim 18 of the '089 patent.

I have already found that the accused devices practice each and every element of claim 1 of the '089 patent, from which claim 18 depends. The evidence cited by Knowles, *supra*, is unrebutted and establishes that the accused devices practice each and every element set forth in claim 18 of the '089 patent.

### 7. Claim 20

Claim 20 of the '089 patent recites:

20. The surface mountable package of claim 1, the first member comprising a printed circuit board.

**Knowles' Position:** Knowles asserts that a printed circuit board is "a composite of inorganic and organic material with internal wiring allowing electronic components to be

**PUBLIC VERSION**

mechanically supported and electrically connected. (Citing CX-462C at Q. 81.) Knowles says that Analog documents {

} (*Id.*) Knowles continues, {

} establish that the substrate material {

} (*Id.*) Knowles says the substrate also

includes a {

} (Citing CX-462C at Q. 81, 71, 72.) Knowles avers that Dr. Gilleo's

physical examination of the accused devices confirmed that the substrate was {

} (Citing CX-462C at Q. 81.) Knowles concludes that Analog's product data

sheets and other documents corroborate that the accused devices practice Claim 20 as the

substrate is comprised of printed circuit board material. (*Id.*)

**Analog's Position:** Analog offers no position directed to this claim.

**Staff's Position:** Staff says that because the remaining claims all depends from claim 1, without infringement of claim 1 there can be no infringement of claim 2, 7 and 16-20 with regard to any of the accused products.

**Discussion and Conclusions:** In Section IV.C *supra*, I have concluded that claim 20 of the '089 patent is invalid. Assuming *arguendo* that claim 20 is found to be valid, I find that Knowles has proven by a preponderance of the evidence that Analog's accused products literally infringe claim 20 of the '089 patent.

I have already found that the accused devices practice each and every element of claim 1 of the '089 patent, from which claim 20 depends. The evidence cited by Knowles, *supra*, is un rebutted and establishes that the accused devices practice each and every element set forth in claim 20 of the '089 patent.

## VI. DOMESTIC INDUSTRY

### A. Applicable Law

In patent-based proceedings under section 337, a complainant must establish that an industry “relating to the articles protected by the patent...exists or is in the process of being established” in the United States. 19 U.S.C. § 1337(a)(2) (2008). Under Commission precedent, the domestic industry requirement of Section 337 consists of an “economic prong” and a “technical prong.” *Certain Data Storage Systems and Components Thereof*, Inv. No. 337-TA-471, Initial Determination Granting EMC’s Motion No. 471-8 Relating to the Domestic Industry Requirement’s Economic Prong (unreviewed) at 3 (Public Version, October 25, 2002).

The “economic prong” of the domestic industry requirement is satisfied when it is determined that the economic activities set forth in subsections (A), (B), and/or (C) of subsection 337(a)(3) have taken place or are taking place. *Certain Variable Speed Wind Turbines and Components Thereof*, Inv. No. 337-TA-376, USITC Pub. No. 3003, 1996 ITC LEXIS 556, Comm’n Op. at 21 (Nov. 1996). With respect to the “economic prong,” 19 U.S.C. § 1337(a)(2) and (3) provide, in full:

(2) Subparagraphs (B), (C), (D), and (E) of paragraph (1) apply only if an industry in the United States, relating to the articles protected by the patent, copyright, trademark, mask work, or design concerned, exists or is in the process of being established.

(3) For purposes of paragraph (2), an industry in the United States shall be considered to exist if there is in the United States, with respect to the articles protected by the patent, copyright, trademark, mask work, or design concerned-

(A) significant investment in plant and equipment;

(B) significant employment of labor or capital; or

(C) substantial investment in its exploitation, including engineering, research and development, or licensing.

## PUBLIC VERSION

Given that these criteria are listed in the disjunctive, satisfaction of any one of them will be sufficient to meet the domestic industry requirement. *Certain Integrated Circuit Chipsets and Products Containing Same*, Inv. No. 337-TA-428, Order No 10, Initial Determination (Unreviewed) (May 4, 2000), citing *Certain Variable Speed Wind Turbines and Components Thereof*, Inv. No. 337-TA-376, Commission Op. at 15, USITC Pub. 3003 (Nov. 1996).

To meet the technical prong, the complainant must establish that it practices at least one claim of the asserted patent. *Certain Point of Sale Terminals and Components Thereof*, Inv. No. 337-TA-524, Order No. 40 (April 11, 2005). “The test for satisfying the ‘technical prong’ of the industry requirement is essentially same as that for infringement, i.e., a comparison of domestic products to the asserted claims.” *Alloc v. Int’l Trade Comm’n*, 342 F.3d 1361, 1375 (Fed. Cir. 2003). The technical prong of the domestic industry can be satisfied either literally or under the doctrine of equivalents. *Certain Excimer Laser Systems for Vision Correction Surgery and Components Thereof and Methods for Performing Such Surgery*, Inv. No. 337-TA-419, Order No. 43 (July 30, 1999).

### **B. Economic Prong**

The parties have stipulated to the following facts:

- Knowles, a limited liability company organized under the laws of the State of Delaware and having its principal offices in the city of Itasca, Illinois, manufactures and sells silicon microphone packages under the trade name “SiSonic.”
- Knowles presently employs approximately { } in the Itasca facility and { } worldwide. As described below, significant segments of the Itasca facility and Knowles employees are dedicated to the SiSonic microphone.
- In particular, the Knowles facility in Itasca, Illinois constitutes approximately { } and functions as Knowles’s corporate headquarters. The Itasca facility is used for administration, sales and

**PUBLIC VERSION**

customer support, research and development, production, manufacturing and warehousing of the SiSonic microphone.

- Since 1989, Knowles has, in its domestic facilities, carried out product planning, research, design and relevant engineering activities relating to acoustic equipment including the SiSonic microphone. The domestic manufacturing capabilities are used for the production of and the ongoing research and design of Knowles's MEMS silicon microphone technology, including the SiSonic microphone.
- These aforementioned activities involve { } The engineers perform tasks including identification and selection of appropriate components testing and qualifying microphones and ongoing research and design on microphones using Knowles's MEMS silicon microphone technology.
- Knowles has a salary budget of over { } for the { } domestic engineers dedicated to the SiSonic product.
- Knowles maintains over { } of equipment used for the SiSonic products at its facility in Itasca, Illinois.
- The approximate salary expenditure for the { } }
- Knowles estimates that { } its Itasca facility is presently dedicated to the SiSonic microphone.
- The Itasca facility manufactures SiSonic microphones. { }

}

- The reliability support for the SiSonic microphone is shared between Knowles's domestic and foreign facilities. The direct customer communications are generally handled in the Itasca facility. The review of potentially malfunctioning SiSonic microphones is initiated overseas and followed by detailed analysis and repair in the Itasca facility.
- In addition to the { } investment in equipment set forth above, Knowles's annual costs accrued domestically in labor, labor overhead, materials, materials overhead purchased services, tooling costs and fixtures allocated to the SiSonic microphone are approximately

{ .}

(JX-19C at ¶¶ 13-24.)

Based on the foregoing stipulated facts, I find that Knowles' significant investment in plant and equipment and significant employment of labor or capital related to the SiSonic product satisfies the economic prong of the domestic industry requirement for both the '231 and '089 patents. 19 U.S.C. §§ 1337(a)(3)(A)-(B) (2009).

### C. Technical Prong

#### 1. The '231 Patent

**Knowles' Position:** Analog contends that the SiSonic microphone products practice claim 1 of the '231 patent and thus satisfy the technical prong.

Knowles argues that the SiSonic products are microelectromechanical system packages. Knowles states that each product provides a first and second level connection, including surface mount pads which are connected to corresponding pads on the end-user's printed circuit board directly underneath the package. (Citing CX-462C at Q. 25.) Knowles claims that the package housing provides mechanical and environmental protection for the MEMS dies and ASIC within the housing. (Citing CX-462C at Q. 25.) Knowles claims that Dr. Gilleo testified that the solder pads built into the bottom of the substrate are used to make electrical and mechanical connections to a printed circuit board and fix the package in place such that it cannot move. (Citing Tr. at 323:15-25, 324:1-325:2.) Alternatively, Knowles argues that the SiSonic products are packages under the constructions proposed by Analog and Staff. (Citing CX-462C at Q. 54-55.)

Knowles asserts that the SiSonic products contain a microelectromechanical system microphone. Knowles states that Dr. Gilleo's examination and the SiSonic product data sheets

## PUBLIC VERSION

both confirm the presence of a MEMS microphone. (Citing CX-462C at Q. 56.)

Knowles claims that the SiSonic products include a substrate comprising a surface for supporting the MEMS microphone. Knowles states that Dr. Gilleo's examination of the SiSonic products and the SiSonic data sheets confirms that the MEMS microphone contained within the housing is supported by a PCB substrate. (Citing CX-462C at Q. 57.)

Knowles states that the SiSonic products include a cover comprising a conductive layer having a center portion bounded by a peripheral edge portion. According to Knowles, Dr. Gilleo's testing confirmed that the cover of the SiSonic products is conductive. (Citing CX-462C at Q. 58.) Knowles claims that this element is also demonstrated in Knowles' data sheets and design guides. (Citing CX-576; CX-577; CX-575; CX-578; CX-568; CX-569; CDX-391.)

Knowles asserts that the SiSonic products include a housing formed by connecting the peripheral edge portion of the cover to the substrate. Knowles states that disassembly of the SiSonic products reflects that they meet this element. (Citing CX-462C at Q. 59.) Knowles states that Dr. Gilleo testified that there were SiSonic designs with two-piece lids and one-piece lids, but that he opined that such a difference was not material to this claim element. (Citing Tr. at 240:1-17, 241:12-20, 242:10-14, 243:21-24, 323:5-13; CDX-391.)

Knowles states that it began selling a two-piece SiSonic package in 2008 (the SPM0410LR5H-QB), having a single piece metal lid attached to the substrate to form a housing. (Citing CX-464C at Q. 117-118.) Knowles further states that it also sells a version of the MPM0410LR5H with a solid metal cap, which was released on September 29, 2008. (Citing Tr. at 106:18-22, 113:13-114:8, 244:8-14; JX-15 at KE1000040.)

Knowles argues that the center portion of the cover is spaced from the surface of the substrate to accommodate the MEMS microphone. (Citing CX-462C at Q. 60; CDX-391; CX-

## PUBLIC VERSION

464C at Q. 118.)

Knowles claims that the housing of the SiSonic products includes an acoustic port for allowing an acoustic signal to reach the microphone. Knowles states that acoustic port is located directly under the MEMS microphone. (Citing CX-462C at Q. 61.) Knowles claims that other SiSonic models have an acoustic port in the cover opposite the MEMS microphone. (Citing CX-462C at Q. 61.)

Knowles asserts that the housing of the SiSonic products provides protection from an interference signal. According to Knowles, Dr. Gilleo confirmed that the metallic cover of the SiSonic products is connected to ground on the bottom of the package, thereby providing protection from an interference signal. (Citing CX-462C at Q. 62.) Knowles states that Dr. Loeppert confirmed the existence of this feature. (Citing CX-464C at Q. 121-122.)

In its reply brief, Knowles argues that the SiSonic products meet the “housing” limitation of claim 1. Knowles asserts that there is no requirement in the ‘231 patent that the “cover” of claim 1 be made only from a single piece. (Citing JX-1 at 5:16-17, 1:45-47.) Thus, Knowles claims that a two-piece cover will meet the requirements of claim 1. Knowles notes that Dr. Gilleo testified that there are SiSonic models with a two-piece cover, and SiSonic models with a one-piece cover, and that he did not believe that this difference was material. (Citing 240:1-17, 241:12-20, 242:10-14, 243:21-24, 323:5-13; CDX-391.)

Knowles argues that the SiSonic products are “packages” under its proposed construction. Knowles claims that it established at the hearing that the SiSonic products provide the needed protection required by Knowles’ proposed construction. (Citing CIB at 34; Tr. at 323:15-25, 324:1-325:2.)

**Analog’s Position:** Analog contends that Knowles failed to demonstrate that the SiSonic

## PUBLIC VERSION

products practice claim 1 of the '231 patent.

Analog states that Knowles argues that it meets the technical prong based on an analysis of four SiSonic products – SPM0404LE5H, SPM0408LE5H, SPM0410LR5H, and SPU0409LE5H. (Citing CX-462C at Q. 50-51.) Analog claims that Dr. Gilleo uses the SPM0404LE5H as an exemplary product because it is not materially different from the other products. (Citing CX-462C at Q. 50.)

Analog argues that the SPM0404LE5H does not have the claimed housing because the housing is made of a lid, a wall, and a base. (Citing CDX-391; CX-464C at Q. 88-91.) According to Analog, claim 1 requires a two-piece housing made from the cover and the substrate. (Citing JX-1 at 5:18-19; Tr. at 241:3-6.) Analog states that Dr. Gilleo confirmed that the housing of the SPM0404LE5H is made of three pieces. (Citing Tr. at 241:7-24, 106:8-17; CX-575 at KE1659699; CX-388 at 28; RX-388C at 55:21-23.) Analog argues that Knowles has not offered sufficient evidence regarding any SiSonic products beyond the SPM0404LE5H to demonstrate the technical prong.

Analog also argues that Knowles failed to demonstrate that the SiSonic products meet Knowles' proposed construction of "package." Analog asserts that Knowles failed to offer evidence to support a finding that the package of the SiSonic products protects against mechanical shock and vibration. (Citing CX-462C at Q. 55; Tr. at 247:8-248:16; RX-385 at 113:15-114:25.)

In its reply brief, Analog notes that Knowles now claims that the SPM0410HR5H-PB product meets claim 1 of the '231 patent. According to Analog, this argument was not raised in Knowles' pre-hearing brief and has been waived. (Citing Ground Rule 8.2.) Analog argues that all of Dr. Gilleo's expert testimony regarding the technical prong centers on the SiSonic products

## PUBLIC VERSION

with a three-piece housing. Analog argues that these products with a three-piece housing do not meet the requirement of claim 1 that the housing is comprised of two pieces – a cover and a substrate.

Analog argues that Knowles' pre-hearing brief says nothing about whether or not its products meet the "mechanical stability" requirement for a "package." (Citing CPHB at 23.) Analog claims that Knowles now argues that the SiSonic products meet the "mechanical stability" requirement. Because the issue was not addressed in the pre-hearing brief, Analog claims that Knowles has waived the argument. (Citing Ground Rule 8.2.)

**Staff's Position:** Staff contends that Knowles has satisfied the technical prong.

Staff states that the evidence has shown that the least the SPM0410LR5H product practices claim 1 of the '231 patent. (Citing Tr. at 322:11-323:13.) With respect to the remaining SiSonic models, Staff notes that the packages are composed of three members – a base, a wall, and a lid, instead of two members are required by claim 1. (Citing RPHB at 32-33.) Staff argues that these three-piece models do not meet the "housing" requirement of claim 1.

Staff disagrees with Analog's claim that because Dr. Gilleo used a three-piece product as a representation for purposes of proving the technical prong, Knowles has failed to meet its burden. (Citing RPHB at 31; CX-462C at Q. 64.) Staff claims that Analog's argument fails to recognize that Dr. Gilleo inspected a product with a housing composed of two members and determined that the product meets claim 1. (Citing CX-551C; CX-462C at Q. 51-52.) Staff notes that Dr. Gilleo testified at the hearing that other than the cover, there were no substantive differences between the SPM0404LE5H and the SPM0410LR5H models. (Citing Tr. at 322:11-323:13.)

## PUBLIC VERSION

**Discussion and Conclusion:** Based on the evidence in the record, I find that Knowles has failed to satisfy the technical prong of the domestic industry requirement for the '231 patent, because I concluded in Section IV.B. *supra* that claim 1 of the '231 patent is invalid.

Assuming *arguendo* that claim 1 is valid, I find that Knowles demonstrated that it satisfies the technical prong. *See Certain Video Graphics Display Controllers & Products Containing Same*, Inv. No. 337-TA-412, Initial Determination (Apr. 30, 1999) (explaining that “[complainant] bears the burden of proving that its domestic industry practices a *valid claim* of [the asserted patent].”) (emphasis added).

Analog offers two separate arguments in opposing Knowles’ technical prong claim. Analog first asserts that Knowles failed to prove that the SiSonic products are “packages” under Knowles’ proposed construction. Because Knowles’ proposed construction was not adopted, this argument is rendered moot.

Analog next argues that the SiSonic products lack a “housing.” Claim 1 requires that “a housing formed by connecting the peripheral edge portion of the cover to the substrate[.]” Analog asserts that Knowles focuses on the SPM0404LE5H SiSonic product in its domestic industry analysis. Analog claims that because the “housing” of the SPM0404LE5H is made up of three pieces – a lid, a wall, and a base – it does not satisfy claim 1. Knowles counters that argument by asserting that the lid and the wall together form the “cover” of claim 1, and that there is nothing that precludes the cover from being comprised of multiple pieces.

While Analog focuses on the “housing” limitation, its argument really concerns the “cover” limitation. Claim 1 requires “a cover comprising a conductive layer having a center portion bounded by a peripheral edge portion[.]” Under Analog’s view of the claim language, claim 1 requires that the cover be a unitary structure. I find nothing in the intrinsic evidence that

## PUBLIC VERSION

would restrict the cover in claim 1 to a unitary structure. *See Cross Med. Prods., Inc. v. Medtronic Sofamor Danek, Inc.*, 424 F.3d 1293, 1309 (Fed. Cir. 2005) (rejecting an attempt to limit the term “channel” to a unitary structure when the intrinsic evidence did not require doing so); *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1367-69 (Fed. Cir. 2002) (refusing to limit the term “member” to a single-component structure). The “cover” of the SPM0404LE5H is comprised of two pieces. (Tr. at 241:7-20.) Thus, I conclude that Analog’s argument about the lack of a “housing” has no merit.

Knowles has offered evidence to support a finding that the SiSonic products meet each limitation of claim 1. The SiSonic products are microelectromechanical system packages. (CX-462C at Q. 53-55.) The SiSonic products include a microelectromechanical system microphone. (*Id.* at Q. 56.) The SiSonic products have a substrate comprising a surface for supporting the microelectromechanical microphone, as Dr. Gilleo testified that the microphone sits on a PCB (FR-4) substrate. (*Id.* at Q. 57.)

The SiSonic products have a cover comprising a conductive layer having a center portion bounded by a peripheral edge portion. (CX-462C at Q. 58.) Dr. Gilleo testified that he was able to confirm that the cover is conductive. (*Id.*) The SiSonic products have a housing formed by connecting the peripheral edge portion of the cover to the substrate. (*Id.* at Q. 59.) The center portion of the cover of the SiSonic products is spaced from the surface of the substrate to accommodate a MEMS microphone, as Dr. Gilleo stated that during his disassembly of the SiSonic products, “it was clear that the MEMS microphone resided in the space between the cover and the substrate.” (*Id.* at 60.)

The housing of the SiSonic products includes an acoustic port for allowing an acoustic signal to reach the MEMS microphone. (CX-462C at Q. 61.) Dr. Gilleo testified that the

## PUBLIC VERSION

products that he examined had the acoustic port in the substrate directly underneath the MEMS microphone, and that there was no barrier that would block the passage of the acoustic signal through the port to the microphone. (*Id.*) Finally, the SiSonic products include a housing that provides protection from an interference signal. (CX-462C at Q. 62.) Dr. Gilleo confirmed that the metallic cover was connected to the ground pad on the bottom of the package. (*Id.*) Dr. Loeppert confirmed that every SiSonic product “includes some form of electromagnetic interference by having a metalized shield connected to the printed circuit board materials to which the MEMS die is mounted.” (CX-464C at Q. 122.)

Even if the SPM0404LE5H was found to lack a “cover” or a “housing,” as both Analog and Staff argue, Knowles produces other SiSonic products – such as the SPM0410LR5H – that include a single-piece cover. (Tr. at 322:11-323:13.) Dr. Gilleo analyzed the SPM0410LR5H as part of his technical prong analysis. (CX-462C at Q. 51-52.) Dr. Gilleo testified that other than the cover, he found no substantive differences between the SPM0410LR5H and the SPM0404LE5H. (Tr. at 322:11-323:13.) Therefore, if the Commission determines that the two-piece cover of the SPM0404LE5H does not meet the requirements of claim 1, Knowles can still satisfy the technical prong through the SPM0410LR5H for all of the reasons described *supra*.

### 2. The ‘089 Patent

#### a. Claim 1

**Knowles’ Position:** Knowles argues that Analog disputes only that the SiSonic products have not been shown to meet Knowles’ construction of the term “package,” as it has not been shown that the SiSonic products protect against “mechanical shock and vibration.” (Citing RPHB at 92.) Knowles asserts that the evidence shows that Knowles established that its SiSonic products practice claim 1 of the ‘089 patent, including the “package” limitation, thereby

## PUBLIC VERSION

satisfying the “technical prong” of the domestic industry requirement. Knowles says the mechanical connection element of Claim 1 is specifically addressed by Dr. Loeppert, who confirmed that the same solder that creates the electrical connection also provides the physical support for the device since the device is a single rigid body and the support is directly underneath it. (Citing CX-609C at Q. 7.)

Knowles contends that Dr. Gilleo disassembled and examined several SiSonic microphone packages to determine if they include all elements of claim 1. (Citing CX-462C at Q. 50, 51, 86; CX-464C at Q. 94-96.) Knowles states that Dr. Gilleo prepared demonstratives using photograph taken from his expert report (CX-551C) depicting the elements of Minervini ‘089 as can be seen in his microscopic photographs of the SPM0404LE5H (CPX-7). (CX-462C at Q. 96, 97; CDX-6C.60-6C.63.) Knowles’ says its employee, Dr. Loeppert, also provided testimony confirming that Knowles practices claim 1. (Citing CX-464C at Q. 94-96, 111.)

Knowles argues that, as shown in regard to the ‘231 patent, the SiSonic products are “packages” as defined by Knowles and provide the needed protection from mechanical and environmental stress. (Citing CX-462C at Q. 87, 53; CDX-392; CX-609C at Q. 7.) Knowles asserts that the SiSonic products also have terminal pads on the bottom of the PCB substrate for use in connecting to corresponding pads on an end-user’s PCB using automated assembly and standard surface mount technology. (Citing CX-462C at Q. 87.) Knowles contends that the packages are intended for use in automated assembly lines using standard solder reflow and pick and place technology as confirmed by the SiSonic design guides and data sheets. (*Id.*) Knowles adds that the SiSonic products are “surface mountable packages” under the constructions proposed by Analog and the Staff and as adopted in the TEO ID. (*Id.* at Q. 88, 89.)

Knowles asserts that the SiSonic products have a PCB substrate (first or second member)

## PUBLIC VERSION

and a cover (first or second member) which together define a chamber in the interior of the package. (Citing CX-462C at Q. 90.) Knowles states that the microphone (transducer) resides within this chamber and is attached to the substrate as corroborated by the diagrams shown in the Design Guide, Figure 1, and Digital Design Guide Figure 2. (Citing CX-462C at Q. 80; CX-464C at Q. 111; CDX-392.)

Knowles says that its SiSonic products have a surface on the substrate where there is a patterned conductive layer which is electrically coupled to the transducer. (Citing CX-462C at Q. 91; CX-464C at Q. 102-104.) Knowles continues that the wire bonds attached to the MEMS microphone are connected to the ASIC which is then connected to the patterned conductive layer as corroborated by the diagrams shown in the Design Guide, Figure 1, and Digital Design Guide, Figure 2. (Citing CX-462C at Q. 91; CX-464C at Q. 102-104.) Knowles contends that this meets the “electrically coupled” limitation as that term has been defined. (*Id.*)

Knowles argues that SiSonic products have an outside surface of the package with terminal pads that are electrically coupled to the patterned conductive layer. (Citing CX-462C at Q. 92; CX-464C at Q. 105-110.) Knowles avers that Dr. Gilleo confirmed this element by using an ohmmeter to confirm that the pads on the outside surface of the package were electrically coupled to the patterned conductive layer on the upper surface of the substrate. (Citing CX-462C at Q. 92.) Knowles states that Dr. Gilleo, in cross sectioning SiSonic samples, also observed what appear to be plated vias between the pads on the outside surface of the package electrically coupled to the patterned conductive layer on the upper surface of the substrate. (*Id.*) Block diagrams and land pad diagrams in the Design Guides and data sheets corroborate these findings. (*Id.*)

Knowles alleges that SiSonic products, similar to the accused products, have a volume (a

## PUBLIC VERSION

front volume) defined by the microphone (transducer) and the substrate (first or second member). (Citing CX-492C at Q. 93; CX-569 at KE1560038.) Knowles says that like the accused products, the SiSonic products also have a volume (a back volume) defined by the microphone (transducer) and the substrate (first or second member), cover (first or second member), and ASIC. (*Id.*) Knowles continues that functionally, however, this “back volume” so defined performs substantially the same overall function (regulating the movement of the diaphragm), operates in substantially the same way (by providing pressure to the back of the diaphragm), and achieves substantially the same result (the microphone produces an electrical signal representative of the acoustic signal) as a back volume defined exclusively by the microphone and the substrate. (*Id.*) Knowles says that since the back volume expands and shrinks based on the movement of the diaphragm, and the diaphragm moves based on the acoustic signal, the back volume is necessarily acoustically coupled to the microphone. (*Id.*) Knowles concludes that under the doctrine of equivalents, the accused packages all have the “volume” required by this claim element. (*Id.*)

Knowles contends that other SiSonic products are configured with the aperture on the top member and the microphone on the bottom member. (Citing CX-492C at Q. 93; CX-569 at KE1560037-38; CX-464C at Q. 100, 101, 113, 114.) Knowles asserts that in this configuration, the volume defined by the microphone and the substrate is a “back volume;” and the volume defined by the microphone, the substrate and the cover is the “front volume.” (*Id.*) Knowles says these observations are corroborated by the diagrams shown in the Design Guide, Figures 1 and 2 (CX-569) and Digital Design Guide, Figure 2 (CX-568).

According to Knowles, the SiSonic products have an aperture formed in the substrate (first or second member) that allows the passage of the acoustic signal to the microphone

## PUBLIC VERSION

(transducer) and the substrate (first or second member). (Citing CX-462C at Q. 94.) In the SiSonic models disassembled by Dr. Gilleo, the aperture was directly underneath the microphone on the bottom member; in other SiSonic models, the aperture may be located on the cover member. (Citing CX-462 at Q. 94; CX-464C at Q. 99-101.) Knowles claims that these observations are corroborated by the diagrams shown in the Design Guide, Figures 1 and 2 (CX-569) and Digital Design Guide, Figure 2 (CX-568).

In its reply brief, Knowles says that Analog's argument that the SiSonic products do not practice the '089 patent is repetitive of its argument made with regard to the '231 patent, namely, that Knowles has failed to show that the SiSonic products provide mechanical and environmental protection under Knowles' proposed construction of "package." (Citing RIB at 98-99.) Knowles says it has shown with regard to the '231 patent that the SiSonic products provide mechanical and environmental protection through the second-level packaging interconnect provided by the terminal pads directly underneath the device or housing. (Citing CIB at 34; and CRB section III.C.2, *supra*.) Knowles argues that contrary to Analog's arguments, Knowles has established that the SiSonic product secures the package to a printed circuit board, thus providing protection against mechanical shock and vibration. (*Id.*)

**Analog's Position:** Analog notes that Knowles argues that it meets the technical prong of domestic industry based on the analysis of four Knowles SiSonic products – SPM0404LE5H, SPM0408LE5H, SPM0410LR5H, and SPU0409LE5H; but uses SPM0404LE5H as an exemplary product.

Analog says that Knowles contends that the "package" of the '089 patent must protect from "mechanical vibration and shock." Analog avers that Dr. Gilleo testified that that Knowles' SiSonic microphone packages meet the "protection" requirement of a "package" simply because

## PUBLIC VERSION

they have a “housing” formed by a “cover and a substrate.” (Citing CX-462C at Q. 55; Tr. at 247:9-248:16; RX-385C at 113:15-114:25.) Analog argues that, to the extent that Knowles is correct that a “package” requires “protection” from “mechanical vibration and shock” and that simply having a “cover and a substrate” is insufficient to show that element, Knowles will be unable to demonstrate that its SiSonic products meet that claim limitation either.

In its reply brief, Analog says that the arguments Knowles makes and the evidence it cites to establish that “its SiSonic products” practice claim 1 of the ’089 patent suffers from the same defect as its arguments and evidence with respect to claim 1 of the ’231 patent, namely that Knowles has failed to prove that its products meet the so-called “package” claim limitation.<sup>43</sup>

**Staff’s Position:** Staff argues that similar to the ’231 patent discussed *infra*. Sec. II.C.2, Knowles relies on the following SiSonic models to support its domestic industry claim: SPM0404LE5H (CPX-7); SPM0408LE5H (CPX-8); SPM0410LE5H (CPX-9); and SPM0409LE5H (CPX-10).<sup>44</sup> Staff asserts that the evidence has shown that the domestic products practice claim 1 of the ’089 patent.

Staff agrees with Knowles that, it was found in the 629 investigation that the SiSonic products practice claim 1 and the packaging of these products has not substantially changed since that investigation. (Citing CPHB at 43.)

Staff adds that Dr. Gilleo examined model numbers SPM0404LE5H (CPX-7); SPM0408LE5H (CPX-8); SPM0410LE5H (CPX-9); and SPM0409LE5H (CPX-10) and

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<sup>43</sup> Analog says that while Knowles argues that there is record evidence showing that its SiSonic packages practice claims 2, 7, 16, 17, 18, and 20 of the ’089 patent, it failed to argue that many of these claim limitations were met in its pre-hearing brief, and these arguments should be deemed waived. (Citing Ground Rule 8.2.) Analog adds that some of the record evidence Knowles cites (CIB at 106-109) to support its arguments with respect to claim 1 of the ’089 patent is improper; saying that CX-464C at Q. 97 was withdrawn and CX-464C at Q. 111 was stricken.

<sup>44</sup> Staff says that although Knowles relies on both the three member and the two member packages for domestic industry, this does not effect the analysis of the technical prong for the ’089 patent. Unlike the ’231 patent, the ’089 patent recites “at least a first member and a second member.” Thus, Staff reasons, this claim encompasses packages with more than two members.

## PUBLIC VERSION

determined that these products all practice the limitations contained in claim 1 of the '089 patent. (Citing CX462C at Q. 65-80.) Staff concludes that the evidence has shown that Knowles has satisfied the technical prong of the domestic industry requirement.

**Discussion and Conclusions:** Based on the evidence in the record, I find that Knowles has failed to satisfy the technical prong of the domestic industry requirement for the '089 patent, because I concluded in Section IV.C.2, *supra* that asserted claim 1 of the '089 patent is invalid. Assuming *arguendo* that claim 1 is valid, I find that Knowles demonstrated that it satisfies the technical prong. *See Certain Video Graphics Display Controllers & Products Containing Same*, Inv. No. 337-TA-412, Initial Determination (Apr. 30, 1999) (explaining that “[complainant] bears the burden of proving that its domestic industry practices a *valid claim* of [the asserted patent].”) (emphasis added).

The parties' arguments are in all material aspects repetitive of their arguments set forth in Section VI.C.1, *supra*, regarding the '231 patent, and center on the issue of whether or not Knowles has proven that its SiSonic products practice a “package” as that term is correctly construed.

Analog's argument is that, under Knowles' construction, the “package” of the '089 patent must protect from “mechanical vibration and shock,” and Knowles cannot, therefore, provide evidence that its SiSonic products practice asserted claim 1. As I noted in Section VI.C.1, however, the proper construction of the term “package” does not reflect Knowles' construction, and Analog's argument is rendered moot.<sup>45</sup>

Knowles has offered evidence that its SiSonic products practice asserted claim 1 of the '089 patent. Dr. Gilleo testified that he disassembled and examined several SiSonic microphone

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<sup>45</sup> Notwithstanding this finding, I note that Dr. Loeppert testified credibly that the package is secured to the secondary substrate by soldering, and Knowles argues credibly that this provides physical support to the device. (CX-609C at Q. 6- 7.)

## PUBLIC VERSION

packages to determine if they include all elements of claim 1. (CX-462C at Q. 50-51, 86; CX-464C at Q. 94-96.) Dr. Gilleo said he prepared demonstratives using photograph taken from his expert report (CX-551C) depicting the elements of claim 1 as shown in his microscopic photographs of the SPM0404LE5H (CPX-7). (CX-462C at Q. 96, 97.) Knowles' employee, Dr. Loeppert, also provided testimony confirming that Knowles practices claim 1. (CX-464C at Q. 95-96, 99-111.) The evidence detailed below provides further proof that the SiSonic products practice all elements of claim 1. More specifically, Knowles' produced the evidence listed below to prove that its SiSonic product practices the following limitations:

- “A surface mountable package for containing a transducer, the transducer being responsive to sound pressure levels of an acoustic signal to provide an electrical output representative of the acoustic signals, the surface mountable package comprising:” (CX-462C at Q. 53, 87-89; CX-609C at Q. 7; CX-576; CX-577; CX-575; CX-578; CX-569);
- “at least a first member and a second member and a chamber being defined by the first member and the second member, the transducer being attached to a surface formed on one of the first member or the second member and the transducer residing within the chamber;” (CX-462C at Q. 90; CX-569; CX-568; CX-464C at Q. 111; CX-387C at KE0000321);
- “the surface being formed with at least one patterned conductive layer, the patterned conductive layer being electrically coupled to the transducer;” (CX-462C at Q. 91; CX-464C at Q. 102-104; CX-569; CX-568);
- “an outside surface of the surface mountable package comprising a plurality of terminal pads electrically coupled to the patterned conductive layer;” (CX-462C at Q. 92; CX-464C at Q. 105-110; CX-387C at KE0000321, KE0000324, KE0000325; CX-388 at 29; CX-569; CX-568; CX-576; CX-577; CX-575; CX-578);
- “a volume being defined by the transducer and one of the first member or the second member, the volume being acoustically coupled to the transducer;” (CX-492C at Q. 93; CX-569 at KE1560037-38; CX-464C at Q. 100, 101, 113, 114; JX-15 at KE1000031; CX-387C at 0000322; CX-568); and
- “and one of the first member or the second member being formed to include an aperture, the aperture configured to permit the passage of an acoustic signal

## PUBLIC VERSION

to the transducer.” (CX-462C at Q. 94; CX-464C at Q. 99-101; CX-569; CX-568).

Based upon the foregoing, I find that the Knowles SiSonic products literally practice each and every element of claim 1 of the ‘089 patent, and that Knowles has demonstrated that it meets the technical prong of the domestic industry requirement for the ‘089 patent.<sup>46</sup>

### **b. Claims 2, 7, 16, 18 & 20**

Knowles asserts that its SiSonic products also practice asserted claims 2, 7, 16, 18, and 20 of the ‘089 patent. Each of these claims is dependent from claim 1. (JX-2.) Based on the evidence in the record, I find that Knowles has failed to satisfy the technical prong of the domestic industry requirement for asserted claims 2, 7, 16, 18, and 20 of the ‘089 patent, because I concluded in Section IV.C.2., *supra*, that those asserted claims are invalid. Assuming *arguendo* that the listed asserted claims are valid, I find that Knowles demonstrated that it satisfies the technical prong.

The technical prong is satisfied when a complainant demonstrates that its product practices a single claim of the asserted patent. *Certain Point of Sale Terminals and Components Thereof*, Inv. No. 337-TA-524, Order No. 40 (April 11, 2005). Because I have already concluded that the SiSonic products practice claim 1 of the ‘089 patent, it would ordinarily be unnecessary to address Knowles’ arguments regarding the dependent claims. Nevertheless, in the event that the Commission were to find that claim 1 is invalid; but that any one of the dependent claims is not rendered invalid, a situation could arise in which a product could meet the technical prong by practicing one or more of the valid dependent claims. Therefore, I will

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<sup>46</sup> Because I find that the Knowles SiSonic product literally practices the 5<sup>th</sup> element of claim 1 (teaching the “volume”), it is unnecessary to treat the issue of the doctrine of equivalents raised by Knowles as an alternative in connection with this element.

## PUBLIC VERSION

treat the substantive issue of whether or not the SiSonic product has been shown to practice dependent claims 2, 7, 16, 18, and 20 of the '089 patent.

**Knowles' position:** Knowles contends that it practices Claims 2 and 7 in that it sells a SiSonic product, the SPM0410LR5H-QB, using a one-piece metal cover with the transducer located over the aperture. (Citing CX-464C at Q. 118-120; CX-605.) Knowles says it also practices claim 16 in that its SiSonic products have a metalized region formed on an exterior surface that is electrically coupled to the patterned conductive layer. (Citing CX-464C at Q. 121.) Knowles adds that it practices claim 18 in that its SiSonic products provide protection against electromagnetic interference. (*Id.* at Q. 122.) Finally, Knowles asserts that it practice claim 20 in that the substrate of its SiSonic microphone packages are made of printed circuit board materials. (*Id.*)

**Analog's position:** Analog says in a footnote that, while Knowles argues that there is record evidence showing that its SiSonic packages practice claims 2, 7, 16, 17, 18, and 20 of the '089 patent, it failed to argue that many of these claim limitations were met in its pre-hearing brief, and these arguments should be deemed waived. (Citing Ground Rule 8.2.) Analog adds that some of the record evidence Knowles cites (CIB at 106-109) to support its arguments with respect to claim 1 of the '089 patent is improper; saying that CX-464C, Q. 97 was withdrawn and CX-464C, Q. 111 was stricken.

**Staff's position:** Staff offers no position beyond that stated regarding claim 1

**Discussion and Conclusion:** First, I note that Knowles' prehearing brief included arguments that, in addition to claim 1, its SiSonic products practice asserted claims 8, 16, and 17. Analog's objection that Knowles waived its argument that its SiSonic products practice asserted claims 2, 7 and 20 is correct, and I will not consider Knowles' arguments regarding those claims.

## PUBLIC VERSION

Regarding claims 8 and 17, I note that Knowles makes no argument in its brief. I turn, therefore, to claim 16.

Asserted claim 16 depends from asserted claim 1 and adds the following element:<sup>47</sup>

a metalized region being formed on an exterior surface of the surface mountable package, the metalized region being electrically coupled to the patterned conductive layer.

(JX-2, 12:47-50.) Dr. Loeppert testified credibly that the Knowles SiSonic SPM0410LR5H-QB, shown in CX-605 at KE1000041-50, has a metal cap which is electrically coupled to the patterned conductive layer – the printed circuit board on which the MEMS die is attached, by means of solder. (CX-464C at Q. 121.) His testimony is unrebutted, and I find that the Knowles SiSonic product practices asserted claim 16 of the ‘089 patent.

Based upon the foregoing, in the event that it is found that claim 1 of the ‘089 patent is invalid, but that dependent claim 16 is valid, I find that Knowles has provided evidence sufficient to establish that it meets the technical prong of the domestic industry requirement by practicing claim 16 of the ‘089 patent.

## VII. REMEDY & BONDING

### A. Limited Exclusion Order

**Knowles’ Position:** Knowles contends that the Commission should issue a limited exclusion order directed to Analog’s silicon microphone packages. Knowles argues that there are no public policy reasons why it should not be entitled to full relief in this investigation.

In its reply brief, Knowles states that Analog argues that an exclusion order is inappropriate because the importation at issue is { .}

Knowles asserts that it is irrelevant why Analog imports and commercially sells the accused

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<sup>47</sup> Inasmuch as I have already found that the SiSonic product practices asserted claim 1 of the ‘089 patent, I will not repeat the evidence on that point here but incorporate by this reference my rationale and findings on those elements of claim 16 that are set forth in independent claim 1.

## PUBLIC VERSION

products in the United States, and that a limited exclusion order should still apply to Analog's importation and sale after importation of accused products.

**Analog's Position:** Analog contends that an exclusion order is an inappropriate remedy in this investigation.

Analog alleges that the accused products are only imported {

} (Citing RX-355C at Q. 60.)

Analog argues that an exclusion order barring importation would allow Knowles to obtain the equivalent of downstream relief against non-party U.S. consumer electronics companies. Analog claims that such relief would go against the spirit of the Federal Circuit's decision in *Kyocera Wireless Corp. v. Int'l Trade Comm'n*, 545 F.3d 1340, 1357-1358 (Fed. Cir. 2008).

**Staff's Position:** Staff contends that if a violation of Section 337 is proven, a limited exclusion order is appropriate.

**Discussion and Conclusion:** In this Initial Determination, I have found no violation of Section 337. If, however, a violation of Section 337 is found by the Commission, I recommend that the Commission issue a limited exclusion order that applies to Analog, as well as all of its affiliated companies, parents, subsidiaries, or other related business entities, or their successors or assigns, and covers the silicon microphone packages and products containing the same found to infringe the asserted patents.

I decline to recommend an exclusion order that is limited to the specific product names or model numbers that are found to infringe. Commission precedent establishes that it is not appropriate to include specific product names in an exclusion order, as the exclusion order

**PUBLIC VERSION**

should extend to the products that are within the scope of the investigation and that are found to infringe the applicable patent or patents. *See Certain Integrated Repeaters, Switches, Transceivers & Products Containing Same*, Inv. No. 337-TA-435, Commission Opinion at 22-23, USITC Pub. 3547 (Oct. 2002); *Certain Hardware Logic Emulation Systems & Components Thereof*, Inv. No. 337-TA-383, Commission Opinion, 1998 WL 307240 (Mar. 1998) (“[T]he Commission’s long-standing practice is to direct its remedial orders to all products covered by the patent claims as to which a violation has been found, rather than limiting its orders to only those specific models selected for the infringement analysis.”)

Analog argues that because it imports accused products {  
} an exclusion order is not appropriate. Analog cites no support for this argument. Section 337 provides that upon the finding of a violation, the Commission shall issue an exclusion order unless there is a sufficient public policy rationale for not issuing an exclusion order. *See* 19 U.S.C. § 1337(d)(1) (2009). Analog’s argument regarding the intended purpose for the importation does not qualify as a sufficient public policy rationale that would prevent the Commission from entering an exclusion order. *Id.*

Analog cites to the Federal Circuit’s decision in *Kyocera*, and claims that any exclusion order would result in the preclusion of imports by non-party downstream companies because {

} I find that the *Kyocera* decision does not support Analog’s argument. In *Kyocera*, the Federal Circuit ruled that limited exclusion orders can only apply to named respondents found to violate Section 337. 545 F.3d at 1356-1358. This decision precludes the issuance of limited exclusion orders directed to unnamed downstream product manufacturers. *Id.*

Here, any limited exclusion order would be directed at Analog, who is a named

PUBLIC VERSION

respondent in this investigation, thus complying with the guidance provided in *Kyocera*. Analog seeks to stretch the Federal Circuit’s decision to apply to a situation where an exclusion order would have the “practical effect” of barring importation by unnamed downstream companies. I decline to extend the scope of the *Kyocera* decision as requested by Analog. Further, I find that Analog has not offered any evidence to support a finding that an exclusion order would have the practical effect of barring importation by unnamed downstream companies. (See RIB at 136-138; RX-355C at Q. 60.)

**B. Cease & Desist Order**

**Knowles’ Position:** Knowles contends that the Commission should issue a cease and desist order.

Knowles argues that Analog maintains a commercially significant inventory of accused products { } Knowles states that as of January 26, 2010, Analog maintained an inventory { } accused silicon microphone packages { } (Citing JX-19C at ¶ 28.) Knowles claims that there is no question that { } (Citing Tr. at 418-419.)

In its reply brief, Knowles argues that it is irrelevant that { } Knowles argues that it only matters that the products are sold commercially and imported for consumption.

**Analog’s Position:** Analog contends that issuance of a cease and desist order would be inconsistent with Commission precedent.

PUBLIC VERSION

Analog argues that {  
} (Citing RX-355C at Q. 60.) Analog states that its inventory numbers as of January 2009 demonstrate this fact. (Citing RX-355C at Q. 61.)

Analog argues that a commercial quantity of microphones {  
}  
(Citing RX-355C at 64-65; RX-287C.) Analog claims that {  
} (Citing RX-355C at Q. 61.) Analog also argues that Knowles' request for a cease and desist order barring the "marketing, offering for sale, or selling" of the accused products is overbroad and inconsistent with the language of Section 337.

In its reply brief, Analog asserts that the Commission normally finds "commercially significant" quantities of inventory where the inventory of the accused product would allow a respondents to fill orders from pre-exclusion order inventory after the exclusion order goes into effect. (Citing *Certain Crystalline Cefadroxil Monohydrate*, Inv. No. 337-TA-293, 1990 WL 10008086 at \*12-13 (Mar. 15, 1990).) Analog reiterates that its domestic supply of accused products cannot be considered "commercially significant," especially in light of the fact that {  
}

**Staff's Position:** Staff contends that the issuance of a cease and desist order is appropriate.

Staff claims that the evidence shows that Analog maintains a "commercially significant" inventory of accused products in the United States. (Citing RX-355C at Q. 13.) Staff states that although {  
} it is enough to be considered commercially

PUBLIC VERSION

{ } Staff asserts that the evidence shows {

}

**Discussion and Conclusion:** In this Initial Determination, I have found no violation of Section 337. If, however, a violation of Section 337 is found by the Commission, I do not recommend the issuance of a cease and desist order.

Section 337 provides that in addition to, or in lieu of, the issuance of an exclusion order, the Commission may issue a cease and desist order as a remedy for violation of section 337. See 19 U.S.C. § 1337(f)(1). The Commission generally issues a cease and desist order directed to a domestic respondent when there is a “commercially significant” amount of infringing, imported product in the United States that could be sold so as to undercut the remedy provided by an exclusion order. See *Certain Crystalline Cefadroxil Monohydrate*, Inv. No. 337-TA-293, USITC Pub. 2391, Comm’n Op. on Remedy, the Public Interest and Bonding at 37-42 (June 1991); *Certain Condensers, Parts Thereof and Products Containing Same, Including Air Conditioners for Automobiles*, Inv. No. 337-TA-334, Comm’n Op. at 26-28 (Aug. 27, 1997). The complainant bears the burden of proving that a respondent has a commercially significant inventory in the United States. *Certain Integrated Repeaters, Switches, Transceivers & Products Containing Same*, Inv. No. 337-TA-435, Comm’n Op., 2002 WL 31359028 (Aug. 16, 2002).

The parties stipulated that as of January 26, 2010, Analog maintained in inventory {

} (JX-19C at ¶ 28.) {

}

Analog’s inventory figures must be viewed in the context of {

}

{

} (RX-355C at Q. 65; RX-287C.) {

} (RX-355C at Q. 65.) According to Analog, {

} (RX-355C at Q. 60.)

{

} (*Id.*)

Because the evidence demonstrates that {

} I find that Knowles has failed to demonstrate that

Analog maintains a “commercially significant” inventory of accused products. Therefore, I decline to recommend the issuance of a cease and desist order should the Commission find a violation of Section 337.

### C. Bonding

**Knowles’ Position:** Knowles contends that a bond should be required during the Presidential review period. Knowles does not offer a specific amount for the bond, but instead states that the amount should be sufficient to protect Knowles from any injury.

**Analog’s Position:** Analog contends that no bond should be required during the Presidential review period.

Analog argues that there is exists no risk that {

} (Citing RX-355C at Q. 66-

80; RX-76C; RX-292C; RX-293C; RX-294C; RX-272C; RX-273C; RX-278C; RX-287C; RX-326C; RX-123C; RX-229C; JX-6C; JX-9C; CX-464C at Q. 140.)

Analog argues that if the Commission sets a bond, it should be based on a reasonable royalty rate for the asserted patents. {

PUBLIC VERSION

}

**Staff's Position:** Staff contends that any bond should be based on a reasonable royalty rate. {

}

**Discussion and Conclusion:** In this Initial Determination, I have found no violation of Section 337. If, however, a violation of Section 337 is found by the Commission, I recommend a bond rate of 3%.

The administrative law judge and the Commission must determine the amount of bond to be required of a respondent, pursuant to section 337(j)(3), during the 60-day Presidential review period following the issuance of permanent relief, in the event that the Commission determines to order a remedy. The purpose of the bond is to protect the complainant from any injury.

19 CFR §§ 210.42(a)(1)(ii), 210.50(a)(3). The complainant has the burden of supporting any bond amount it proposes. *Certain Rubber Antidegradants, Components Thereof, and Products Containing Same*, Inv. No. 337-TA-533, Comm'n Op., 2006 ITC LEXIS 591 (Jul. 21, 2006).

When reliable price information is available, the Commission has often set the bond by eliminating the differential between the domestic product and the imported, infringing product.

*See Certain Microsphere Adhesives, Processes for Making Same, and Products Containing Same, Including Self-Stick Repositionable Notes*, Inv. No. 337-TA-366, Comm'n Op. a 24

**PUBLIC VERSION**

(1995). In other cases, the Commission has turned to alternative approaches, especially when the level of a reasonable royalty rate could be ascertained. *See, e.g., Certain Integrated Circuit Telecommunication Chips and Products Containing Same, Including Dialing Apparatus*, Inv. No. 337-TA-337, Comm'n Op. at 41 (1995).

Knowles offers no evidence regarding bond. In fact, Knowles devotes only two sentences to the issue of bonding in its initial brief, and fails to address bonding in its rebuttal brief. (*See* CIB at 149; CRB at 73-74.) Knowles asserts that the amount of a bond should be sufficient to protect Knowles from any injury, but it fails to suggest any bond amount. (*Id.*)

Staff asserts that the bond should be 3%. {

} Therefore, I recommend a bond

rate of 3%.

**VIII. MATTERS NOT DISCUSSED**

This Initial Determination's failure to discuss any matter raised by the parties, or any portion of the record, does not indicate that it has not been considered. Rather, any such matter(s) or portion(s) of the record has/have been determined to be irrelevant, immaterial or meritless. Arguments made on brief which were otherwise unsupported by record evidence or legal precedent have been accorded no weight.

**PUBLIC VERSION**

**IX. CONCLUSIONS OF LAW**

1. The Commission has subject matter jurisdiction, *in rem* jurisdiction, and *in personam* jurisdiction.

2. There has been an importation of the accused Analog silicon microphone packages and products containing the same, which are the subject of the alleged unfair trade allegations.

3. An industry does not exist in the United States that exploits U.S. Pat. No. 6,781,231, as required by 19 U.S.C. § 1337(a)(2).

4. Claim 1 of U.S. Pat. No. 6,781,231 is invalid pursuant to 35 U.S.C. §§ 102, 103.

5. The accused Analog products infringe claim 1 of U.S. Pat. No. 6,781,231.

6. There is no violation of 19 U.S.C. § 1337(a)(1) with respect to U.S. Pat. No. 6,781,231.

7. An industry does not exist in the United States that exploits U.S. Pat. No. 7,242,089, as required by 19 U.S.C. § 1337(a)(2).

8. Claims 1, 2, 7, 16, 17, 18, and 20 of U.S. Pat. No. 7,242,089 are invalid pursuant to 35 U.S.C. § 103.

9. The accused Analog products infringe claims 1, 2, 7, 16, 17, 18, and 20 of U.S. Pat. No. 7,242,089.

10. There is no violation of 19 U.S.C. § 1337(a)(1) with respect to U.S. Pat. No. 7,242,089.

**XI. ORDER**

Based on the foregoing, and the record as a whole, it is my Final Initial Determination that there is no violation of 19 U.S.C. § 1337(a)(1) in the importation into the United States, sale

**PUBLIC VERSION**

for importation, and the sale within the United States after importation of certain silicon microphone packages and products containing the same.

I hereby **CERTIFY** to the Commission my Final Initial and Recommended Determinations together with the record consisting of the exhibits admitted into evidence. The pleadings of the parties filed with the Secretary, and the transcript of the pre-hearing conference and the hearing, as well as other exhibits, are not certified, since they are already in the Commission's possession in accordance with Commission rules.

It is further **ORDERED** that:

In accordance with Commission Rule 210.39, all material heretofore marked *in camera* because of business, financial and marketing data found by the administrative law judge to be cognizable as confidential business information under Commission Rule 201.6(a), is to be given *in camera* treatment continuing after the date this investigation is terminated.

The initial determination portion of the Final Initial and Recommended Determination, issued pursuant to Commission Rule 210.42(a)(1)(i), shall become the determination of the Commission sixty (60) days after the service thereof, unless the Commission, within that period, shall have ordered its review of certain issues therein, or by order, has changed the effective date of the initial determination portion. If the Commission determines that there is a violation of 19 U.S.C. § 1337(a)(1), the recommended determination portion, issued pursuant to Commission Rule 210.42(a)(1)(ii), will be considered by the Commission in reaching a determination on remedy and bonding pursuant to Commission Rule 210.50(a).

Within ten days of the date of this document, each party shall submit to the Office of the

**CONTAINS CONFIDENTIAL BUSINESS INFORMATION**

Administrative Law Judge a statement as to whether or not it seeks to have any portion of this document deleted from the public version. The parties' submissions must be made by hard copy by the aforementioned date and must include a copy of this document with red brackets indicating any portion asserted to contain confidential business information to be deleted from the public version. The parties' submission concerning the public version of this document need not be filed with the Commission Secretary.

**SO ORDERED.**

Issued: 11/22/2010  
DATE

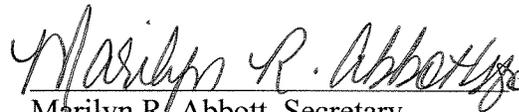
  
\_\_\_\_\_  
Robert K. Rogers, Jr.  
Administrative Law Judge

**CERTAIN SILICON MICROPHONE PACKAGES  
AND PRODUCTS CONTAINING THE SAME**

**Inv. No. 337-TA-695**

**PUBLIC CERTIFICATE OF SERVICE**

I, Marilyn R. Abbott, hereby certify that the attached **ORDER** was served upon **Maressa A. Frederick, Esq.**, Commission Investigative Attorney, and the following parties via first class mail delivery on December 21, 2010



Marilyn R. Abbott, Secretary  
U.S. International Trade Commission  
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**CERTAIN SILICON MICROPHONE PACKAGES  
AND PRODUCTS CONTAINING THE SAME**

**Inv. No. 337-TA-695**

**PUBLIC CERTIFICATE OF SERVICE PAGE 2**

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