

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SUZHOU MOJAWA INTELLIGENT ELECTRONIC CO., LTD.,
Petitioner,

v.

SHENZHEN SHOKZ CO., LTD.,
Patent Owner.

IPR2025-00842
Patent 11,197,084 B2

Before ST. JOHN COURTENAY III, GEORGIANNA W. BRADEN, and
STEVEN M. AMUNDSON, *Administrative Patent Judges*.

AMUNDSON, *Administrative Patent Judge*.

DECISION
Granting Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

Suzhou Mojawa Intelligent Electronic Co., Ltd. (“Petitioner”) filed a Petition requesting an *inter partes* review of claims 1–10 and 12–20 in U.S. Patent No. 11,197,084 B2 (“the ’084 patent”) (Exhibit 1001) under 35 U.S.C. §§ 311–319. Paper 1 (“Pet.”). Shenzhen Shokz Co., Ltd. (“Patent Owner”) filed a Preliminary Response. Paper 10 (“Prelim. Resp.”).

Under 37 C.F.R. § 42.4(a), we have authority to determine whether to institute an *inter partes* review. We may institute an *inter partes* review only if “the information presented in the petition filed under section 311 and any response filed under section 313 shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” 35 U.S.C. § 314(a) (2024). The “reasonable likelihood” standard is “a higher standard than mere notice pleading” but “lower than the ‘preponderance’ standard to prevail in a final written decision.” *Hulu, LLC v. Sound View Innovations, LLC*, IPR2018-01039, Paper 29 at 13 (PTAB Dec. 20, 2019) (precedential).

Based on the current record and for the reasons explained below, Petitioner has shown that there is a reasonable likelihood that it would prevail with respect to at least one of the challenged claims. Thus, we institute an *inter partes* review of claims 1–10 and 12–20 in the ’084 patent on all challenges included in the Petition.

II. BACKGROUND

A. Real Parties in Interest

Petitioner identifies itself as the sole real party in interest. Pet. 120. Patent Owner identifies itself as the sole real party in interest. Paper 3

(Patent Owner’s Mandatory Notices), 1. The parties do not raise any issue about real parties in interest.

B. Related Matters

Petitioner and Patent Owner identify the following civil action as a related matter: *Shenzhen Shokz Co., Ltd. v. Shenzhen Wenming Technology Co., Ltd. et al.*, No. 1:24-cv-06717 (N.D. Ill. filed July 31, 2024). Pet. 120; Paper 3, 1.

C. The ’084 Patent (Exhibit 1001)

The ’084 patent, titled “Loudspeaker Apparatus,” issued on December 7, 2021, from an application filed on December 30, 2020, as a continuation of application no. PCT/CN2019/102397 filed on August 24, 2019, which claims the benefit of priority to Chinese patent application no. 201910009927.4, filed on January 5, 2019. Ex. 1001, 1:6–10, codes (22), (30), (45), (54), (63). The patent states that the disclosure “relates to a loudspeaker apparatus, and in particular, to a loudspeaker apparatus with a waterproof function.” *Id.* at 1:14–16.

The ’084 patent explains that people perceive sound “because air transmits vibration to the eardrum through the external ear canal, and the vibration formed by the eardrum drives the human auditory nerve, thereby perceiving the sound.” Ex. 1001, 1:20–23. According to the patent, however, ordinary earphones “can no longer meet the normal use of users in some special scenes (e.g., swimming, rainy days, etc.).” *Id.* at 1:27–29. The patent endeavors to address the need for “earphones with waterproof function and better sound quality” by providing a loudspeaker apparatus. *Id.* at 1:29–30, 1:36–37, code (57).

The loudspeaker apparatus “may include an ear hook, a core housing, and a circuit housing.” Ex. 1001, 1:37–38, code (57). The ear hook “may include a first plug end and a second plug end.” *Id.* at 1:39–40, code (57). The ear hook “may be surrounded by a protective sleeve.” *Id.* at 1:40, code (57). The protective sleeve “may be made of an elastic waterproof material.” *Id.* at 1:41–42, code (57).

The core housing “may be used for accommodating an earphone core.” Ex. 1001, 1:42–43, code (57). The core housing “may be fixed to the first plug end and elastically abutted against the protective sleeve.” *Id.* at 1:43–45, code (57).

The circuit housing “may be used for accommodating a control circuit or a battery.” Ex. 1001, 1:45–46, code (57). The circuit housing “may be fixed to the second plug end.” *Id.* at 1:46–47, code (57).

The control circuit or the battery “may drive the earphone core to vibrate.” Ex. 1001, 1:47–48, code (57). The earphone core’s vibration “may generate a driving force to drive a housing panel of the core housing to vibrate.” *Id.* at 1:48–50, code (57). The driving force “may be not parallel to a normal line of the housing panel.” *Id.* at 1:50–52, code (57).

The '084 patent's Figure 2 (reproduced below) is an exploded structural diagram of an MP3 player implementing a loudspeaker apparatus:

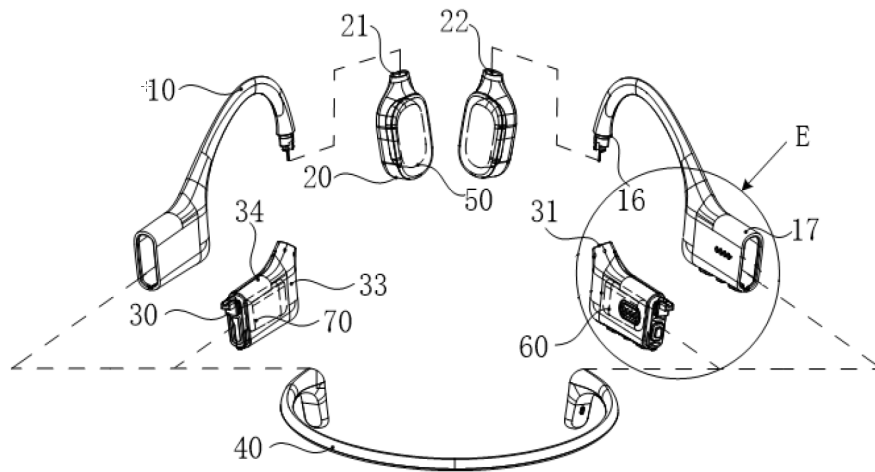


FIG. 2

Figure 2 illustrates an MP3 player including the following components:

- ear hook 10;
- core housing 20 arranged at a first plug end of ear hook 10;
- circuit housing 30 arranged at a second plug end of ear hook 10;
- rear hook 40 arranged at an end of circuit housing 30 away from ear hook 10;
- earphone core 50 arranged in core housing 20;
- control circuit 60 arranged in circuit housing 30 on the right in Figure 2; and
- battery 70 arranged in circuit housing 30 on the left in Figure 2.

Ex. 1001, 8:54–67, 9:5–9, 16:17–20, Fig. 2.

Ear hook 10 “refers to a structure surrounding and supporting a user’s ear when the user wears a bone conductive MP3 player, and then suspending

and fixing the core housing 20 and the earphone core 50 at a predetermined position of the user's ear.” Ex. 1001, 8:67–9:4.

The “number of the core housings 20 is two, which are used to accommodate two earphone cores 50 respectively.” Ex. 1001, 8:61–63, Fig. 2. The “number of the circuit housings 30 is also two, which are used to accommodate the control circuit 60 and the battery 70 respectively.” Ex. 1001, 8:63–65, Fig. 2.

Ear hook 10 “further include[s] a protective sleeve 16 and a housing sheath 17 integrally formed with the protective sleeve 16.” Ex. 1001, 9:9–12, Fig. 2; *see id.* at 10:45–50. Housing sheath 17 “may be integrally formed with the protective sleeve 16 on the periphery of the plug end 15 by injection molding.” *Id.* at 11:21–24.

The '084 patent's Figure 3 (reproduced below) is a partial structural diagram of an ear hook for an MP3 player implementing a loudspeaker apparatus:

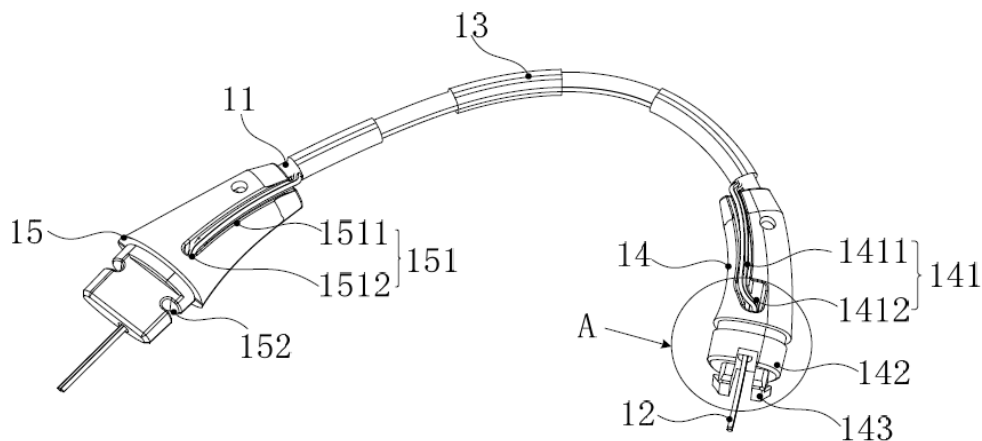


FIG. 3

Figure 3 illustrates ear hook 10 including “an elastic metal wire 11, a wire 12, a fixed sleeve 13, a plug end 14, and a plug end 15.” Ex. 1001,

9:5–8, Fig. 3. “The plug end 14 and the plug end 15 may be arranged at both ends of the elastic metal wire 11.” *Id.* at 9:8–9.

Elastic metal wire 11 “is mainly used to keep the ear hook 10 in a shape that matches the user’s ear” and “may be made of a memory alloy, which has good deformation recovery ability.” Ex. 1001, 9:12–14, 9:18–19. Hence, “even if the ear hook 10 is deformed by an external force, it may still be restored to its original shape when the external force is removed, and continue to be used by users.” *Id.* at 9:19–22.

Plug end 14 includes first wiring channel 141 and plug end 15 includes second wiring channel 151 arranged respectively “to extend the wire 12 along the first wiring channel 141 and the second wiring channel 151.” Ex. 1001, 9:56–60, Fig. 3. For instance, “the wire 12 may be threaded into the first wiring channel 141 and the second wiring channel 151 in a threading way after the first wiring channel 141 and the second wiring channel 151 are formed.” *Id.* at 9:61–64.

First wiring channel 141 includes “a first wiring groove 1411 and a first wiring hole 1412 connecting with the first wiring groove 1411.” Ex. 1001, 10:1–3, Fig. 3. “The wire 12 at the plug end 14 may extend along the first wiring groove 1411 and the first wiring hole 1412 and be exposed on the outer end surface of the plug end 14 to further connect with other structures.” *Id.* at 10:8–12.

Second wiring channel 151 includes “a second wiring groove 1511 and a second wiring hole 1512 connecting with the second wiring groove 1511.” Ex. 1001, 10:14–17, Fig. 3. “The wire 12 at the plug end 15 may extend along the second wiring groove 1511 and the second wiring

hole 1512 and be exposed on the outer end surface of the plug end 15 to further connect to other structures.” *Id.* at 10:22–26.

Plug end 14 also includes “an inserting portion 142 and two elastic hooks 143.” Ex. 1001, 12:25–26, Fig. 3. The “two elastic hooks 143 may be arranged side by side and spaced apart symmetrically on the side of the inserting portion 142 facing the inside of the core housing 20 along the direction of insertion.” *Id.* at 12:44–47.

Plug end 15 also includes “a slot 152 perpendicular to the inserted direction of the plug end 15 with respect to the socket 31” shown in Figure 2. Ex. 1001, 16:46–47, Figs. 2–3.

In “some embodiments, the core housing 20 and the plug end 14 may be connected by plugging, clamping, etc., so as to fix the core housing 20 and the ear hook 10 together.” Ex. 1001, 11:60–62. Hence, “the ear hook 10 and the core housing 20 may be formed separately first, and then be assembled together, instead of directly forming the two together.” *Id.* at 11:63–65. In “other embodiments, the ear hook 10 and the core housing 20 may be integrally formed according to the situation.” *Id.* at 12:9–11.

In “some embodiments, the circuit housing 30 and the plug end 15 may be plugged and fixed, so that the circuit housing 30 may be fixed to the end of the ear hook 10 away from the core housing 20.” Ex. 1001, 16:13–16. Hence, “the ear hook 10 and the circuit housing 30 may be formed separately, and then be assembled after the form is completed, instead of directly forming the two together.” *Id.* at 16:25–28.

The '084 patent's Figure 10 (reproduced below) is a structural diagram and an application scenario of a bone conductive loudspeaker:

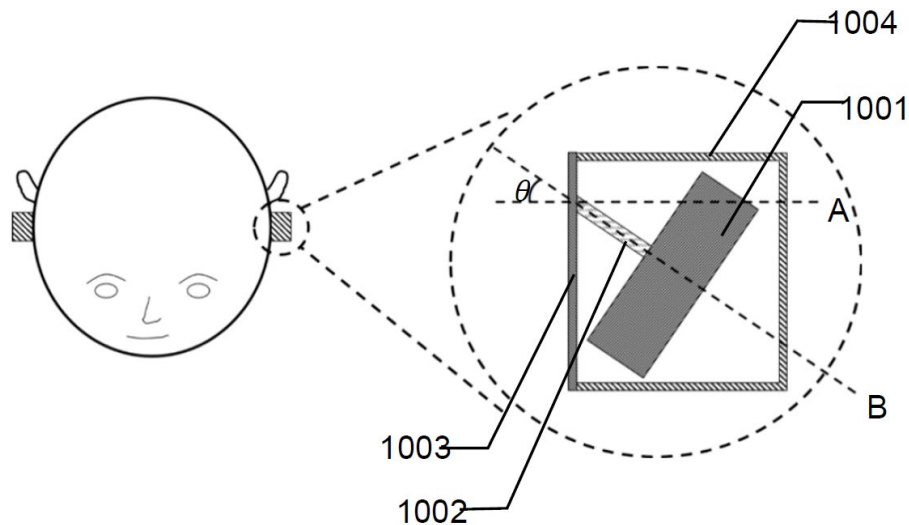


FIG. 10

Figure 10 illustrates a bone conductive loudspeaker including “a driving device 1001, a transmission component 1002, a panel 1003 (the panel 1003 may also be referred to as a housing panel, which is the side of the core housing 20 facing the human body), and a housing 1004.” Ex. 1001, 17:23–28, Fig. 10. Housing 1004 “may be equivalent to the core housing 20” in Figure 2. *Id.* at 17:17–18. Driving device 1001 “may be equivalent to the earphone core 50” in Figure 2. *Id.* at 17:18–20.

In “some embodiments, the housing 1004 may include a housing back and a housing side.” Ex. 1001, 17:28–29. “The panel 1003 may be connected with the housing back and the housing side.” *Id.* at 17:29–31. “The driving device 1001 may transmit the vibrating signal to the panel 1003 and/or the housing 1004 through the transmission component 1002, and further transmit the sound to the human body by contacting with the panel 1003 or the housing 1004 and human skin,” e.g., “at the tragus” or “on the backside of the auricle.” *Id.* at 17:31–41.

In “some embodiments, a straight line B (or a vibrating direction of a driving device) of a driving force generated by the driving component 1001 and a normal line A of the panel 1003 may form an angle θ ” such that “the straight line B is not parallel to the normal line A.” Ex. 1001, 17:42–46, Fig. 10. “A value range of the angle θ may be $0 < \theta < 180^\circ$.” *Id.* at 18:24. Further, “the value range may be $0 < \theta < 180^\circ$ and not equal to 90° .” *Id.* at 18:24–25.

D. The Challenged Claims

The '084 patent includes 20 claims. Ex. 1001, 36:49–39:8. Petitioner challenges independent claim 1 for a “loudspeaker apparatus” and claims 2–10 and 12–20 that depend directly or indirectly from claim 1. Pet. 1, 20–119.

Claim 1 exemplifies the challenged claims and reads as follows (with formatting added for clarity and with bracketed numbers and letters added for reference purposes):¹

1. [1pre] A loudspeaker apparatus, comprising:
 - [1a] an ear hook including a first plug end and a second plug end,
 - [1b] the ear hook being surrounded by a protective sleeve, the protective sleeve being made of an elastic waterproof material;
 - [1c] a core housing for accommodating an earphone core, the core housing being fixed to the first plug end and elastically abutted against the protective sleeve; and
 - [1d] a circuit housing for accommodating a control circuit or a battery, the circuit housing being fixed to the second plug end, the control circuit or the battery driving the earphone

¹ We use the same reference numbers and letters that Petitioner uses to identify the claim language. *See* Pet. vii (Chart of Claims).

core to vibrate, the vibration of the earphone core generating a driving force to drive a housing panel of the core housing to vibrate, the driving force being not parallel to a normal line of the housing panel.

Ex. 1001, 36:49–63.

E. The Asserted References

For its challenges, Petitioner relies on the following references:

Name	Reference	Exhibit
Li	CN 107454492 A, published December 8, 2017 (based on an application filed August 18, 2017)	1004 ²
Asaka	CN 202931524 U, published May 8, 2013 (based on an application filed May 16, 2012)	1006 ³
Numata	JP P2008-294872 A, published December 4, 2008 (based on an application filed May 26, 2007)	1007 ⁴
Wang	CN 205356672 U, published June 29, 2016 (based on an application filed December 24, 2015)	1008 ⁵
Xu	CN 205017577 U, published February 3, 2016 (based on an application filed October 19, 2015)	1009 ⁶
Nielsen	WO 2009/086838 A1, published July 16, 2009 (based on an application filed January 6, 2009)	1010

² Petitioner provides an English translation of Li as Exhibit 1004 and the corresponding Chinese publication as Exhibit 1025. *See* Pet. 7 n.1.

³ Petitioner provides an English translation of Asaka as Exhibit 1006 and the corresponding Chinese publication as Exhibit 1027. *See* Pet. 11 n.4.

⁴ Petitioner provides an English translation of Numata as Exhibit 1007 and the corresponding Japanese publication as Exhibit 1028. *See* Pet. 13 n.5.

⁵ Petitioner provides an English translation of Wang as Exhibit 1008 and the corresponding Chinese publication as Exhibit 1029. *See* Pet. 14 n.6.

⁶ Petitioner provides an English translation of Xu as Exhibit 1009 and the corresponding Chinese publication as Exhibit 1030. *See* Pet. 15 n.7.

Name	Reference	Exhibit
Fujita	WO 2008/007666 A1, published January 17, 2008 (based on an application filed July 10, 2007)	1022 ⁷
Fukuda	US 9,253,563 B2, issued February 2, 2016 (based on an application filed October 25, 2013)	1023

Pet. 1, 20–119.

Petitioner asserts that:

- (1) Li, Asaka, Numata, Wang, and Xu qualify as prior art under § 102(a)(1); and
- (2) Nielsen, Fujita, and Fukuda qualify as prior art under § 102(a)(1) and § 102(a)(2).

Pet. 7, 11, 13–18; *see* 35 U.S.C. § 102(a)(1)–(2).

At this stage of the proceeding, Patent Owner does not dispute that any asserted reference qualifies as prior art. *See, e.g.*, Prelim. Resp. 1–2, 12–47.

F. The Asserted Challenges to Patentability

Petitioner asserts the following challenges to patentability:

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1	103	Li, Fujita
2–6	103	Li, Fujita, Asaka
7–10	103	Li, Fujita, Numata
12–15	103	Li, Fujita, Fukuda
16–20	103	Li, Fujita, Wang, Xu, Nielsen

Pet. 1, 20–119.

⁷ Petitioner provides an English translation of Fujita as Exhibit 1022 and the corresponding Japanese publication as Exhibit 1032. *See* Pet. 17 n.9.

G. Testimonial Evidence

To support its challenges, Petitioner relies on the declaration of Chris Kyriakakis, Ph.D. (Exhibit 1003). Dr. Kyriakakis states, “I have been engaged by Petitioner” to “provide my expert opinions in support of the above-identified petition for *inter partes* review of” the ’084 patent.

Ex. 1003 ¶ 1. Dr. Kyriakakis explains that he received a “Bachelor of Science degree in Engineering and Applied Science from the California Institute of Technology (Caltech) in 1985” and a “Master of Science degree in Electrical Engineering in 1987” as well as a “Ph.D. in Electrical Engineering in 1993, both from the University of Southern California.” *Id.* ¶ 5.

At this stage of the proceeding, Patent Owner does not submit testimonial evidence.

III. PATENTABILITY ANALYSIS

A. Legal Principles: Obviousness

A patent may not be obtained “if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains.” 35 U.S.C. § 103. An obviousness analysis involves underlying factual inquiries including (1) the scope and content of the prior art; (2) differences between the claimed invention and the prior art; (3) the level of ordinary skill in the art; and (4) where in evidence, objective indicia of nonobviousness, such as commercial success, long-felt but unsolved

needs, and failure of others.⁸ *Graham v. John Deere Co. of Kan. City*, 383 U.S. 1, 17–18, 35–36 (1966); *Apple Inc. v. Samsung Elecs. Co.*, 839 F.3d 1034, 1047–48 (Fed. Cir. 2016) (en banc). When evaluating a combination of references, an obviousness analysis should address “whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007).

We analyze the obviousness issues according to these principles.

B. Level of Ordinary Skill in the Art

Factors pertinent to determining the level of ordinary skill in the art include (1) the educational level of the inventor; (2) the type of problems encountered in the art; (3) prior-art solutions to those problems; (4) the rapidity with which innovations are made; (5) the sophistication of the technology; and (6) the educational level of workers active in the field. *Envtl. Designs, Ltd. v. Union Oil Co.*, 713 F.2d 693, 696–97 (Fed. Cir. 1983). Not all factors may exist in every case, and one or more of these or other factors may predominate in a particular case. *Id.* These factors are not exhaustive, but merely a guide to determining the level of ordinary skill in the art. *Daiichi Sankyo Co. v. Apotex, Inc.*, 501 F.3d 1254, 1256 (Fed. Cir. 2007). Moreover, the prior art itself may reflect an appropriate skill level. *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001).

⁸ At this stage of the proceeding, the parties do not address objective indicia of nonobviousness. *See, e.g.*, Pet. 20–119; Prelim. Resp. 12–47. Dr. Kyriakakis states that “[a]t this time, I am not aware of any objective evidence (or ‘secondary considerations’) that would suggest the Challenged Claims are not obvious.” Ex. 1003 ¶ 297.

Petitioner asserts that a person of ordinary skill as of the '084 patent's earliest priority date "would have had a Bachelor's degree in electrical or computer engineering, or a comparable field of study, plus approximately two to three years of professional experience with acoustic technology." Pet. 5. Petitioner also asserts that "[a]dditional graduate education could substitute for professional experience, and significant experience in the field could substitute for formal education." *Id.* at 5–6. Dr. Kyriakakis's testimony supports Petitioner's assertions. *See* Ex. 1003 ¶¶ 34–35.

For purposes of the Preliminary Response only, Patent Owner relies on the Petitioner's description of an ordinarily skilled artisan. Prelim. Resp. 11.

Based on the current record and for purposes of this decision, we accept Petitioner's description of an ordinarily skilled artisan because it comports with the technology and claims of the '084 patent as well as the asserted references. *See, e.g.*, Ex. 1001, 1:12–3:62, 36:49–39:8, code (57); *infra* §§ III.E.1–III.E.2.

C. Claim Construction

1. GENERAL PRINCIPLES

We construe claim terms "using the same claim construction standard" that district courts use to construe claim terms in civil actions for patent infringement. *See* 37 C.F.R. § 42.100(b) (2025). Under that standard, claim terms "are given their ordinary and customary meaning, which is the meaning the term would have to a person of ordinary skill in the art at the time of the invention." *Power Integrations, Inc. v. Fairchild Semiconductor Int'l, Inc.*, 904 F.3d 965, 971 (Fed. Cir. 2018) (citing *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–13 (Fed. Cir. 2005) (en banc)). The meaning of claim

terms may be determined by “look[ing] principally to the intrinsic evidence of record, examining the claim language itself, the written description, and the prosecution history, if in evidence.” *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 469 F.3d 1005, 1014 (Fed. Cir. 2006) (citing *Phillips*, 415 F.3d at 1312–17).

2. PETITIONER’S POSITION

Petitioner does not propose an explicit construction for any claim term, phrase, or limitation. Pet. 6–7; *see id.* at 20–119.

But Petitioner raises an issue regarding claim 5. Pet. 6–7. Claim 5 reads as follows (with bracketed numbers and letters added for reference purposes):⁹

5. [5pre] The loudspeaker apparatus of claim 3, wherein

[5a] the first wiring channel includes a first wiring groove and a first wiring hole connecting the first wiring groove and an outer end surface of the first plug end,

[5b] the wire extends along the first wiring groove and the first wiring hole and is exposed on the outer end surface of the first plug end,

[5c] the second wiring channel includes a second wiring groove and a second wiring hole connecting the second wiring groove and the outer end surface of the *first* plug end, and

[5d] the wire extends along the second wiring groove and the second wiring hole and is exposed on the outer end surface of the second plug end.

Ex. 1001, 37:19–32 (emphasis added).

Petitioner asserts that an ordinarily skilled artisan “would have understood that there is a typo” in limitation 5c where “first” appears instead

⁹ We use the same reference numbers and letters that Petitioner uses to identify the claim language. *See* Pet. vii–viii (Chart of Claims).

of “second.” Pet. 6. According to Petitioner, this typo “is clear from the claim language,” where “the first two substantive claim elements address the ‘first’ wiring channel, wiring groove, wiring hole, and plug end, and the third and fourth substantive claim elements address the ‘second’ version of the same structures, including the ‘second plug end’ in the final claim element.” *Id.* at 6–7.

Petitioner asserts that without interpreting “first” to mean “second” in limitation 5c, “there would be no disclosure of the first plug end connecting to the disclosed ‘second’ elements and the connection would have to traverse the space between the first and second plugs.” Pet. 7 (citing Ex. 1003 ¶¶ 52–54).

3. PATENT OWNER’S POSITION

Patent Owner asserts that “all claim terms should be interpreted according to their plain and ordinary meaning.” Prelim. Resp. 11.

Regarding claim 5, Patent Owner asserts that the Board need not reach “that issue because claim 5 depends indirectly on independent claim 1, and Petitioner has failed to show a reasonable likelihood of invalidating claim 1.” Prelim. Resp. 11.

4. DISCUSSION

“[O]nly those 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); *see Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017). Based on the current record, we determine that no claim term, phrase, or limitation requires an explicit construction to decide

whether Petitioner satisfies the “reasonable likelihood” standard for instituting trial.

Regarding claim 5, claim interpretation may remedy an “obvious minor” typographical or clerical error in a claim evident to “one skilled in the art” from “the face of the patent.” *See Pavo Sols. LLC v. Kingston Tech. Co.*, 35 F.4th 1367, 1373 (Fed. Cir. 2022). Correction is appropriate “only if (1) the correction is not subject to reasonable debate based on consideration of the claim language and the specification and (2) the prosecution history does not suggest a different interpretation of the claims.” *Novo Indus., L.P. v. Micro Molds Corp.*, 350 F.3d 1348, 1354 (Fed. Cir. 2003). The analysis whether correction is appropriate “must consider how a potential correction would impact the scope of a claim and if the inventor is entitled to the resulting claim scope based on the written description of the patent.” *CBT Flint Partners, LLC v. Return Path, Inc.*, 654 F.3d 1353, 1359 (Fed. Cir. 2011).

During the instituted trial, we leave it to the parties to address the propriety of interpreting “first” to mean “second” in limitation 5c in light of the principles discussed in the preceding paragraph.

*D. Denial of Institution Due to an
Alleged “Lack of Specificity” in the Petition*

1. BACKGROUND

Petitioner asserts that modular portions of headsets, including “speakers, control circuits, and batteries,” were well known as of the ’084 patent’s priority date. Pet. 19; *see id.* at 22, 25–28, 32–33. Petitioner asserts that the prior art teaches “modular electrical connections” achieved “through various connectors, including plugs, jacks, and pins.” *Id.*

at 20, 26–27, 91. Petitioner further asserts that the prior art teaches the benefits of modular component design. *Id.* at 19–20, 25–30, 33, 39, 65–66, 87, 90.

To support its assertions, Petitioner cites the following seven references under the heading “Interchangeable Audio Headset Prior Art”:

Name	Reference	Exhibit
Hupkes	US 2008/0279409 A1, published Nov. 13, 2008 (based on an application filed May 11, 2007)	1011
Dyer	US 7,672,469 B2, issued March 2, 2010 (based on an application filed Nov. 17, 2005)	1012
Mei	US 8,515,103 B2, issued August 20, 2013 (based on an application filed Nov. 22, 2010)	1013
Chen	US 2016/0080853 A1, published March 17, 2016 (based on an application filed Sept. 17, 2014)	1014
Lott	US 9,866,966 B2, issued January 9, 2018 (based on an application filed Nov. 24, 2016)	1015
Bellas	US 2018/0316999 A1, published Nov. 1, 2018 (based on an application filed April 26, 2017)	1016
Eggebraaten	US 2014/0126742 A1, published May 8, 2014 (based on an application filed Nov. 5, 2013)	1019

Pet. 19–20; *see id.* at 26–28, 65.

2. PATENT OWNER’S POSITION

Regarding the seven “Interchangeable Audio Headset Prior Art” references, Patent Owner asserts that:

- (1) the Petition’s statutorily required “Statement of Precise Relief Requested” lists only the references discussed above in Section II.E, e.g., Li and Fujita for claim 1;
- (2) the Petition’s introductory heading for each ground adds “and the knowledge of” an ordinarily skilled artisan;

- (3) adding the seven “Interchangeable Audio Headset Prior Art” references under the guise of an ordinarily skilled artisan’s knowledge means that the Petition “adds any possible combination of one or more of these seven (that is, any one of them, any combination of two through six of them, or all seven) to the base combination” of Li and Fujita; and
- (4) “the Petition’s reliance on up to seven additional references to teach two critical claim elements results in a lack of particularity that results in voluminous and excessive grounds.”

Prelim. Resp. 35–36; *see supra* §§ II.E–II.F.

Citing *Adaptics Ltd. v. Perfect Co.*, IPR2018-01596, Paper 20 at 24 (PTAB Mar. 6, 2019) (informative), Patent Owner asserts that “[t]his lack of specificity alone is sufficient reason for the Board to conclude that the Petition fails to show a reasonable likelihood of prevailing on any ground.” Prelim. Resp. 36.

3. ANALYSIS

For the reasons explained below, we disagree with Patent Owner that a “lack of specificity” in the Petition warrants denial of institution.

The Board’s rules require that a petition provide “a statement of the precise relief requested for each claim challenged,” including “specify[ing] where each element of the claim is found in the prior art patents or printed publications relied upon.” 37 C.F.R. § 42.104(b)(4). The Board’s rules also require that a petition include “a detailed explanation of the significance of the evidence.” 37 C.F.R. § 42.22(a)(2).

Contrary to Patent Owner’s assertions, the Petition satisfies these rules. *See* Pet. 1, 20–119. Under the heading “Statement of Precise Relief Requested,” the Petition provides the following table:

Ground	Claims	Stat. Basis	Prior Art
1	1	35 U.S.C. § 103	Li and Fujita
2	12–15	35 U.S.C. § 103	Li, Fujita, and Fukuda
3	2–6	35 U.S.C. § 103	Li, Fujita, and Asaka
4	7–10	35 U.S.C. § 103	Li, Fujita, and Numata
5	16–20	35 U.S.C. § 103	Li, Fujita, Wang, Xu, and Nielsen

Id. at 1.

Subsequently, as explained in more detail below, Petitioner’s analysis sufficiently addresses how the disclosures in the references cited in this table teach each element of the challenged claims. *See* Pet. 23–42, 45–60, 64–81, 84–101, 104–119; *infra* §§ III.E.4(a)–(e), III.F–III.I.

The Petition also explains the significance of the seven “Interchangeable Audio Headset Prior Art” references. Pet. 19–20, 25–28, 65–66; *see* Paper 11, 31–32. Specifically, the Petition explains that these references show that:

- (1) modular portions of headsets, including “speakers, control circuits, and batteries,” were well known as of the ’084 patent’s priority date;
- (2) the prior art teaches “modular electrical connections” achieved “through various connectors, including plugs, jacks, and pins”; and
- (3) the prior art teaches the benefits of modular component design.

Pet. 19–20, 22, 25–30, 32–33, 39, 65–66, 87, 90–91.

The Petition properly relies on the seven “Interchangeable Audio Headset Prior Art” references to show what was generally known, i.e., to show the knowledge of a skilled artisan. *See, e.g., Koninklijke Philips N.V. v. Google LLC*, 948 F.3d 1330, 1337–38 (Fed. Cir. 2020) (“*Philips*”); *Ariosa*

Diagnostics v. Verinata Health, Inc., 805 F.3d 1359, 1365 (Fed. Cir. 2015). For example, the Federal Circuit in *Philips* decided that the Board properly determined that challenged claims would have been obvious over a single reference (SMIL 1.0) “in light of the general knowledge of a skilled artisan” as established by expert evidence and a different reference (Hua). *Philips*, 948 F.3d at 1337–38.

Furthermore, the Federal Circuit has “emphasized the importance of a factual foundation to support a party’s claim about what one of ordinary skill in the relevant art would have known.” *Randall Mfg. v. Rea*, 733 F.3d 1355, 1362 (Fed. Cir. 2013). “One form of evidence to provide such a foundation, perhaps the most reliable because not litigation-generated, is documentary evidence consisting of prior art in the area.” *Id.* at 1362–63. Petitioner’s reliance on the seven “Interchangeable Audio Headset Prior Art” references to show what was well known comports with Federal Circuit guidance. *See id.*

Additionally, the circumstances in *Adaptics* differ materially from the circumstances here. The *Adaptics* petition included a § 102 ground based on Bendel, a § 102 ground based on Sartorius, and the following three § 103 grounds:

- “Williams in view of Bendel, Sartorius, Mettler, Digi-Star, Yuyama, and/or Wright”;
- “Turnage in view of Bendel, Sartorius, Williams, Digi-Star, Yuyama, Mettler, and/or Wright”; and
- “Bendel or Sartorius in view of Williams, Turnage, Abrams, or Bordin, and in further view of each other, Mettler, Digi-Star, Yuyama, and/or Wright.”

Adaptics, IPR2018-01596, Paper 20 at 8–9.

Regarding the third or “catch-all” § 103 ground, the Board observed that the use of “and/or” expanded that ground to “include combinations of three, four, or more references, yielding hundreds of possible combinations.” *Adaptics*, IPR2018-01596, Paper 20 at 19. The Board criticized that ground as “not reasonably bounded in scope and unduly burdensome for both Patent Owner and the Board to address” because that ground required an analysis “whether each and every claim limitation is taught not only by each of Bendel and Sartorius, but by each of these references in combination with one or more of the other references asserted in the proceeding.” *Id.* at 20–21. Here, in contrast to *Adaptics*, the Petition does not include grounds that are unreasonable in scope and unduly burdensome to analyze. *See* Pet. 20–119.

Also, unlike the circumstances here, “declarations in support of” certain references in *Adaptics* included “voluminous additional exhibits containing substantive disclosures relating to the subject matter of the challenged patent claims.” *Adaptics*, IPR2018-01596, Paper 20 at 22. Regarding the “voluminous additional exhibits,” the Board reasoned as follows:

The extent to which these additional documents may be relied upon to fill gaps in the asserted references with respect to the claimed subject matter increases our concern that the Petition lacks the required particularity, and, instead, turns the Petition into an empty invitation for the Board and Patent Owner to search the record for evidence that might support the full breadth of Petitioner’s contentions.

Id. at 22–23.

For these reasons, we disagree with Patent Owner that a “lack of specificity” in the Petition warrants denial of institution. *See* Prelim. Resp. 35–36.

E. Alleged Obviousness over Li and Fujita: Claim 1

Petitioner contends that claim 1 is unpatentable under § 103 because the claim would have been obvious over Li and Fujita. *See* Pet. 1, 20–42. Patent Owner disputes Petitioner’s contentions. *See* Prelim. Resp. 1–2, 12–46.

Below, we provide overviews of Li and Fujita. Then, we consider the obviousness issues. For the reasons explained below, Petitioner establishes sufficiently for purposes of institution that it has a reasonable likelihood of showing claim 1 to be unpatentable under § 103 because the claim would have been obvious over the combined teachings of Li and Fujita.

1. OVERVIEW OF LI (EXHIBIT 1004)

Li is a Chinese patent application publication titled “A Bone Conduction Earphone,” filed on August 18, 2017, and published on December 8, 2017. Ex. 1004, codes (19), (22), (43), (54). Li states that the invention “relates to the field of earphones, particularly to a bone conduction headphone.” *Id.* ¶ 1.

Li explains that bone conduction transmits sound by converting sound into “mechanical vibrations of different frequencies, and sound waves are transmitted by the human skull, bone labyrinth, inner ear lymphatic fluid, organum spirale, auditory nerves, and auditory center.” Ex. 1004 ¶ 2. Li also explains that bone conduction earphones “use bone conduction technology to receive speech and closely adhere to the bone, and sound

waves are directly transmitted by the bone to the auditory nerve” such that “both ears can be exposed without damaging the eardrum.” *Id.*

According to Li, however, “existing bone conduction earphones have poor bending performance and are prone to damage during bending.”

Ex. 1004 ¶ 2. Li endeavors to address that deficiency by providing “a bone conduction earphone that can improve the poor bending performance of existing bone conduction earphones.” *Id.* ¶ 3.

Specifically, Li discloses “a bone conduction earphone” comprising “an ear hook assembly” that includes “a first housing, a second housing, and a connecting component connecting the first housing and the second housing.” Ex. 1004 ¶ 4, code (57); *see id.* ¶ 23, Figs. 1–2. The connecting component “comprises a first elastic metal wire connecting the first housing and the second housing at both ends respectively, and a first elastic coating layer wrapped around the first elastic metal wire.” *Id.* ¶ 4, code (57).

Li explains that by connecting “the first housing and the second housing” with a first elastic metal wire and covering the first elastic metal wire with a first elastic coating layer, “the bending performance of the ear hook can be effectively enhanced” due to the “elastic effect” of the first elastic metal wire and the first elastic coating layer. Ex. 1004 ¶ 5; *see id.* ¶ 26. Hence, the ear hook assembly “can effectively recover to its original state when bent, with no deformation.” *Id.* ¶ 5; *see id.* ¶ 26. Thus, “the issue of easy damage caused by the use of plastic as the material of the ear hook assembly in conventional bone conduction earphones can be improved.” *Id.* ¶ 5; *see id.* ¶ 26.

Li's Figure 1 (reproduced below) depicts an ear hook assembly in a bone conduction earphone:

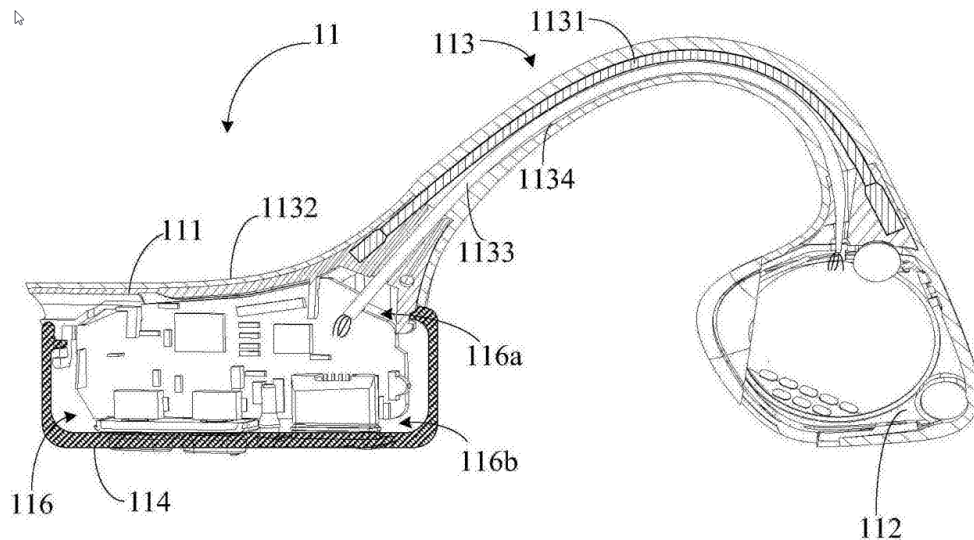


Figure 1 illustrates ear hook assembly 11 including “a first housing 111, a second housing 112, and a connecting component 113 connecting the first housing 111 and the second housing 112.” Ex. 1004 ¶ 23, Fig. 1. Ear hook assembly 11 “is generally used for users to hang the bone conduction earphone on their ears when wearing them, which can make the bone conduction earphone more firmly worn on the user’s ear.” *Id.* ¶ 25.

As Figure 1 shows, “the connecting component 113 comprises a first elastic metal wire 1131 connecting the first housing 111 and the second housing 112 at both ends, and a first elastic coating layer 1132 wrapped around the first elastic metal wire 1131.” Ex. 1004 ¶¶ 23, 26, Fig. 1. Due to “the elastic effect of the first elastic coating layer 1132,” “the first elastic coating layer 1132 can be more effectively wrapped around the first elastic metal wire 1131, even after multiple bends, ensuring the effectiveness of the bone conduction earphone structure.” *Id.* ¶ 28.

Optionally, “the first housing 111 and the second housing 112 are plastic housings, fixed at both ends of the first elastic metal wire 1131 by

injection molding, and the first elastic coating layer 1132 is integrally formed to cover the first elastic metal wire 1131.” Ex. 1004 ¶ 29; *see id.*

¶ 35. “This makes the connection between the first housing 111, the second housing 112, and the first elastic metal wire 1131 more stable, and enhances the sense of unity and texture of the bone conduction earphone, making the structure of the bone conduction earphone more compact and lightweight.” *Id.* ¶ 29.

Optionally, “the first elastic coating layer 1132 covers the first elastic metal wire 1131, at least a portion of the outer surface of the first housing 111, and at least a portion of the outer surface of the second housing 112 by injection molding.” Ex. 1004 ¶ 36; *see id.* ¶ 41. “This enhances the texture and unity of the bone conduction earphone, and the presence of the first elastic coating layer 1132 can further protect the housing and internal components, making the bone conduction earphone more wear-resistant.” *Id.* ¶ 36.

- fourth housing 115 cooperating with second housing 112 “to form a second accommodating space 117 for accommodating” a bone conduction speaker (on the left and on the right);
- first elastic metal wire 1131 “connecting the first housing 111 and the second housing 112 at both ends”;
- first elastic coating layer 1132 surrounding first elastic metal wire 1131;
- first wire set 1133 “extending from the first housing 111 to the second housing 112 through the lead channel 1134” such that “one end of the first wire set 1133 can be connected first (e.g., in a board mounted manner) to the components inside the second housing 112, such as a bone conduction speaker,” and “the other end of the first wire set 1133 can be passed through the lead channel 1134 to connect to the components inside the first housing 111,” such as battery pack 13 or control circuit assembly 14;
- second elastic metal wire 121 in rear hook assembly 12;
- second elastic coating layer 122 surrounding second elastic metal wire 121 in rear hook assembly 12;
- plug-in portions 123 provided at both ends of second elastic metal wire 121 and “connected and fixed to the first housings 111 of the two ear hook assemblies 11”; and
- second wire set 124 “wrapped by” second elastic coating layer 122 and “used to connect the components inside the two ear hook assemblies 11,” such as battery pack 13 and control circuit assembly 14.

Ex. 1004 ¶¶ 23, 39–40, 43, 46, 58, 69–70, Fig. 2.

Rear hook assembly 12 includes second elastic metal wire 121, second elastic coating layer 122, and plug-in portions 123 “provided at both ends of the second elastic metal wire 121.” Ex. 1004 ¶ 58, Fig. 2. By

“connecting the plug-in portion 123 of the rear hook assembly 12 with the first housing 111 of the two ear hook assemblies 11, the issue of large earphone size caused by screw fixation in existing bone conduction earphones are improved, simplifying the structure, reducing the weight of bone conduction earphones, facilitating later wiring, and reducing costs.”

Id. ¶ 59.

Li's Figure 9 (reproduced below) depicts plug-in portion 123 in more detail:

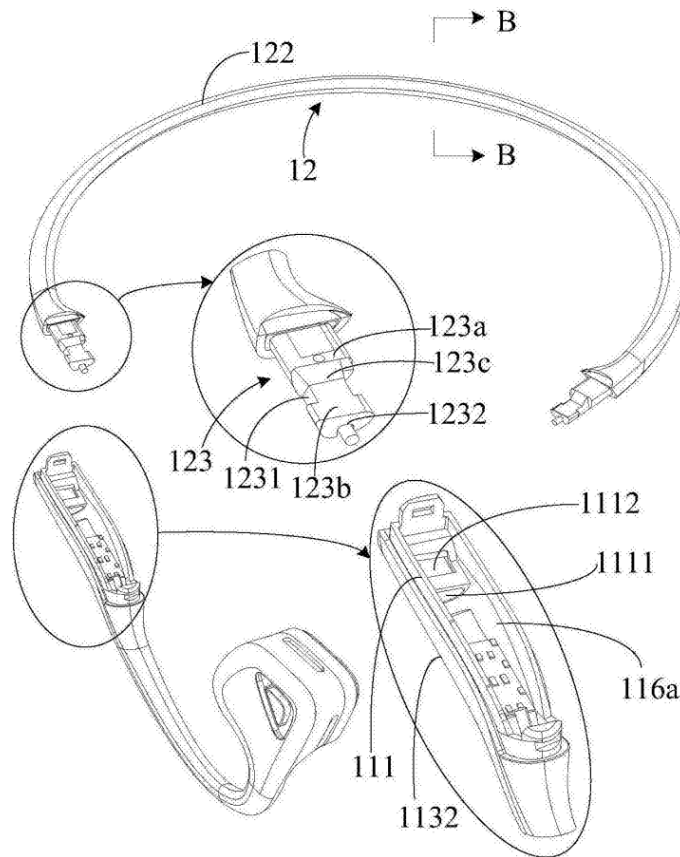


Figure 9 illustrates plug-in portion 123 including “a first plug-in section 123a connected to the second elastic metal wire 121, and a second plug-in section 123b connected to the first plug-in section 123a and located away from the second elastic metal wire 121.” Ex. 1004 ¶ 62, Fig. 9.

Figure 9 also illustrates first housing 111 “provided with a plug-in hole 1111

for allowing the insertion of the plug-in portion 123, and an opening 1112 connecting the plug-in hole 1111 and the outside in the vertical direction of the insertion direction of the plug-in portion 123.” *Id.* ¶ 60, Fig. 9.

2. OVERVIEW OF FUJITA (EXHIBIT 1022)

Fujita is an international patent application publication titled “Bone Conduction Receiver,” filed on July 10, 2007, and published on January 17, 2008. Ex. 1022, codes (12), (22), (43), (54). Fujita states that the invention “relates to a bone conduction receiver utilizing a bone conduction speaker.” *Id.* ¶ 1.

Fujita explains that:

- (1) “bone conduction receivers have been applied as man-machine interface devices, utilized as input/output devices for audio information connected to information devices such as mobile phones”;
- (2) a “bone conduction speaker transmits audio information to the user by applying vibrations to the human head, which are conveyed to the auditory organs”; and
- (3) “it is desirable to use bone conduction speakers in bone conduction receivers” because, among other things, “bone conduction receivers can accurately transmit audio information, have excellent portability, and can be effectively utilized by a wide range of users, including both individuals with normal hearing and some individuals with hearing impairments.”

Ex. 1022 ¶¶ 2–3. According to Fujita, however, “there is a problem that the output vibration of the bone conduction speaker cannot be efficiently transmitted.” *Id.* ¶ 7.

Fujita endeavors to address that problem by providing “a bone conduction receiver capable of efficiently transmitting the output vibration of the bone conduction speaker.” Ex. 1022 ¶ 7, code (57). The bone

conduction receiver “comprises the following parts: a bone conduction speaker converting sound information into vibration, and a casing for accommodating the bone conduction speaker.” *Id.* ¶ 8. The bone conduction speaker “comprises the following parts: a vibration generating part generating vibration according to sound information, and a convex vibration transmitting part protruding from the casing, and transmitting the vibration generated by the vibration generating part to a human head when being in close contact with the human head.” *Id.* Because “the vibration transmitting part protruding from the casing makes accurate contact with the face,” the “output vibration of the bone conduction speaker can be efficiently transmitted.” *Id.*

Fujita's Figure 2 (reproduced below) depicts a cross-sectional view of a bone conduction speaker for a bone conduction receiver:

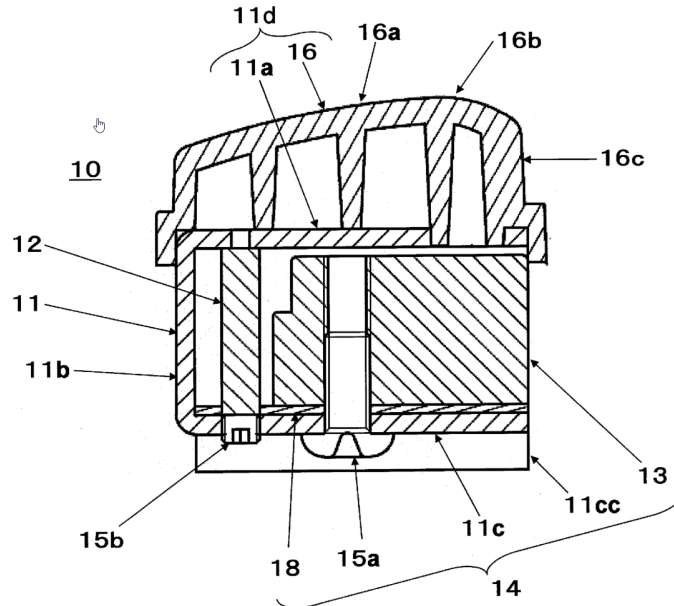


Figure 2 illustrates bone conduction speaker 10 including the following components:

- U-shaped frame 11 “assembled at the center” and comprising vibration output part 11a on the front surface,

elastic part 11b on the side surface, and frame fixing part 11c on the back surface;

- stacked columnar piezoelectric element 12 arranged in frame 11;
- base weight 13 arranged in frame 11;
- fixing part 14;
- compression screws 15a and 15b;
- cushion 16 “arranged on the upper surface” of vibration output part 11a and comprising close contact surface 16a, apex 16b, and front end side 16c; and
- positioning plate 18 arranged in frame 11.

Ex. 1022 ¶¶ 20, 24–27, 37, Fig. 2. Fixing part 14 “is formed through the frame fixing part 11c, the positioning plate 18, the base weight 13 and the screws 15a.” *Id.* ¶ 26, Fig. 2.

“The stacked columnar piezoelectric element 12 has a characteristic of displacement in the length direction and is arranged between two symmetrical surfaces of the vibration output part 11a and the frame fixing part 11c.” Ex. 1022 ¶ 25, Fig. 2.

“The vibration output part 11a and the cushion 16 form a vibration transmitting part 11d, and the vibration transmitting part 11d transmits the vibration generated by the stacked columnar piezoelectric element 12.”

Ex. 1022 ¶ 27, Fig. 2. After “the bone conduction speaker 10 generates vibration, the vibration is transmitted from the vibration output part 11a through the cushion 16 to the head of the user.” *Id.* ¶ 29. “[T]he cushion 16 of the bone conduction speaker 10 directly contacts the skin of the head of the user.” *Id.* ¶ 30.

Preferably, “[t]he cushion 16 is made of a material with low thermal conductivity, low specific gravity and high rigidity.” Ex. 1022 ¶ 30.

Fujita’s Figure 4 (reproduced below) depicts a bone conduction speaker contacting the skin of the head of the user:

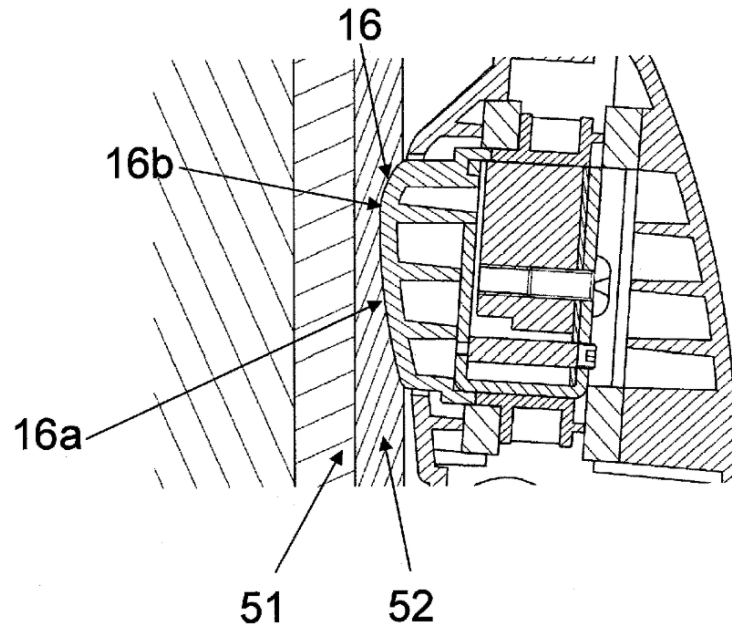


Figure 4 illustrates “the hard cushion 16, the soft skin 52 and the hard skull 51 form[ing] a sandwich structure.” Ex. 1022 ¶ 30, Fig. 4.

When “the cushion 16 is in close contact with the skin 52, a close contact surface 16a of the cushion 16 sinks into the contacted skin 52 to form a convex surface.” Ex. 1022 ¶ 32, Fig. 4. “In the cushion 16, the apex 16b of the convex close contact surface 16a exerts the greatest pressure on the skin 52.” *Id.* ¶ 33, Figs. 4, 6. Due to “the close contact between the cushion 16 and the skin 52, vibration is transmitted more effectively at the part where contact pressure is high.” *Id.* ¶ 34.

Although “the usage posture of the bone conduction receiver” is “assumed to vary greatly depending on the user,” the “ideal usage posture of

the bone conduction receiver” is “arranged substantially parallel to the face.”
Ex. 1022 ¶ 38, Fig. 7A.

3. WHETHER AN ORDINARILY SKILLED ARTISAN WOULD
HAVE BEEN MOTIVATED TO COMBINE THE TEACHINGS OF
THE REFERENCES WITH A REASONABLE EXPECTATION OF SUCCESS

Petitioner asserts that an ordinarily skilled artisan “would have found it obvious to combine Li and Fujita by using bone conduction speakers of the type taught by Fujita in bone conduction earphones of the type taught by Li” because:

- (1) “Li describes most of the earphone structure” but “lacks details on the bone conduction speaker design, including the design of the vibration mechanism”;
- (2) a skilled artisan “would have looked to other references in the field for details” about the bone conduction speaker design;
- (3) “Fujita teaches a bone conduction speaker that ‘efficiently transmit[s] the output vibration’ due to the speaker’s design making ‘accurate contact with the face’”;
- (4) a skilled artisan would have understood that “the design of Fujita’s bone conduction speaker would enhance the efficiency of transmitting sound using the Li earphones”; and
- (5) the “benefit of providing such improvement would have motivated” a skilled artisan to “make the combination.”

Pet. 20–21 (alteration by Petitioner) (quoting Ex. 1022 ¶¶ 7–8) (citing Ex. 1003 ¶ 110; Ex. 1022 ¶¶ 7–17).

Petitioner also asserts that combining Fujita’s teachings with Li’s teachings “would simply involve applying known techniques (Fujita’s bone conduction speaker) to a known device ready for improvement (Li’s bone

conduction earphones) to yield predictable results (operating bone conduction earphones with improved sound efficiency).” Pet. 21.

Petitioner further asserts that an ordinarily skilled artisan would have had a reasonable expectation of success in combining Fujita’s teachings with Li’s teachings because “Li’s earphones are designed to be worn over the ear with the bone conduction speaker touching the side of the user’s head to transfer vibrations and generate sound, which is the same orientation in which Fujita’s bone conduction speaker is designed to be used.” Pet. 21–22 (citing Ex. 1004, Figs. 1–2; Ex. 1022, Figs. 1, 6, 8). Petitioner explains that “the teachings of Li and Fujita would have been predictably combined due to the predictability of the bone conduction speaker art and the known interchangeability of elements including vibration mechanisms and housing.” *Id.* at 22 (citing Ex. 1003 ¶ 111).

At this stage of the proceeding, Patent Owner makes no arguments against combining Fujita’s teachings with Li’s teachings. *See, e.g.*, Prelim. Resp. 12–46.

Based on the current record and for the reasons stated by Petitioner and supported by Dr. Kyriakakis’s testimony, Petitioner establishes sufficiently for purposes of institution that an ordinarily skilled artisan would have had a reason to combine Fujita’s teachings with Li’s teachings in the way Petitioner proposes. *See* Pet. 20–21; Ex. 1003 ¶¶ 107–113. Based on the current record, Petitioner also establishes sufficiently that an ordinarily skilled artisan would have had a reasonable expectation of success in combining the teachings of the references. *See* Pet. 21–22; Ex. 1003 ¶¶ 111–112.

4. INDEPENDENT CLAIM 1

(a) Preamble 1pre

Claim 1’s preamble recites “[a] loudspeaker apparatus.” Ex. 1001, 36:49.

Petitioner contends that Li discloses or renders obvious claim 1’s preamble because Li describes “a bone conduction earphone.” Pet. 23 (citing Ex. 1003 ¶¶ 114–115; Ex. 1004, code (57), Figs. 1–2).

At this stage of the proceeding, Patent Owner makes no arguments specific to claim 1’s preamble. *See, e.g.*, Prelim. Resp. 12–46. Nonetheless, the burden remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015).

Generally, a preamble does not limit a claim. *Allen Eng’g Corp. v. Bartell Indus., Inc.*, 299 F.3d 1336, 1346 (Fed. Cir. 2002). We need not decide whether claim 1’s preamble limits the claim because, based on the current record and for the reasons stated by Petitioner and supported by Dr. Kyriakakis’s testimony, Petitioner establishes sufficiently for purposes of institution that Li teaches claim 1’s preamble. *See* Pet. 23; Ex. 1003 ¶¶ 114–115.

(b) Limitation 1a

Claim 1 recites “an ear hook including a first plug end and a second plug end.” Ex. 1001, 36:50–51 (limitation 1a).

(i) Petitioner’s Contentions

Petitioner contends that Li renders obvious limitation 1a for several related reasons. *See* Pet. 24–30. First, Petitioner asserts that Li’s bone conduction earphone includes ear hook assembly 11 with connecting

component 113 that “can directly contact the ear and support the bone conduction earphone.” *Id.* at 24 (citing Ex. 1003 ¶ 116; Ex. 1004 ¶¶ 23, 25–26). As support, Petitioner provides the following annotated version of Li’s Figure 1:

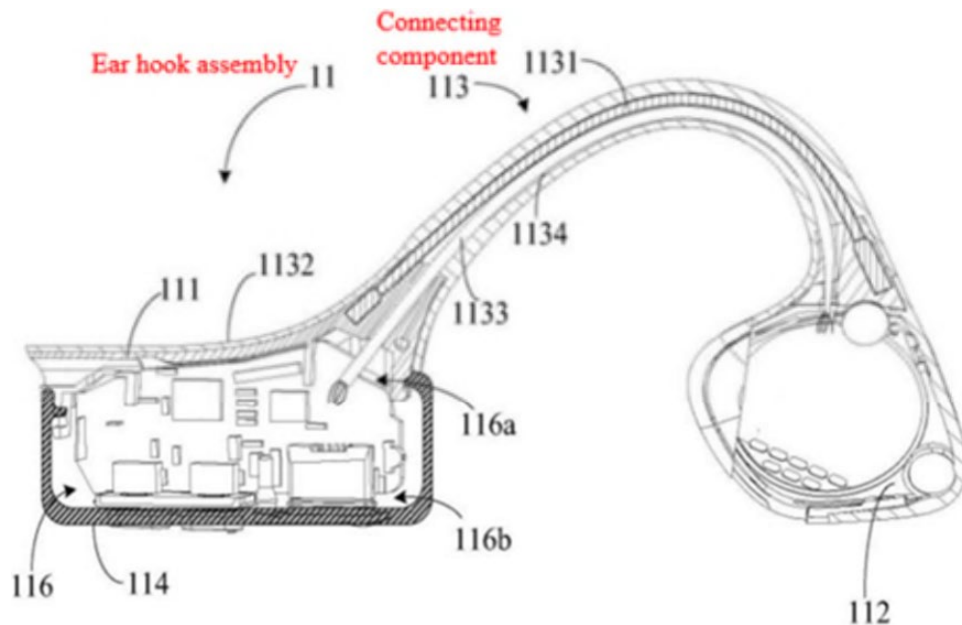


Figure 1 illustrates ear hook assembly 11 including “a first housing 111, a second housing 112, and a connecting component 113 connecting the first housing 111 and the second housing 112.” Ex. 1004 ¶ 23, Fig. 1. The above annotated version of Figure 1 includes the red annotation “Ear hook assembly” by reference numeral 11 and the red annotation “Connecting component” by reference numeral 113. *See* Pet. 24; Ex. 1003 ¶ 116.

Second, Petitioner asserts that Li’s bone conduction earphone includes second elastic metal wire 121 with plug-in portions 123 provided at both ends of second elastic metal wire 121 and connected to “the first housings 111 of the two ear hook assemblies 11.” Pet. 24 (citing Ex. 1004 ¶ 58, Figs. 2, 9). As support, Petitioner provides the following annotated version of Li’s Figure 9:

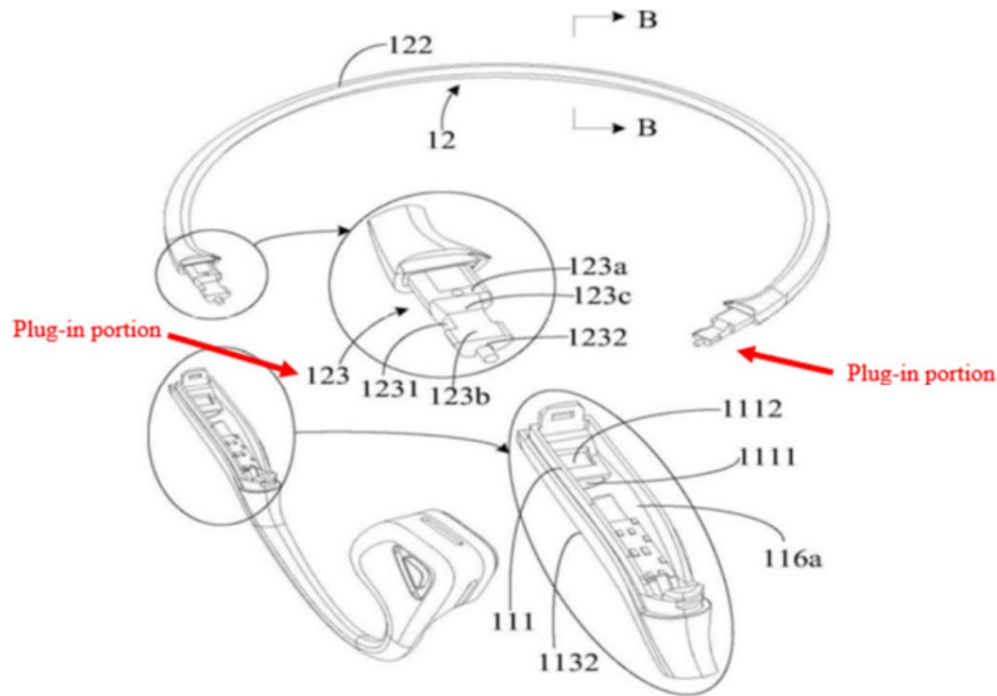


Figure 9 illustrates plug-in portion 123 including “a first plug-in section 123a connected to the second elastic metal wire 121, and a second plug-in section 123b connected to the first plug-in section 123a and located away from the second elastic metal wire 121.” Ex. 1004 ¶ 62, Fig. 9. The above annotated version of Figure 9 includes the red annotation “Plug-in portion” on the left with a red arrow identifying reference numeral 123 and the red annotation “Plug-in portion” on the right with a red arrow identifying plug-in portion 123 at an end of second elastic metal wire 121. *See* Pet. 25; Ex. 1003 ¶ 117.

Third, Petitioner asserts that an ordinarily skilled artisan “would have found it obvious to include a first plug end in Li’s ear hook using the same general design” as plug-in portions 123 because:

- (1) modular portions of headsets were well known as of the ’084 patent’s priority date, including modular speaker portions of headsets;

- (2) speaker portions of headsets “were modular for various reasons, such as component replacements and removability, upgrades, and reducing manufacturing and production costs due to the simple shape of components”;
- (3) a skilled artisan would have been motivated to use “known modular electrical connections such as pins and contacts commonly found in jacks, and plugs” and to “include mating pins and contacts in corresponding sockets of the speaker housing and control circuit housing for electrically connecting the ear hook to those housings” to beneficially reduce “manufacturing costs and complexity”; and
- (4) a skilled artisan would have been motivated to “add an ear hook including a first plug end to Li between the ear hook and earphone core given that modular speaker portions of headsets were well-known” and because the modification “would have achieved the well-known benefits of a modular speaker.”

Pet. 25–27 (emphases omitted) (citing Ex. 1003 ¶ 118; Ex. 1004 ¶¶ 24, 69; Ex. 1011 ¶¶ 6–7, 30–32, Fig. 2; Ex. 1012, 2:4–15, 3:13–35, Fig. 2; Ex. 1013, 10:62–11:8, Fig. 1; Ex. 1014 ¶¶ 4, 17, Fig. 1; Ex. 1015, 2:6–17, 5:33–6:17, 6:65–7:42, Figs. 5, 7; Ex. 1016 ¶¶ 56, 79, 85, 96; Ex. 1019 ¶¶ 9–15, 31, 35, 45, Figs. 1–15).

Additionally, Petitioner contends that the ’084 patent “mentions reducing manufacturing cost and adjusting for design changes as a benefit of its modular design, which modular designs were known to do.” Pet. 27 (citing Ex. 1001, 11:66–12:11, 16:29–40; Ex. 1003 ¶ 119).

Fourth, Petitioner asserts that an ordinarily skilled artisan would have been motivated to “add an ear hook including a second plug end to Li between the ear hook and circuit housing given that modular speaker portions of headsets were well-known” and because the modification would

have achieved the “well-known modular earphone benefits.” Pet. 28 (emphasis omitted) (citing Ex. 1004 ¶ 59; Ex. 1012, 2:4–15; Ex. 1014 ¶ 4; Ex. 1015, 2:6–17; Ex. 1016 ¶¶ 56, 79, 85, 96). Petitioner asserts that those benefits include “simplifying the structure and reducing costs, especially when it comes to replacing the housing containing the earphone’s battery or control circuit.” *Id.* Petitioner explains that the proposed modifications involve “structures already used in Li and slight modifications to where they appear in the device.” *Id.* at 28, 33 (citing Ex. 1003 ¶¶ 121, 130).

Fifth, Petitioner asserts that it would have been obvious to an ordinarily skilled artisan to modify Li’s ear hook assembly 11 to “include a first plug end and second plug end on either side of connecting component 113 to connect the first housing 111 and second housing 112” because:

- (1) “Li already discloses plug ends in its design”;
- (2) Li teaches that “[b]y connecting the plug-in portion 123 of the rear hook assembly 12 with the first housing 111 of the two ear hook assemblies 11, the issue of large earphone size caused by screw fixation in existing bone conduction earphones are improved, simplifying the structure, reducing the weight of bone conduction earphones, facilitating later wiring, and reducing costs”;
- (3) Li recognizes the benefits of plug ends “in a modular earphone design, including reducing earphone size, simplifying the structure, facilitating later wiring, and reducing manufacturing costs and complexity”; and
- (4) a skilled artisan would have recognized that the benefits of plug ends “would be further realized by adding plug ends to other components of the earphones, including on either end of connecting component 113.”

Pet. 28–30 (alteration by Petitioner) (emphases omitted) (quoting Ex. 1004 ¶ 59) (citing Ex. 1003 ¶ 122; Ex. 1004 ¶¶ 23, 69).

According to Petitioner, adding a plug end at each end of connecting component 113 “would require nothing more than adding Li’s already designed plug ends to that portion of the device.” Pet. 30; *see id.* at 69–70, 74 (explaining that the plug location “is simply moved to both ends of the ear hook”).

(ii) Patent Owner’s Contentions

Patent Owner disputes that Li renders obvious limitation 1a. *See, e.g.*, Prelim. Resp. 22–36. In particular, Patent Owner contends that Li does not disclose “plug ends between the connecting component 113 and the first and second housings 111 and 112 on either end.” *Id.* at 24–26. Patent Owner explains that Li’s plug-in portions 123 reside on second elastic metal wire 121, i.e., “a distinct component from the connecting component 113 that Petitioner identifies as the ‘ear hook.’” *Id.* at 27.

Patent Owner asserts that Li does not teach or suggest either (1) a plug end where connecting component 113 meets with second housing 112 and fourth housing 115 mapped to the claimed “core housing” or (2) a plug end where connecting component 113 meets with first housing 111 and third housing 114 mapped to the claimed “circuit housing.” Prelim. Resp. 28, 32; *see id.* at 28–29. According to Patent Owner, nothing in Li “teaches or even suggests putting a plug end in the configuration required by the claim” or that “replacing the injection molded connections on the connecting component 113 with a ‘plug end’ would provide any benefits whatsoever, much less those associated with the plug-in portions of the rear hook 12.” *Id.* at 30, 34–35; *see id.* at 31, 37.

Regarding Petitioner’s proposed modifications to add a plug at each end of connecting component 113, Patent Owner asserts that an ordinarily skilled artisan would not have had “any reason for adding the claimed plugs” to connecting component 113. Prelim. Resp. 28. Patent Owner asserts that even if Li “suggested benefits to a headset that is ‘modular’ by having plug-in connections somewhere, that does not explain the logical leap” for an ordinarily skilled artisan to add plug-in connections where claim 1 requires them. *Id.* at 31 (emphasis omitted).

Patent Owner quotes Li’s paragraph 59 discussing the advantages of using plug-in portions 123 with rear hook assembly 12 to connect rear hook assembly 12 to each first housing 111 as follows:

By connecting the plug-in portion 123 **of the rear hook assembly 12** with the first housing 111 of the two ear hook assemblies 11, the issue of large earphone size caused by screw fixation in existing bone conduction earphones are improved, simplifying the structure, reducing the weight of bone conduction earphones, facilitating later wiring, and reducing costs.

Prelim. Resp. 34 (emphasis by Patent Owner) (quoting Ex. 1004 ¶ 59).

Patent Owner then contends that “[n]othing about this paragraph (which is about the plug-in portions of the rear hook 12) teaches adding a plug end to an ear hook (i.e., connecting component 113 as mapped by Petitioner).” *Id.* (emphases omitted). Patent Owner also contends that this paragraph “says nothing about why adding a plug connection between the connecting component 113 and first housing 111 would mitigate” concerns about large size “caused by screw fixation” at the particular location described, “nor why any of the other benefits of a plug at that location would apply to the

different context of the connection between the ear hook and a circuit housing.” *Id.*

Furthermore, Patent Owner asserts that Petitioner “does not even argue that Fujita provides” a suggestion to add plug-in connections where claim 1 requires them. Prelim. Resp. 37.

Regarding the seven “Interchangeable Audio Headset Prior Art” references, Patent Owner asserts that the cited portions say nothing about arranging plug ends in either of the two places required by claim 1, much less in both places. Prelim. Resp. 37–38, 40–41. Patent Owner asserts that Petitioner fails to explain why an ordinarily skilled artisan would have been motivated to incorporate the teachings of these references into Li’s “specific headphone structure” to yield plug ends of an ear hook as required by claim 1. *Id.* at 37. Patent Owner also asserts that Petitioner fails to analyze or discuss “the similarities or differences between each” of the seven “Interchangeable Audio Headset Prior Art” references and “how or why” an ordinarily skilled artisan would have combined them. *Id.* at 40.

Regarding Petitioner’s contention that the ’084 patent “mentions reducing manufacturing cost and adjusting for design changes as a benefit of its modular design,” Patent Owner asserts that Petitioner improperly relies on hindsight obtained from the ’084 patent instead of “a teaching from the prior art.” Prelim. Resp. 40 (quoting Pet. 27).

Additionally, Patent Owner contends that Li teaches away from Petitioner’s proposed modifications to add a plug at each end of connecting component 113. Prelim. Resp. 41, 43. Specifically, Patent Owner asserts that Li teaches using injection molding to form the housings at each end of connecting component 113 to advantageously:

- (1) make the connections “more stable”;
- (2) enhance “the sense of unity and texture of the bone conduction earphone”; and
- (3) make “the structure of the bone conduction earphone more compact and lightweight.”

Id. at 41 (quoting Ex. 1004 ¶ 29).

Patent Owner also asserts that Petitioner’s proposed modifications to add a plug at each end of connecting component 113 “would negate all these goals” and “result in a significantly more complex structure.” Prelim.

Resp. 41; *see id.* at 43. Patent Owner explains that:

- (1) when Li’s teaching to “join the housings and connecting component with integrated injection molding is applied to the preferred embodiment of a binaural headset, there will be only three separately molded assemblies”; and
- (2) Petitioner’s proposed modifications to add a plug at each end of connecting component 113 would split the headset into seven separately molded assemblies joined by six plugs.

Id. at 41–43.

(iii) Analysis

Based on the current record and for the reasons explained below, Petitioner establishes sufficiently for purposes of institution that Li renders obvious limitation 1a. *See* Pet. 24–30; Ex. 1003 ¶¶ 116–124. First, Li’s bone conduction earphone includes ear hook assembly 11 with connecting component 113 that “can directly contact the ear and support the bone conduction earphone.” Ex. 1004 ¶¶ 23, 25–26, Fig. 1; *see* Ex. 1003 ¶¶ 57, 116; Pet. 24. Furthermore, as Li’s Figures 2 and 9 show, “there are two ear hook assemblies 11, and the bone conduction earphone further

includes a rear hook assembly 12.” Ex. 1004 ¶ 58, Figs. 2, 9; *see* Ex. 1003 ¶¶ 57, 117; Pet. 24–25.

Second, Li’s bone conduction earphone also includes the following components:

- (1) first housing 111 arranged at the rearward end of each connecting component 113;
- (2) second housing 112 arranged at the forward end of each connecting component 113;
- (3) third housing 114 cooperating with first housing 111 “to form a first accommodating space 116 for accommodating” either battery pack 13 or control circuit assembly 14;
- (4) fourth housing 115 cooperating with second housing 112 “to form a second accommodating space 117 for accommodating” a bone conduction speaker; and
- (5) first elastic metal wire 1131 “connecting the first housing 111 and the second housing 112 at both ends.”

Ex. 1004 ¶¶ 23, 43, 46, 70, Fig. 2; *see* Ex. 1003 ¶¶ 57, 117; Pet. 24–25.

Third, rear hook assembly 12 includes plug-in portions 123 at both ends with plug-in portions 123 “connected and fixed to the first housings 111 of the two ear hook assemblies 11.” Ex. 1004 ¶ 58, Figs. 2, 9; *see* Ex. 1003 ¶¶ 57, 117; Pet. 24.

Fourth, based on the current record, Petitioner establishes sufficiently for purposes of institution that an ordinarily skilled artisan would have had a reason to modify Li to add:

- (1) “a first plug end to Li between the ear hook and earphone core” comprising second housing 112 cooperating with fourth housing 115; and

- (2) “a second plug end to Li between the ear hook and circuit housing” comprising first housing 111 cooperating with third housing 114.

See Ex. 1003 ¶¶ 118–123 (emphases omitted); Pet. 25–30 (emphases omitted).

The added plug ends would have the “same general design” as plug-in portions 123 and would reside at each end of connecting component 113 to connect it with first housing 111 and second housing 112. *See* Ex. 1003 ¶¶ 118, 123; Pet. 25, 29. Thus, the proposed modifications “would require nothing more than adding Li’s already designed plug ends” to connecting component 113. *See* Ex. 1003 ¶ 123; Pet. 30.

Based on the current record, Petitioner establishes sufficiently for purposes of institution that an ordinarily skilled artisan would have had a reason to modify Li to add a plug at each end of connecting component 113 to obtain the well-known benefits of modular component design. *See* Ex. 1003 ¶¶ 76, 118–121, 123; Pet. 19–20, 25–28. Those benefits include, among other things, reduced manufacturing costs, e.g., “due to the simple shape of components,” “facilitating later wiring,” reduced costs when replacing components, and facilitating upgrades. *See* Ex. 1003 ¶¶ 76, 118–121, 123; Pet. 19–20, 25–28.

Based on the current record, we are unpersuaded by Patent Owner that Li teaches away from Petitioner’s proposed modifications to add a plug at each end of connecting component 113. *See* Prelim. Resp. 41, 43.

A “reference does not teach away” if “it merely expresses a general preference for an alternative invention but does not ‘criticize, discredit, or otherwise discourage’ investigation into the invention claimed.” *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 567 F.3d 1314, 1327

(Fed. Cir. 2009) (quoting *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004)).

Li expresses a general preference for connecting first housing 111 and second housing 112 to the two ends of first elastic metal wire 1131 in connecting component 113 by injection molding. Ex. 1004 ¶¶ 29, 35, dependent claims 2 and 7. For example, Li explains that “[o]ptionally, the first housing 111 and the second housing 112 are fixedly connected to both ends of the first elastic metal wire 1131 by injection molding.” *Id.* ¶ 29. Li does not “criticize, discredit, or otherwise discourage” using a plug to connect a housing to connecting component 113. *See, e.g., id.* ¶¶ 29, 35.

Instead, Li discloses using plugs to mechanically connect certain other components, i.e., to connect rear hook assembly 12 to “the first housings 111 of the two ear hook assemblies 11.” Ex. 1004 ¶ 58, Figs. 2, 9; *see* Ex. 1003 ¶¶ 57, 117, 122. Li similarly discloses using mechanical connectors comprising a clamping portion that engages with a locking portion to connect components, e.g., to “fix the first housing 111 and the third housing 114 together” and “fix the second housing 112 and the fourth housing 115 together.” Ex. 1004 ¶¶ 44–45. Li identifies these mechanical connectors as alternatives to adhesive bonding and “fasteners such as screws.” *Id.* ¶ 44; *see id.* ¶ 59 (identifying plugs as alternatives to “screw fixation”).

Hence, Li discloses a variety of ways to connect components in a bone conduction earphone and does not “criticize, discredit, or otherwise discourage” any of those ways. *See, e.g.,* Ex. 1004 ¶¶ 29, 35, 44–45, 58–59, Figs. 2, 9; *see* Ex. 1003 ¶¶ 57, 117, 122.

As Patent Owner contends, Li does not disclose “plug ends between the connecting component 113 and the first and second housings 111 and 112 on either end.” *See* Prelim. Resp. 24–26. Based on the current record, however, the absence of that disclosure in Li does not matter because Petitioner identifies a reason with rational underpinning to modify Li to add a plug at each end of connecting component 113, i.e., to obtain the well-known benefits of modular component design. *See* Ex. 1003 ¶¶ 76, 118–121, 123; Pet. 19–20, 25–28. Hence, at this preliminary stage, we are unpersuaded by Patent Owner’s assertion that an ordinarily skilled artisan would not have had “any reason for adding the claimed plugs” to connecting component 113. *See* Prelim. Resp. 28.

Although Li’s paragraph 59 discusses the advantages of using plug-in portions 123 with rear hook assembly 12 to connect rear hook assembly 12 to each first housing 111, Petitioner relies on an ordinarily skilled artisan’s knowledge to demonstrate that a skilled artisan would have recognized that the benefits of plug ends “would be further realized by adding plug ends to other components of the earphones, including on either end of connecting component 113.” Pet. 30; Ex. 1003 ¶ 123; *see* Pet. 19–20, 25–30; Ex. 1003 ¶¶ 76, 118–121; Ex. 1004 ¶ 59.

An ordinarily skilled artisan’s knowledge is “part of the store of public knowledge that must be consulted when considering whether a claimed invention would have been obvious.” *Randall*, 733 F.3d at 1362. Hence, a patent challenger may rely on an ordinarily skilled artisan’s knowledge to establish obviousness. *See, e.g., Philips*, 948 F.3d at 1337–38; *Ariosa*, 805 F.3d at 1365. For instance, the Supreme Court stated in *KSR* that determining “whether there was an apparent reason to combine the

known elements in the fashion claimed by the patent at issue” may involve analyzing “the background knowledge possessed by a person having ordinary skill in the art.” *KSR*, 550 U.S. at 418. Furthermore, the Federal Circuit stated in *Randall* that “well-documented knowledge” could “easily explain why an ordinarily skilled artisan would have been motivated to combine or modify the cited references to arrive at the claimed inventions.” *Randall*, 733 F.3d at 1356, 1362.

To show “the background knowledge possessed by a person having ordinary skill in the art,” Petitioner cites documentary evidence consisting of prior art. Pet. 25–28 (citing Ex. 1003 ¶ 118; Ex. 1004 ¶¶ 24, 59, 69; Ex. 1011 ¶¶ 6–7, 30–32, Fig. 2; Ex. 1012, 2:4–15, 3:13–35, Fig. 2; Ex. 1013, 10:62–11:8, 22:23–23:2, 23:64–24:8, Figs. 1, 17, 19; Ex. 1014 ¶¶ 4, 15, 17, Figs. 1, 3; Ex. 1015, 2:6–17, 4:2–5, 5:19–6:17, 6:65–7:42, Figs. 3, 5, 7; Ex. 1016 ¶¶ 56, 79, 85, 96; Ex. 1019 ¶¶ 9–15, 31, 35, 45, Figs. 1–15). Among other things, that documentary evidence teaches the benefits of modular component design. *See, e.g.*, Ex. 1011 ¶¶ 6–7, 30–37, Fig. 2; Ex. 1012, 2:4–15; Ex. 1013, 10:62–11:8, 22:23–23:2, 23:64–24:8, Figs. 1, 17, 19; Ex. 1014 ¶¶ 4–5, 14–17, Figs. 1, 3; Ex. 1015, 2:6–17, 4:2–5, 5:19–6:17, 6:65–7:42, Figs. 3, 5, 7; Ex. 1016 ¶¶ 56, 79, 85, 96).

As an example, Hupkes teaches that “easily exchangeable” speaker modules beneficially allow a user to eliminate discomfort “not apparent to the user when the user tests the headset prior to purchase.” *See* Ex. 1011 ¶¶ 6–7, 30–37. As another example, Chen teaches that modular speaker components beneficially allow “different configurations with different functions [to] be selectively used” and “provid[e] the desired sound effects and quality, sav[e] the costs and bring[] convenience to the user.” *See*

Ex. 1014 ¶¶ 4–5, 14–17. As yet another example, Bellas teaches that (1) “removable” components “can provide headphone users with increased mobility and/or flexibility” and (2) components having “a relatively simple shape . . . can lower production costs.” Ex. 1016 ¶¶ 56, 96.

Patent Owner’s assertion that Petitioner fails to explain why an ordinarily skilled artisan would have been motivated to incorporate the teachings of the seven “Interchangeable Audio Headset Prior Art” references into Li’s “specific headphone structure” to yield plug ends of an ear hook as required by claim 1 does not address the relevant inquiry. *See* Prelim. Resp. 37. The relevant inquiry is whether a skilled artisan would have been motivated to combine Li’s teachings with the skilled artisan’s knowledge about the benefits of modular component design. *See Philips*, 948 F.3d at 1338.

Similarly, Patent Owner’s assertion that Petitioner fails to analyze or discuss “the similarities or differences between each” of the seven “Interchangeable Audio Headset Prior Art” references and “how or why” an ordinarily skilled artisan would have combined them lacks merit. *See* Prelim. Resp. 40. Petitioner does not propose combining the seven “Interchangeable Audio Headset Prior Art” references with each other or with Li and Fujita. *See* Pet. 19–20, 25–30.

If, as Patent Owner asserts (Prelim. Resp. 41), Petitioner’s proposed modifications to add a plug at each end of connecting component 113 would “result in a significantly more complex structure,” that does not preclude obviousness. A patent challenger does not need to show “that a combination is ‘the *best* option, only that it be a *suitable* option.’” *Intel Corp. v. Qualcomm Inc.*, 21 F.4th 784, 800 (Fed. Cir. 2021) (emphases by the court)

(quoting *PAR Pharm., Inc. v. TWI Pharms., Inc.*, 773 F.3d 1186, 1197–98 (Fed. Cir. 2014)).

Furthermore, a “given course of action often has simultaneous advantages and disadvantages, and this does not necessarily obviate motivation to combine.” *Medichem, S.A. v. Rolabo, S.L.*, 437 F.3d 1157, 1165 (Fed Cir. 2006). The “benefits, both lost and gained, should be weighed against one another.” *Winner Int’l Royalty Corp. v. Wang*, 202 F.3d 1340, 1349 n.8 (Fed. Cir. 2000). This issue is better resolved at trial on a more developed record.

Additionally, at this preliminary stage, we are unpersuaded by Patent Owner that Petitioner improperly relies on hindsight obtained from the ’084 patent instead of “a teaching from the prior art” about the benefits of modular component design. *See* Prelim. Resp. 40. Petitioner contends that the ’084 patent “mentions reducing manufacturing cost and adjusting for design changes as a benefit of its modular design, which modular designs were known to do.” Pet. 27 (citing Ex. 1001, 11:66–12:11, 16:29–40; Ex. 1003 ¶ 119). As we understand Petitioner’s contention, Petitioner simply points out that the ’084 patent’s disclosure comports with the prior art’s teachings about the benefits of modular component design.

(c) Limitation 1b

Claim 1 recites “the ear hook being surrounded by a protective sleeve, the protective sleeve being made of an elastic waterproof material.” Ex. 1001, 36:51–53 (limitation 1b).

Petitioner contends that Li discloses or renders obvious limitation 1b because Li’s bone conduction earphone includes “a first elastic coating layer 1132 wrapped around the first elastic metal wire 1131” in connecting

component 113. Pet. 30–31 (emphasis omitted) (quoting Ex. 1004 ¶ 26) (citing Ex. 1004 ¶ 30, Figs. 1, 3). As support, Petitioner provides the following annotated version of Li’s Figure 1:

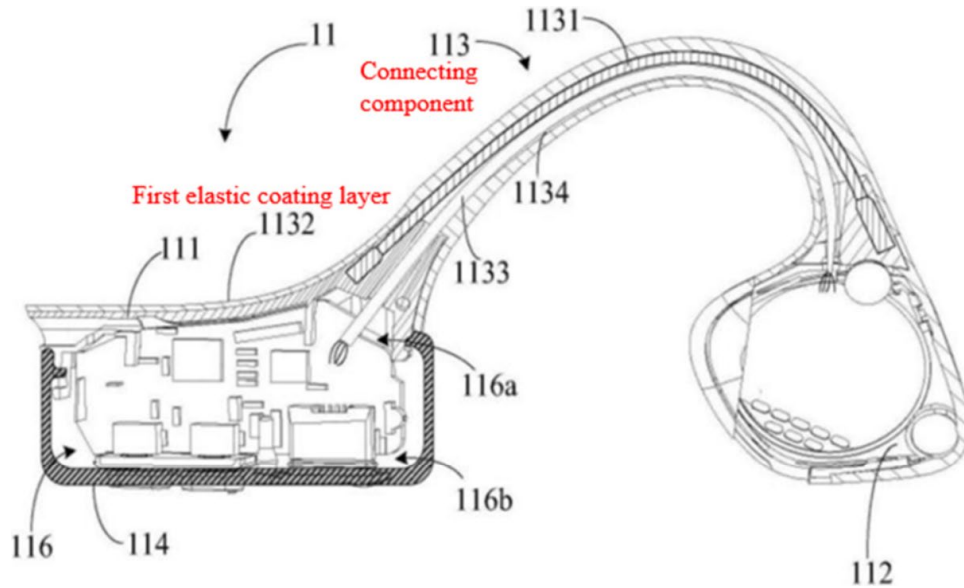


Figure 1 illustrates ear hook assembly 11 including “a first housing 111, a second housing 112, and a connecting component 113 connecting the first housing 111 and the second housing 112.” Ex. 1004 ¶ 23, Fig. 1. The above annotated version of Figure 1 includes the red annotation “Connecting component” by reference numeral 113 and the red annotation “First elastic coating layer” by reference numeral 1132. See Pet. 31; Ex. 1003 ¶ 125.

Petitioner also contends that Li discloses that “the first elastic coating layer 1132 is silicone, latex, rubber, another elastic plastic layer, or a composite material layer containing silicone.” Pet. 31 (citing Ex. 1002 ¶ 126; Ex. 1004 ¶ 28). According to Petitioner, an ordinarily skilled artisan “would have understood the material of the first elastic coating layer, e.g., silicone, to be waterproof.” *Id.* at 31–32 (emphasis omitted) (citing Ex. 1004 ¶ 73).

At this stage of the proceeding, Patent Owner makes no arguments specific to limitation 1b. *See, e.g.*, Prelim. Resp. 12–46. Nonetheless, the burden remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware*, 800 F.3d at 1378.

Based on the current record and for the reasons stated by Petitioner and supported by Dr. Kyriakakis’s testimony, Petitioner establishes sufficiently for purposes of institution that Li teaches limitation 1b. *See* Pet. 30–32; Ex. 1003 ¶¶ 125–127.

(d) Limitation 1c

Claim 1 recites “a core housing for accommodating an earphone core, the core housing being fixed to the first plug end and elastically abutted against the protective sleeve.” Ex. 1001, 36:54–56 (limitation 1c).

(i) “A Core Housing for Accommodating an Earphone Core”

a. Petitioner’s Contentions

Petitioner contends that Li discloses “a core housing for accommodating an earphone core” because Li’s bone conduction earphone includes fourth housing 115 cooperating with second housing 112 “to form a second accommodating space 117 for accommodating” a bone conduction speaker. Pet. 32 (citing Ex. 1003 ¶¶ 128–129; Ex. 1004 ¶ 43, Figs. 1–2, 8). Petitioner maps the claimed “core housing” to second housing 112 and fourth housing 115. *Id.* at 32–33, 85.

b. Patent Owner’s Contentions

At this stage of the proceeding, Patent Owner does not dispute that Li teaches “a core housing for accommodating an earphone core.” *See, e.g.*, Prelim. Resp. 12–46. Nonetheless, the burden remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware*, 800 F.3d at 1378.

c. Analysis

Based on the current record and for the reasons stated by Petitioner and supported by Dr. Kyriakakis's testimony, Petitioner establishes sufficiently for purposes of institution that Li teaches "a core housing for accommodating an earphone core." *See* Pet. 32; Ex. 1003 ¶¶ 128–129.

(ii) The "Core Housing Being Fixed to the First Plug End"

a. Petitioner's Contentions

Petitioner contends that Li renders obvious the "core housing being fixed to the first plug end." *See* Pet. 32–33. Specifically, Petitioner asserts that an ordinarily skilled artisan "would have found it obvious to include a first plug end on one end of Li's ear hook to connect it" to Li's core housing, i.e., second housing 112 and fourth housing 115, for the reasons discussed for limitation 1a, e.g., "to achieve the benefits of a modular earphone design," including "simplifying the structure and reducing costs." *Id.* at 32–33 (emphasis omitted). Petitioner explains that the first plug would provide the "core housing being fixed to the first plug end" because "Li's plug design would be replicated between the core housing and earphone." *Id.* at 33 (emphasis omitted).

b. Patent Owner's Contentions

Patent Owner disputes that Li renders obvious the "core housing being fixed to the first plug end" for essentially the same reasons Patent Owner disputes that Li renders obvious limitation 1a. *See* Prelim. Resp. 22–31; *supra* § III.E.4(b)(ii).

c. Analysis

Based on the current record and for (1) the reasons stated by Petitioner and supported by Dr. Kyriakakis's testimony and (2) the reasons discussed

above for limitation 1a, Petitioner establishes sufficiently for purposes of institution that Li renders obvious the “core housing being fixed to the first plug end.” *See* Pet. 24–30, 32–33; Ex. 1003 ¶¶ 116–124, 130–131; *supra* § III.E.4(b)(iii). Based on the current record, we consider Patent Owner’s arguments regarding limitation 1a unavailing. *See supra* § III.E.4(b)(iii).

(iii) The Core Housing Being “Elastically Abutted Against the Protective Sleeve”

a. Petitioner’s Contentions

Petitioner contends that Li renders obvious the core housing being “elastically abutted against the protective sleeve.” *See* Pet. 33–35. Specifically, Petitioner asserts that Li teaches a housing “elastically abutted against the protective sleeve” because:

- (1) Li’s bone conduction earphone includes rear hook assembly 12 comprising “a second elastic metal wire 121, a second elastic coating layer 122 wrapped around the second elastic metal wire 121, and plug-in portions 123 provided at both ends of the second elastic metal wire 121”;
- (2) the “second elastic coating layer 122 may be silicone, rubber, latex, or a composite including silicone”; and
- (3) “[a]s shown in Figure 2, the second elastic coating layer 122 abuts the third housing 114 at the plug-in portion 123.”

Id. at 33–34 (citing Ex. 1003 ¶¶ 131–132; Ex. 1004 ¶ 58, Fig. 2).

Additionally, Petitioner asserts that Li discloses first elastic coating layer 1132 of connecting component 113 covering at least part of Li’s core housing, i.e., second housing 112 and fourth housing 115, because Li explains that “the first elastic coating layer 1132 further covers at least [a] portion of the outer surfaces of the first housing 111 and the second

housing 112, such as the entire outer surface.” Pet. 35 (quoting Ex. 1004 ¶ 36).

Furthermore, Petitioner asserts that “Li acknowledges the benefits of having a coating of the protective sleeve over the entirety of the ear hook and the core housing, such as wear-resistance.” Pet. 35 (emphases omitted) (citing Ex. 1004 ¶ 36). Therefore, according to Petitioner, it would have been obvious to an ordinarily skilled artisan “to have elastic coating over all of the entire bone conduction earphone to achieve the same benefit.” *Id.* (citing Ex. 1003 ¶¶ 133–134).

b. Patent Owner’s Contentions

Patent Owner disputes that Li renders obvious the core housing being “elastically abutted against the protective sleeve.” *See* Prelim. Resp. 29–30, 44–46. In particular, Patent Owner contends that Li does not “teach joining the connecting component 113 to the first housing in such a way that the core housing elastically abuts the protective sleeve.” *Id.* at 29. Patent Owner contends that Li teaches that the two housings 111 and 112 “are fixed at both ends of the connecting component by injection molding” so that “the elastic coating layer covers at least portions of all three,” i.e., connecting component 113 and the two housings 111 and 112. *Id.* at 29–30, 45–46 (citing Ex. 1004 ¶¶ 29, 36). According to Patent Owner, nothing in Li’s disclosure about joining connecting component 113 and the two housings 111 and 112 by injection molding “suggests any benefit to adding a connection formed by a plug with a protective sleeve abutted against a housing.” *Id.* at 46.

Furthermore, Patent Owner asserts that Li achieves the benefits of an elastic coating, such as wear resistance, by “fixing the housings to the

connecting component by injection molding, not by plug junctions.” Prelim. Resp. 46. Patent Owner also asserts that Petitioner “fails to explain why replacing the fixed injection-molded connections with plug junctions would improve such wear resistance.” *Id.*

Regarding Li’s Figure 2, Patent Owner contends that Petitioner erroneously asserts “without any further explanation, that ‘[a]s shown in Figure 2, the second elastic coating layer 122 abuts the third housing 114 at the plug-in portion 123.’” Prelim. Resp. 44 (alteration by Patent Owner) (quoting Pet. 34). According to Patent Owner, Figure 2 is an “exploded” illustration depicting many components separated from each other rather than assembled, and Figure 2 “does not show whether the second elastic coating layer 122 and the third housing 114 make contact at all, much less whether they ‘elastically abut[]’ in the claimed manner.” *Id.* at 44–45. Patent Owner contends that Petitioner does not explain how an ordinarily skilled artisan would have gleaned the “elastically abutted” limitation from Figure 2. *Id.* at 45.

c. Analysis

Based on the current record and for the reasons explained below, Petitioner establishes sufficiently for purposes of institution that Li renders obvious the core housing being “elastically abutted against the protective sleeve.” *See* Pet. 33–35; Ex. 1003 ¶¶ 131–133. Specifically, as Petitioner asserts, Li teaches a housing “elastically abutted against the protective sleeve.” *See* Ex. 1003 ¶ 132; Ex. 1004 ¶ 58, Figs. 2–3, 5, 9–10; Pet. 33–34. Li’s bone conduction earphone includes rear hook assembly 12 comprising “a second elastic metal wire 121, a second elastic coating layer 122 wrapped around the second elastic metal wire 121, and plug-in portions 123 provided

at both ends of the second elastic metal wire 121.” Ex. 1004 ¶ 58, Figs. 2, 5, 9–10; *see* Ex. 1003 ¶ 132. “[T]he second elastic coating layer 122 is a silicone layer” and “can also be a rubber layer or a latex layer, or a composite material layer including silicone.” Ex. 1004 ¶ 58; *see* Ex. 1003 ¶ 132. We are persuaded at this preliminary stage that an ordinarily skilled artisan would have understood that silicone may serve as a protective waterproof covering for electronic audio devices. *See* Ex. 1003 ¶ 127.

Li’s figures show that second elastic coating layer 122 abuts a housing when “plug-in portions 123 are respectively connected and fixed to the first housings 111 of the two ear hook assemblies 11.” *See* Ex. 1004 ¶ 58, Figs. 2–3, 5, 9–10. For instance, Li’s Figure 10 (reproduced below) shows second elastic coating layer 122 with end portions extending over each plug-in portion 123 and abutting first housing 111 or third housing 114 (or both) when plug-in hole 1111 in first housing 111 receives plug-in portion 123:

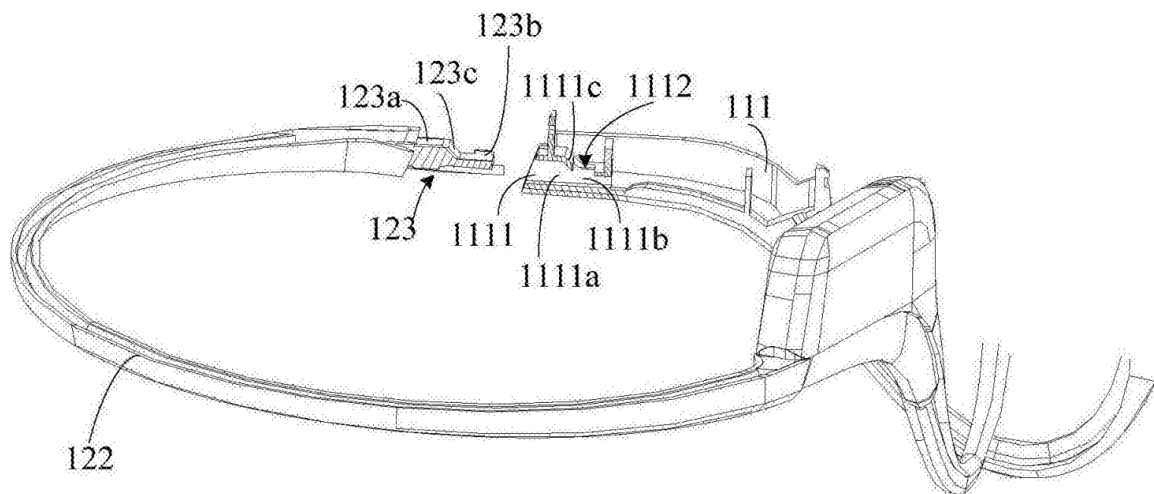


Figure 10 illustrates (1) second elastic coating layer 122 surrounding second elastic metal wire 121 (not shown in Figure 10), (2) an upper, center plug-in portion 123 ready for insertion into plug-in hole 1111 in first housing 111, and (3) a lower, right plug-in portion 123 (not labeled in Figure 10) inserted

into plug-in hole 1111 in first housing 111 (not labeled in Figure 10). *See* Ex. 1004 ¶ 60, Fig. 10.

Second elastic coating layer 122 has the same shape in Figures 2, 5, 9, and 10. *See* Ex. 1004, Figs. 2, 5, 9–10. Hence, even if Figure 2 does not clearly show second elastic coating layer 122 contacting a housing as Patent Owner argues (Prelim. Resp. 44–45), Li’s figures collectively show that feature. *See* Ex. 1004, Figs. 2, 5, 9–10.

Additionally, as Petitioner asserts, Li discloses first elastic coating layer 1132 of connecting component 113 covering at least part of Li’s core housing, i.e., second housing 112 and fourth housing 115. *See* Ex. 1003 ¶ 133; Ex. 1004 ¶ 36, Figs. 1–2; Pet. 35. In particular, Li explains that “optionally, the first elastic coating layer 1132 further covers at least [a] portion of the outer surfaces of the first housing 111 and the second housing 112, such as the entire outer surface.” Ex. 1004 ¶ 36; *see* Ex. 1003 ¶ 133. For example, “the first elastic coating layer 1132 covers the first elastic metal wire 1131, at least a portion of the outer surface of the first housing 111, and at least a portion of the outer surface of the second housing 112 by injection molding.” Ex. 1004 ¶ 36.

As Li explains and an ordinarily skilled artisan would have understood, “the presence of the first elastic coating layer 1132 can further protect the housing and internal components, making the bone conduction earphone more wear-resistant.” *See* Ex. 1003 ¶ 133; Ex. 1004 ¶ 36. To obtain the benefit of improved wear resistance, an ordinarily skilled artisan would have been motivated to have a protective elastic coating cover the entire bone conduction earphone. Ex. 1003 ¶ 133.

Patent Owner’s assertion that Li achieves the benefits of an elastic coating, such as wear resistance, by “fixing the housings to the connecting component by injection molding, not by plug junctions” appears to mischaracterize Li. *See* Ex. 1004 ¶¶ 29, 35–36; Prelim. Resp. 46. Li does not describe wear resistance as a benefit due to using injection molding to connect first housing 111 and second housing 112 with first elastic metal wire 1131. *See* Ex. 1004 ¶¶ 29, 35–36.

Instead, Li explains that using injection molding to connect first housing 111 and second housing 112 with first elastic metal wire 1131 “makes the connection between the first housing 111, the second housing 112, and the first elastic metal wire 1131 more stable, and enhances the sense of unity and texture of the bone conduction earphone, making the structure of the bone conduction earphone more compact and lightweight.” Ex. 1004 ¶ 29. Li separately explains that using injection molding to form first elastic coating layer 1132 such that it “covers at least [a] portion of the outer surfaces of the first housing 111 and the second housing 112, such as the entire outer surface,” beneficially “enhances the texture and unity of the bone conduction earphone” and first elastic coating layer 1132 “further protect[s] the housing and internal components, making the bone conduction earphone more wear-resistant.” *Id.* ¶ 36; *see* Ex. 1003 ¶ 133.

Patent Owner’s assertion that Petitioner “fails to explain why replacing the fixed injection-molded connections with plug junctions would improve such wear resistance” appears to mischaracterize Petitioner’s position. *See* Pet. 33–35; Prelim. Resp. 46. We do not understand Petitioner to argue that “replacing the fixed injection-molded connections with plug junctions would improve such wear resistance.” *See* Pet. 33–35; Prelim.

Resp. 46. Instead, Petitioner explains that “having a coating of the protective sleeve over the entirety of the ear hook and the core housing” would beneficially improve wear resistance. *Id.* at 35 (emphases omitted).

(iv) Summary

For the reasons discussed above, we are persuaded that Li would have rendered obvious limitation 1c to an ordinarily skilled artisan before the effective filing date of the claimed invention. *See* Pet. 32–35; Ex. 1003 ¶¶ 128–134; *supra* §§ III.E.4(d)(i)–(iii).

(e) Limitation 1d

Claim 1 recites “a circuit housing for accommodating a control circuit or a battery, the circuit housing being fixed to the second plug end, the control circuit or the battery driving the earphone core to vibrate, the vibration of the earphone core generating a driving force to drive a housing panel of the core housing to vibrate, the driving force being not parallel to a normal line of the housing panel.” Ex. 1001, 36:57–63 (limitation 1d).

(i) Petitioner’s Contentions

Petitioner contends that the combined disclosures in Li and Fujita teach limitation 1d for several related reasons. *See* Pet. 35–42. First, Petitioner asserts that Li discloses “a circuit housing for accommodating a control circuit or a battery” because Li’s bone conduction earphone includes third housing 114 cooperating with first housing 111 “to form a first accommodating space 116 for accommodating” either battery pack 13 (on the left in Figure 2) or control circuit assembly 14 (on the right in Figure 2). *Id.* at 35 (citing Ex. 1003 ¶ 135; Ex. 1004 ¶¶ 24, 46, Figs. 1–2). Petitioner maps the claimed “circuit housing” to first housing 111 and third housing 114. *Id.* at 35–37.

Second, Petitioner asserts that Li renders obvious “the circuit housing being fixed to the second plug end.” Pet. 37. Regarding plug-in portions 123 “connected and fixed to the first housings 111 of the two ear hook assemblies 11,” Petitioner asserts that an ordinarily skilled artisan “would have found it obvious to locate sockets that mate with plug-in portions 123 on the corresponding end of connecting component 113 at the other end of first housing 111” for “the same reasons it would have been obvious to add sockets to the bone conduction speaker housing corresponding to the plug ends added to connecting component 113 proximate the bone conduction speaker housing.” *Id.* at 38 (citing Ex. 1003 ¶¶ 138–139). According to Petitioner, the “prior art teaches the benefits of modular circuit housing design” as explained for limitation 1a, and “the design in Li would achieve these well-known benefits using structures already in use in Li.” *Id.* at 39 (citing Ex. 1003 ¶ 139).

Third, Petitioner asserts that Li discloses or renders obvious “the control circuit or the battery driving the earphone core to vibrate.” Pet. 36. As support, Petitioner quotes Li’s disclosures about component functions as follows:

[B]one conduction speakers are used to output sound to users via vibration in a bone conduction manner. The battery is used to power the various components of the bone conduction earphone. The control circuit is used to control the bone conduction earphone, such as for adjusting volume, turning on and off, playing audio, and Bluetooth communication.

Id. at 37 (alteration by Petitioner) (quoting Ex. 1004 ¶ 24).

Fourth, Petitioner asserts that Fujita discloses or renders obvious “the vibration of the earphone core generating a driving force to drive a housing panel of the core housing to vibrate, the driving force being not parallel to a

normal line of the housing panel.” Pet. 39. More specifically, Petitioner asserts that Fujita’s bone conduction speaker 10 includes (1) multilayer columnar piezoelectric element 12 “for generating oscillation in accordance with the sound information” and (2) cushion 16 protruding from the case “for transmitting the oscillation generated by the multilayer columnar piezoelectric element” by “abutting to the human head.” *Id.* at 39–40 (quoting Ex. 1022, code (57)). Petitioner also asserts that the driving force in Fujita’s bone conduction speaker 10 “is not parallel to a normal line of the housing panel.” *Id.* at 40 (citing Ex. 1003 ¶ 141).

As support, Petitioner provides the following annotated version of Fujita’s Figure 2:

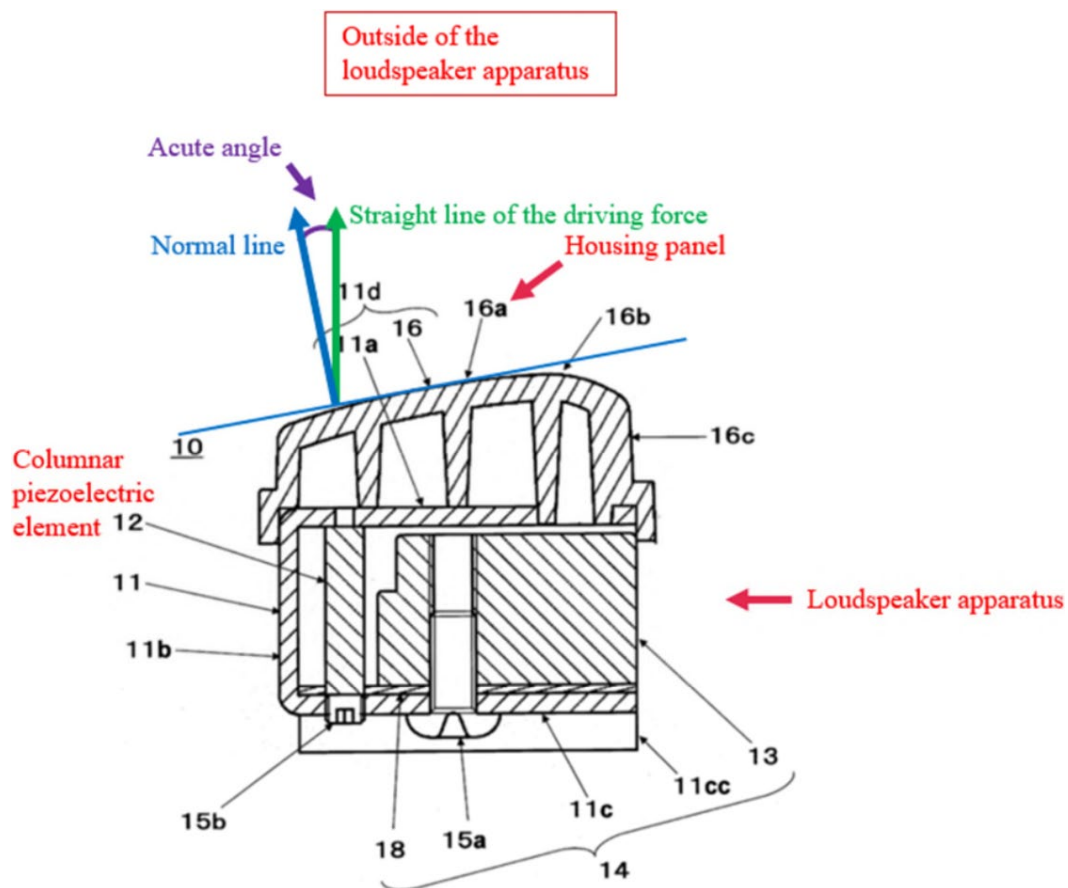


Figure 2 illustrates bone conduction speaker 10 including, among other things, columnar piezoelectric element 12 and cushion 16 comprising close contact surface 16a, apex 16b, and front end side 16c. Ex. 1022 ¶¶ 20, 24–27, 37, Fig. 2. The above annotated version of Figure 2 includes:

- (1) the red annotation “Outside of the loudspeaker apparatus” at the top of the figure;
- (2) the red annotation “Loudspeaker apparatus” and a red arrow identifying bone conduction speaker 10;
- (3) the red annotation “Columnar piezoelectric element” by reference numeral 12;
- (4) the red annotation “Housing panel” and a red arrow identifying close contact surface 16a;
- (5) a blue line denoting a tangent plane of close contact surface 16a;
- (6) a blue arrow perpendicular to the blue line denoting a tangent plane of close contact surface 16a and labeled “Normal line”;
- (7) a green arrow directed upwardly from the point where the blue arrow originates at the blue line denoting a tangent plane of close contact surface 16a and labeled “Straight line of the driving force”; and
- (8) the purple annotation “Acute angle” and a purple arrow identifying the angle between the blue arrow and the green arrow.

See Pet. 41; Ex. 1003 ¶ 141.

Referring to the above annotated version of Figure 2, Petitioner asserts that an ordinarily skilled artisan would have understood that:

- (1) the annotated “Normal line” is “one example of a normal line because the housing panel used to contact the user’s body in Fujita is non-planar (has a curvature)”;

- (2) “the normal line may be determined by” (i) “selecting a certain point in an area when the panel is in contact with human skin,” (ii) “determining a tangent plane of the panel at the selected point,” (iii) “determining a straight line that passes through the point and is perpendicular to the tangent plane,” and (iv) “designating the straight line as the normal line of the panel”; and
- (3) “when the panel used to contact the user’s body is non-planar like in Fujita, different points correspond to different tangent planes of the panel, and the determined normal line may also be different.”

Pet. 41–42.

(ii) Patent Owner’s Contentions

At this stage of the proceeding, Patent Owner makes no arguments regarding “a circuit housing for accommodating a control circuit or a battery” or “the control circuit or the battery driving the earphone core to vibrate, the vibration of the earphone core generating a driving force to drive a housing panel of the core housing to vibrate, the driving force being not parallel to a normal line of the housing panel.” *See, e.g.*, Prelim.

Resp. 12–46. Patent Owner disputes that Li renders obvious “the circuit housing being fixed to the second plug end” for essentially the same reasons Patent Owner disputes that Li renders obvious limitation 1a. *See id.* at 22–28, 32–35; *supra* § III.E.4(b)(ii).

(iii) Analysis

Based on the current record and for (1) the reasons stated by Petitioner and supported by Dr. Kyriakakis’s testimony and (2) the reasons discussed above for limitation 1a, Petitioner establishes sufficiently for purposes of institution that the combined disclosures in Li and Fujita teach limitation 1d. *See* Pet. 24–30, 35–42; Ex. 1003 ¶¶ 116–124, 135–142; *supra*

§ III.E.4(b)(iii). Based on the current record, we consider Patent Owner’s arguments regarding limitation 1a unavailing. *See supra* § III.E.4(b)(iii).

(f) Preliminary Conclusion About Obviousness/Nonobviousness

As discussed above, Petitioner’s analysis sufficiently addresses how the combined disclosures in Li and Fujita teach claim 1’s subject matter. *See supra* §§ III.E.4(a)–(e). Additionally, Petitioner provides a sufficient reason with rational underpinning as to why an ordinarily skilled artisan would have been motivated to combine Fujita’s teachings with Li’s teachings in the way Petitioner proposes and would have had a reasonable expectation of success. *See supra* § III.E.3. Hence, Petitioner demonstrates a reasonable likelihood of proving claim 1 to be unpatentable under § 103 because the claim would have been obvious over the combined teachings of Li and Fujita.

F. Alleged Obviousness over Li, Fujita, and Asaka: Claims 2–6

Claims 2–6 depend directly or indirectly from claim 1. Ex. 1001, 36:64–37:35. Petitioner contends that claims 2–6 are unpatentable under § 103 because the claims would have been obvious over Li, Fujita, and Asaka. *See* Pet. 1, 60–81. At this stage of the proceeding, Patent Owner makes no arguments specific to claims 2–6. *See, e.g.*, Prelim. Resp. 22–47. Instead, Patent Owner asserts that “the Petition’s failure to demonstrate a reasonable likelihood of prevailing” for claim 1 “carries over” to claims 2–6. *Id.* at 47.

We have reviewed Petitioner’s arguments and evidence concerning claims 2–6. *See* Pet. 60–81; Ex. 1003 ¶¶ 172–214. Based on the current record, and absent contrary arguments from Patent Owner, Petitioner’s analysis sufficiently addresses how the combined disclosures in Li, Fujita,

and Asaka teach the subject matter of claims 2–6.¹⁰ *See* Pet. 64–81; Ex. 1003 ¶¶ 172, 181–214. Petitioner also provides a sufficient reason with rational underpinning as to why an ordinarily skilled artisan would have been motivated to combine the teachings of the references in the way Petitioner proposes and would have had a reasonable expectation of success. *See* Pet. 60–64; Ex. 1003 ¶¶ 173–180. Hence, Petitioner demonstrates a reasonable likelihood of proving claims 2–6 to be unpatentable under § 103 because the claims would have been obvious over the combined teachings of Li, Fujita, and Asaka.

G. Alleged Obviousness over Li, Fujita, and Numata: Claims 7–10

Claims 7–10 depend directly or indirectly from claim 1. Ex. 1001, 37:36–67. Petitioner contends that claims 7–10 are unpatentable under § 103 because the claims would have been obvious over Li, Fujita, and Numata. *See* Pet. 1, 81–101. At this stage of the proceeding, Patent Owner makes no arguments specific to claims 7–10. *See, e.g.*, Prelim. Resp. 22–47. Instead, Patent Owner asserts that “the Petition’s failure to demonstrate a reasonable likelihood of prevailing” for claim 1 “carries over” to claims 7–10. *Id.* at 47.

We have reviewed Petitioner’s arguments and evidence concerning claims 7–10. *See* Pet. 81–101; Ex. 1003 ¶¶ 215–253. Based on the current record, and absent contrary arguments from Patent Owner, Petitioner’s analysis sufficiently addresses how the combined disclosures in Li, Fujita, and Numata teach the subject matter of claims 7–10. *See* Pet. 84–101;

¹⁰ For claim 5, Petitioner’s analysis sufficiently addresses how the combined disclosures in Li, Fujita, and Asaka teach the claimed subject matter if “first” is interpreted to mean “second” in limitation 5c. *See* Pet. 6–7, 75–80.

Ex. 1003 ¶¶ 215, 224–253. Petitioner also provides a sufficient reason with rational underpinning as to why an ordinarily skilled artisan would have been motivated to combine the teachings of the references in the way Petitioner proposes and would have had a reasonable expectation of success. *See* Pet. 81–84; Ex. 1003 ¶¶ 216–223. Hence, Petitioner demonstrates a reasonable likelihood of proving claims 7–10 to be unpatentable under § 103 because the claims would have been obvious over the combined teachings of Li, Fujita, and Numata.

H. Alleged Obviousness over Li, Fujita, and Fukuda: Claims 12–15

Claims 12–15 depend directly or indirectly from claim 1. Ex. 1001, 38:5–37. Petitioner contends that claims 12–15 are unpatentable under § 103 because the claims would have been obvious over Li, Fujita, and Fukuda. *See* Pet. 1, 42–60. At this stage of the proceeding, Patent Owner makes no arguments specific to claims 12–15. *See, e.g.*, Prelim. Resp. 22–47. Instead, Patent Owner asserts that “the Petition’s failure to demonstrate a reasonable likelihood of prevailing” for claim 1 “carries over” to claims 12–15. *Id.* at 47.

We have reviewed Petitioner’s arguments and evidence concerning claims 12–15. *See* Pet. 42–60; Ex. 1003 ¶¶ 144–171. Based on the current record, and absent contrary arguments from Patent Owner, Petitioner’s analysis sufficiently addresses how the combined disclosures in Li, Fujita, and Fukuda teach the subject matter of claims 12–15. *See* Pet. 45–60; Ex. 1003 ¶¶ 151–171. Petitioner also provides a sufficient reason with rational underpinning as to why an ordinarily skilled artisan would have been motivated to combine the teachings of the references in the way Petitioner proposes and would have had a reasonable expectation of success.

See Pet. 42–45; Ex. 1003 ¶¶ 144–150. Hence, Petitioner demonstrates a reasonable likelihood of proving claims 12–15 to be unpatentable under § 103 because the claims would have been obvious over the combined teachings of Li, Fujita, and Fukuda.

*I. Alleged Obviousness over Li, Fujita, Wang,
Xu, and Nielsen: Claims 16–20*

Claims 16–20 depend directly or indirectly from claim 1. Ex. 1001, 38:38–39:8. Petitioner contends that claims 16–20 are unpatentable under § 103 because the claims would have been obvious over Li, Fujita, Wang, Xu, and Nielsen. *See* Pet. 1, 101–119. At this stage of the proceeding, Patent Owner makes no arguments specific to claims 16–20. *See, e.g.*, Prelim. Resp. 22–47. Instead, Patent Owner asserts that “the Petition’s failure to demonstrate a reasonable likelihood of prevailing” for claim 1 “carries over” to claims 16–20. *Id.* at 47.

We have reviewed Petitioner’s arguments and evidence concerning claims 16–20. *See* Pet. 101–119; Ex. 1003 ¶¶ 254–296. Based on the current record, and absent contrary arguments from Patent Owner, Petitioner’s analysis sufficiently addresses how the combined disclosures in Li, Fujita, Wang, Xu, and Nielsen teach the subject matter of claims 16–20. *See* Pet. 104–119; Ex. 1003 ¶¶ 254, 263–296. Petitioner also provides a sufficient reason with rational underpinning as to why an ordinarily skilled artisan would have been motivated to combine the teachings of the references in the way Petitioner proposes and would have had a reasonable expectation of success. *See* Pet. 101–104; Ex. 1003 ¶¶ 255–262. Hence, Petitioner demonstrates a reasonable likelihood of proving claims 16–20 to

be unpatentable under § 103 because the claims would have been obvious over the combined teachings of Li, Fujita, Wang, Xu, and Nielsen.

IV. CONCLUSION

Based on the arguments and evidence presented by the parties, we determine that there is a reasonable likelihood Petitioner would prevail with respect to at least one claim challenged in the Petition. Hence, we institute an *inter partes* review of all challenged claims on all challenges included in the Petition. *See SAS Inst. Inc. v. Iancu*, 584 U.S. 357, 364–65 (2018) (noting that the language of 35 U.S.C. § 314(b) “indicates a binary choice—either institute review or don’t”); *PGS Geophysical AS v. Iancu*, 891 F.3d 1354, 1360 (Fed. Cir. 2018) (interpreting the statute as requiring “a simple yes-or-no institution choice respecting a petition, embracing all challenges included in the petition”); 37 C.F.R. § 42.108(a).

At this preliminary stage, we have not made a final determination about the patentability of any challenged claim, the construction of any claim term, phrase, or limitation, or any other legal or factual issue.

V. ORDER

Accordingly, it is

ORDERED that, according to 35 U.S.C. § 314(a), an *inter partes* review of claims 1–10 and 12–20 in the ’084 patent is instituted on all challenges included in the Petition; and

FURTHER ORDERED that, according to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial that commences on the entry date of this decision.

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For PETITIONER:

James M. Heintz
Matthew Satchwell
Shaobin Zhu
Michael L. Burns
DLA Piper LLP US
jim.heintz@us.dlapiper.com
matthew.satchwell@us.dlapiper.com
shaobin.zhu@us.dlapiper.com
michael.burns@us.dlapiper.com

For PATENT OWNER:

Babak Tehranchi
Bing Ai
Wei Yuan
John Esterhay
Evan Day
PERKINS COIE LLP
tehranchi-ptab@perkinscoie.com
ai-ptab@perkinscoie.com
yuan-ptab@perkinscoie.com
esterhay-ptab@perkinscoie.com
day-ptab@perkinscoie.com