

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.

U.S. Patent No. 11,310,582

Case IPR2025-00843

**REBUTTAL DECLARATION OF CHRIS KYRIAKAKIS, PH.D
IN SUPPORT OF PETITIONER'S REPLY TO
PATENT OWNER'S RESPONSE**

I, Chris Kyriakakis, Ph.D, declare as follows:

I. INTRODUCTION

1. My name is Chris Kyriakakis. My background and qualifications have been previously set forth. *See* EX1003, ¶¶5-18. I am submitting this Declaration on behalf of Suzhou Mojawa Intelligent Electronic Co., Ltd. (“Petitioner”) in support of the *inter partes* review (“IPR”) of U.S. Patent No. 11,310,582 (“the ’582 patent”), which I understand is Exhibit 1001 to the petition submitted to the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I am competent to testify under oath, and will do so if called as a witness, as follows herein.

2. Specifically, I have been asked to consider whether any of my opinions set forth in my earlier declaration (EX1003) with respect to claims 1-12, 14, and 16-20 (“the challenged claims”) have changed in view of subsequent papers being presented in this IPR, including the Response by Patent Owner Shenzhen Shokz Co., Ltd. (“Patent Owner”) (Paper 25) (“POR”) and exhibits filed by Patent Owner (Exhibits 2001-2023). In addition to those items, I have also considered other items discussed below.

3. It is still my opinion that the challenged claims of the ’582 patent would have been obvious as set forth in my earlier declaration (EX1003).

4. In reply to Patent Owner’s Response (Paper 25) and the “Declaration of Michael Scordilis, Ph.D. in Support of Patent Owner’s Response to Petition for *Inter Partes* Review of U.S. Patent No. 11,310,582 B2” (“Scordilis,” EX2020), I disagree in many respects. I address some of these points here.

II. GROUND 1: THE COMBINATION OF LI AND LIAO RENDERS CLAIMS 1 AND 14 OBVIOUS

A. Claim 1: An Ear Hook With First and Second Plug Ends (Element 1[a]) Would Have Been Obvious

1. Li Does Not Teach Away From an Ear Hook With First and Second Plug Ends

(a) Structural Stability and Integrity Concerns Do Not Negate Obviousness

5. Dr. Scordilis opined that adding first and second plug ends to the Li ear hook would be “in contradiction to” or “incompatible with” Li’s disclosure. Scordilis, ¶¶84-88, 94-101; *see also* POR 18-20, 23-26. I disagree for the following reasons.

6. Li’s disclosure of locking or adhesive reinforcement features does not teach away from plug-based modular construction. Dr. Scordilis is incorrect that “[t]eachings of adhesives and locking pieces [in Li] [sic] is inherently inconsistent with the principle of interchangeability.” Scordilis, ¶96, *see also* POR 23-26, 25. Li discloses adhesive application and locking piece insertion to enhance connection are “optional[,]” EX1004, ¶60, and would not render Li incompatible with

interchangeable modularity. Li discloses that adhesive application and locking piece insertion may enhance the connection EX1004, ¶60. These optional features would not render Li incompatible with interchangeability or modularity. Li's plug-in connection structure provides for modular assembly, disassembly, and interchangeability. EX1004, ¶59 (plug in portion 123 facilitates later wiring). A locked plug connection is also not incompatible with interchangeable modularity. Li discloses the locked plug connection can be made with reversible or removable structure such as a wedge or pin. EX1004, ¶61. I also note that "interchangeability" is one of several reasons (e.g., simplified manufacturing and reduced costs) for adopting a modular construction with first and second plug ends.

(b) Waterproofing Concerns Do Not Obviate Motivation to Include Plug Ends

7. Dr. Scordilis opined that "waterproofing concerns" would discourage a POSITA from modifying Li to include first and second plug ends. Scordilis ¶89-93; *see also* POR 21-23. I disagree. Li discloses multiple waterproofing structures, including elastic coating layers, waterproof lining boards in elastic contact with surrounding structures, and waterproof breathable membranes. EX1004, ¶¶[0028], [0056], [0071]-[0073]. A POSITA was very familiar with waterproofing techniques, including using an elastomeric material to seal the seam formed between adjoining components. A POSITA would have been motivated to modify Li's ear hook to include first and second plug ends to achieve the benefits of

modularity, including those specifically mentioned in Li, namely “simplifying the structure, . . . facilitating later wiring, and reducing costs,” EX1004, ¶59, notwithstanding any increased risk of water infiltration.

2. A POSITA Would Have Modified Li to Include First and Second Plug Ends

8. Dr. Scordilis opined that the references I considered do not disclose an ear hook with first and second plug ends. Scordilis, ¶¶77-82, 98-101; *see also* POR 26-36. The references demonstrate that a POSITA would have found such an arrangement obvious. A POSITA would have understood that modular connections are naturally located at interfaces between structural support components and functional modules, including the interfaces between the ear hook and the core housing and between the ear hook and the circuit housing. A POSITA would have understood there to be a finite number of places where modular connections would be located in a loudspeaker apparatus to achieve the benefits of modular construction, among which are the first and second ends of the ear hook.

9. In a bone-conduction earphone, the ear hook mechanically supports the core housing, which contains the speaker, and the circuit housing, which contains the battery or control circuit. A POSITA would have understood these two junctions are natural locations for modular separation because they are the interfaces between the ear hook and the corresponding functional modules. A POSITA, seeking to gain the well-known benefits of modular construction,

including simplified manufacturing, facilitated wiring, component replacement, cost reduction, would have recognized that providing plug ends at these interfaces is an obvious and predictable design choice.

B. Claim 1: Li Discloses or Suggests the Core Housing Being Elastically Abutted Against the Protective Sleeve (Element [1c])

10. Dr. Scordilis opined that “[t]here is nothing within Li that suggests that the elastic coating layer 122 is elastically compressed [abutted] against the end surface of the housing 111 when the plug-in portion 123 is inserted.” Scordilis, ¶¶103-109; *see also* POR 37-42. I disagree.

11. Li discloses the 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.” EX1004, ¶58, FIGS. 2, 3, 5, 9, 10. Li’s figures collectively show the second elastic contacting layer 122 contacting a housing. EX1004, FIGS. 2, 5, 9, 10 (below).

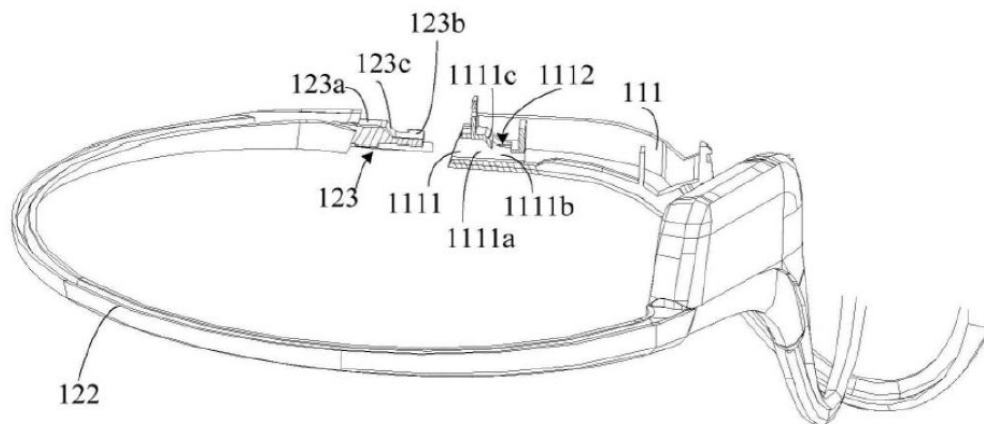


Figure 10
EX1004, FIG. 10

12. POSITA would have understood that the second elastic coating layer 122 undergoes elastic deformation when it abuts the housing. Li discloses the plug-in portion 123 and the plug-in hole 1111 are configured for a “tight fit” between them so that “the rear hook can be effectively connected to the ear hook. EX1004, ¶¶63-64. As shown below, a POSITA would have understood that the plug-in portion 123 fully occupies the plug-in hole 1111 when inserted and the second elastic coating layer 122 would undergo elastic compressive deformation upon contact with the end of the plug-in hole 1111 of the housing 111 to effect the tight fit therebetween and to account for ordinary engineering tolerances. A POSITA would have understood the second elastic coating layer 122 form an interference-type relationship with the housing 111 such that the second elastic coating layer 122 undergoes elastic deformation when it is elastically abutted against the housing 111.

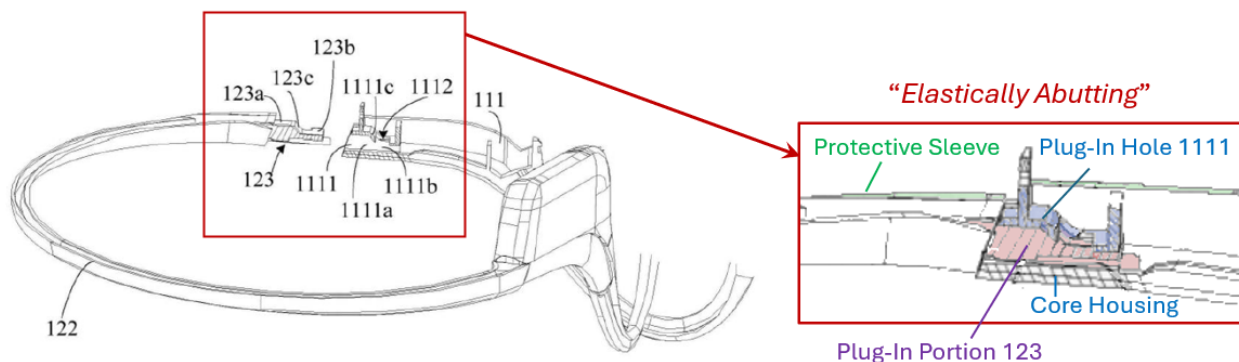


Figure 10

EX1004, FIG. 10 (annotated)

13. The compression of the second elastic coating layer 122 in the Li-Liao combination follows the same elastically abutting relationship described in the '582 patent. The '582 patent describes the protective sleeve 16 as including an “abutting” surface: “the protective sleeve 16 forms an annular abutting surface 161 on the outer end surface 21 of the annular table surface 1422 facing the outer end surface of the core housing 20.” EX1001, 13:18-21; FIG. 6 (below). An annular boss 162 extends radially inward from the annular abutting surface 161. *Id.*, 13:24-27. The protective sleeve 16 undergoes elastic deformation when elastically abutted against the core housing: “[W]hen the core housing 20 and the plug end 14 are plugged and fixed, the annular abutting surface 161 and the annular boss 162 may elastically abut against the outer end surface [21] of the core housing 20 and the connecting slope 24, respectively.” EX1001, 13:46-50, FIG. 6. The protective sleeve undergoing elastic deformation by being compressed against the core housing, as described in the '582 patent, would have been obvious to a POSITA in view of the Li-Liao combination.

C. Claim 1: It Would Have Been Obvious for Housing Panels to Vibrate at the Claimed Frequencies (Element [1e])

14. Dr. Scordilis’s “counterexamples” concerning a rigid housing construction do not change my opinion that the claimed phase difference is obvious in view of the Li-Liao combination. *See* Scordilis, ¶¶117-122, *see also* POR 46-49. Liao discloses direct attachment between the housing panels and further teaches

that the panel may be “directly mounted on the housing or bonded to the housing with adhesive.” EX1005, ¶[0063]. A POSITA would have understood that directly attached rigid housing panels formed from the same or similar rigid materials would tend to vibrate together with minimal phase lag.

15. Liao discloses the housing may be formed from rigid materials including ABS, PS, HIPS, and PP, which are the same materials that are identified in the '582 Patent as suitable housing panel materials. *Compare* EX1005, ¶[0075] *with* EX1001, 18:16-19:16 (each naming ABS, PS, HIPS, PP, etc.). The '582 patent explains that when the overall rigidity of the housing is relatively large, the housing panel and the housing back panel may “keep the same or substantially the same” vibration amplitudes and phases, thereby reducing sound leakage. EX1001, 20:29-33. A POSITA would have understood that Liao’s directly attached rigid housing structure would predictably exhibit substantially in-phase vibration behavior, including a phase difference well below the claimed 60° threshold within the recited frequency range.

16. The specific geometry of Liao’s direct-attachment housing further supports substantially in-phase vibration. Liao discloses a housing with a flat, planar front panel and a flat rear housing wall of substantially similar shape, with the vibration source located centrally. The centrally located vibration source and substantially symmetric geometry minimize asymmetric propagation paths that

could otherwise induce significant phase divergence. Liao does not teach a housing including curvatures, cutouts, or asymmetric reinforcements that would induce phase misalignment. A POSITA would have understood that Liao's housing includes front and back panels that vibrate with nearly identical phase and amplitude within the claimed frequency range. Dr. Scordilis's generalized concerns about geometry (Scordilis, ¶¶117-119; *see also* POR 46-47) are not applicable to Liao's housing which lacks those features that could cause differential behavior, and do not negate the obviousness in view of Liao of a housing having panels that vibrate with a phase difference well below 60°.

17. In reply to Patent Owner's argument that Petitioner uses hindsight bias in relying on a rigidly connected housing from Liao (POR 49-53), I also disagree. Liao discloses a variety of connection methods and teaches benefits of the direct attachment method. EX1005, ¶¶57-58, 63 ("General technical personnel in this field can determine the material, position, and connection method of the connection member according to different practical applications, or modify, improve, or combine the properties of the different connection members mentioned above, but these modifications and improvements are still within the scope described above. For example, the connection members described above may not be necessary. The panel can be directly mounted on the housing or bonded to the

housing with adhesive.”). Rather than being critical or discouraging its use, Liao teaches using a direct attachment method is desirable. *See, e.g.*, EX1005, ¶63.

18. A POSITA would have understood that Liao’s directly attached rigid housing structure provides a direct and substantially symmetric vibration transmission path between the centrally located vibration source and the housing panels. In such a configuration, vibrational energy would propagate through the housing with minimal relative delay or modal divergence between the front and rear panels. A POSITA would have expected the housing panel and the housing back panel to vibrate substantially in phase, with a phase difference well below 60° within the claimed 2000-3000 Hz frequency range. Dr. Scordilis’s hypothetical counterexamples involving curved panels, asymmetric supports, or other nonuniform geometries (*see, e.g.*, EX2020, ¶133) are not disclosed in Liao and do not undermine the predictable vibration behavior of the specific rigid and substantially symmetric housing structure taught by Liao.

D. Claim 14: It Would Have Been Obvious for Housing Panels to Vibrate Within the Claimed Vibration Amplitude Ratio Range

19. A POSITA would have understood that Liao’s directly attached rigid housing structure would predictably produce substantially similar vibration amplitudes and an amplitude ratio within the claimed range of 0.5 to 1.5. This understanding from Liao is consistent with the relationship between housing rigidity and amplitude described in the ’582 patent itself, which states that “when

the housing of the bone conduction speaker has a relatively large rigidity, the housing panel and the housing back panel may keep the same or substantially the same vibration amplitude and phase at higher frequencies, thereby significantly reducing the sound leakage of the bone conduction earphone.” EX1001, 20:57-67.

The additional hypothetical conditions now raised by Dr. Scordilis as preventing substantially similar vibration amplitudes in rigid housing structures, POR 54-56; Scordilis, ¶¶132-134, are not themselves addressed in the ’582 patent, which further confirms to me that a POSITA would have understood how to address those hypothetical conditions to meet the added features of claim 14 in view of the Li-Liao combination.

III. Ground 3: The Li-Liao-Numata Combination Renders Claims 7–12 Obvious

20. Dr. Scordilis opined that the Petition’s Li-Liao-Numata combination would result in “unwearable and unusable configurations.” Scordilis, ¶¶141-148 at 146; *see also* POR 61-69. I disagree. The Li-Liao-Numata combination yields earphones with a secure fit and improved wear resistance.

21. Dr. Scordilis’s opinion assumes that Numata’s exact assembly orientation and release geometry would be incorporated into Li without modification. Numata, however, broadly teaches detachable modular connector structures with elastic locking, stable retention, and removable earhook assemblies.

EX1007, ¶¶[0031]-[0034]. Numata further teaches that the earhook assembly may be inserted from above or below to configure the headset for either the left or right ear. *Id.* If a particular orientation were undesirable in a specific implementation, a POSITA would have understood that the connector structure was adaptable and not “permanently unusable.” Scordilis, ¶¶142, 147. A POSITA further would have recognized that routine engineering techniques—such as keyed or asymmetric geometries, side-access release structures, or modified latch arrangements—would readily prevent incorrect insertion or simplify assembly. Numata’s reversible insertion capability further demonstrates the flexibility and adaptability of its modular connector structure.

22. Moreover, I disagree with Dr. Scordilis’s opinion that Numata’s plug would become “permanently” stuck because Li’s housing lacks Numata’s through-hole (*see* Scordilis, ¶146; *see also* POR 66-67). A POSITA would recognize that Numata’s through-hole is merely one example of a release mechanism for a snap-fit connection—not a functional requirement of the plug itself. Li’s housing can readily incorporate other standard, releasable locking mechanisms that do not require a through-hole, such as a resilient cantilever latch accessible from the exterior, a threaded collar, a spring-loaded detent, or a flexible barb that compresses upon pulling. These alternatives were well-known in the art of portable electronic device assembly. A POSITA seeking to combine Numata’s bi-

directional plugging with Li's waterproof earphone would adapt the release mechanism accordingly—a routine design choice.

23. Dr. Scordilis's opinion assumes that Numata's exact release-tool geometry is incorporated into Li's inline connector arrangement without modification. Numata's relevant teaching, however, is the use of detachable elastically locking modular connector structures. EX1007, [0031]-[0034]. A POSITA would have readily understood that the particular placement of a release opening or release mechanism is a routine engineering detail that would be adapted for an inline configuration using known connector techniques, including side-access release slots, flexible latch structures, removable covers, or alternative manual release mechanisms. The fact that one particular disassembly approach illustrated in Numata may require geometric adaptation when incorporated into Li does not render the combination inoperable or beyond ordinary skill.

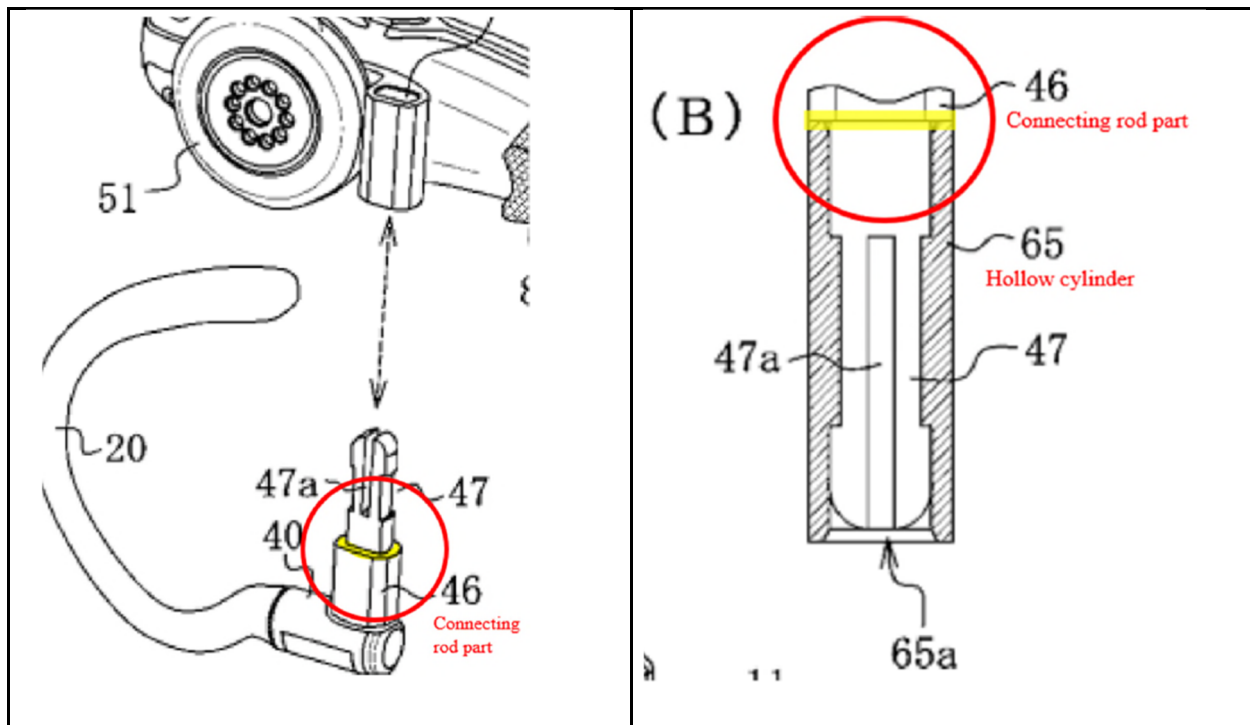
24. Potential assembly issues concerning Numata would have represented, at most, an ordinary implementation detail readily addressed through routine engineering techniques for achieving the undisputed benefits of the Numata plug end. A POSITA would have combined the teachings of Li-Liao-Numata given the undisputed benefits of secure fit and improved wear resistance.

25. Dr. Scordilis opined that a POSITA would not have combined Numata with Li-Liao because Numata's plugs do not provide electrical

connectivity to Li's housing. Scordilis, ¶¶149-153; *see also* POR 67-69. I disagree. A POSITA would have understood that Numata's plugs provide electrical connectivity in multiple ways. For example, a POSITA would have understood that Numata's detachable insertion interface shown in Figures 8 and 9 could readily accommodate electrical connections if desired. Numata discloses a hollow through-hole structure (65, 65A) and insertion part (47) configured for detachable modular assembly and repeated insertion. EX1007, Figs. 8-9, [0031]-[0034]. Once the mechanical alignment and detachable retention structures are provided, incorporating conventional conductive elements—such as conductive pins, spring contacts, conductive sleeves, or routed wires—would have represented routine connector engineering well within the ordinary skill in the art.

26. Dr. Scordilis opined that Numata does not teach each element of claim 9. Scordilis, ¶¶154-157; *see also* POR 69-73. I disagree. Claim 9 states the inserting portion of the plug end is *partially inserted* into the socket, and that the exposed part of the inserting portion has an annular surface “spaced apart” from the outer end surface of the core housing. EX1001, 37:34-39 (claim 9). Claim 10 depends from claim 9 and adds a condition, “when the core housing and the first plug end are fixed.” *Id.*, 37:40-46 (claim 10). Figure 6 of the '582 patent shows the plug end *completely* plugged and fixed within the socket, not *partially inserted* into the socket.

27. A POSITA would have understood that when the Numata plug is partially inserted into a socket, the yellow highlighted surface of the connecting rod part 46 (i.e., the exposed portion) is arranged in a stepped manner to form an annular table surface that is close to, and spaced apart from, the outer end surface of the hollow cylinder 65 (i.e., the core housing). EX1007, Figs. 9 and 8(B) (excerpt) (annotated) (shown below)). A POSITA would have understood that, even when the Numata plug is fixed to the socket as in FIG. 8(b), the yellow highlighted surface is “spaced apart” from the outer end surface of the hollow cylinder 65 (i.e., the core housing), e.g., to accommodate typical manufacturing tolerances and permit reliable installation.



EX1007, FIGS. 9, 8(B)

28. Dr. Scordilis opines that Li-Liao-Numata does not disclose element 10[b]. Scordilis, ¶¶ 158-161; *see also* POR 72-73. I disagree. A POSITA would have understood Li teaches an arrangement comprising a protective sleeve that elastically abuts against the core housing to realize sealing. A POSITA would have understood Li teaches a protective sleeve of the ear hook interacting with elastic coating layer 1132 over the core housing to realize even further sealing. EX1004, [0036], [0058], FIGS. 2, 3, 5, 9, 10.

IV. Ground 4: The Li-Liao-Wang-Xu-Nielsen Combination Renders Claims 16–20 Obvious

29. Dr. Scordilis opines that Petitioner’s application of Liao against claim 16-20 directly contradicts its application of Liao against element [1e]. Scordilis, ¶¶162-166; *see also* POR 75-78. I disagree.

30. A POSITA would not have viewed Liao’s disclosure of elastic connection members and Liao’s disclosure of direct attachment techniques as mutually exclusive or technically inconsistent. Liao explains that “general technical personnel in this field can determine the material, position, and connection method of the connection member according to different practical applications,” and further explains that “the connection members described above may not be necessary” because “[t]he panel can be directly mounted on the housing or bonded to the housing with adhesive.” EX1005, ¶63. A POSITA would

have understood Liao to disclose multiple alternative housing connection techniques that could be selected depending on the desired vibration and acoustic characteristics of the device.

31. Separately, Liao also discloses that bone conduction speakers may use “dynamic coil” energy conversion methods and that “using high-density permanent magnets” can “achieve better sound quality.” EX1005, ¶¶[0052]-[0053]; *see also* ¶¶[0143], [0145], [0148]-[0152], [0171], Figs. 11, 18-A, 18-B, 22-A. A POSITA would have understood these magnetic circuit components to be compatible with different disclosed housing configurations, including Liao’s direct-attachment housing configuration discussed above. This understanding would have been consistent with the state of the magnetic circuit loudspeaker art, which commonly involved improving “electromechanical conversion efficiency,” “magnetic flux density,” “sensitivity,” and “overall acoustic performance.” EX1008 (Wang), ¶[0013]; EX1009 (Xu), ¶[0003], [0014]-[0015]; EX1010 (Nielsen), 4:1-12. A POSITA in the magnetic circuit loudspeaker field commonly understood different magnetic circuit structures and related components to be usable with different housing and vibration configurations to achieve desired acoustic performance characteristics.

V. ACKNOWLEDGMENTS

32. I declare that all statements made herein of my knowledge are true and that all statements made on information and belief are believed to be true; and further, that these statements were made with knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. § 1001.

I, Chris Kyriakakis, declare under penalty of perjury under the laws of the United States of America that the foregoing is true and current.



Chris Kyriakakis

Executed on 05/18/2026