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Filed on behalf of **Luxottica of America Inc.** and **Meta Platforms, Inc.**

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

LUXOTTICA OF AMERICA INC. AND META PLATFORMS, INC.,
Petitioners,

v.

SOLOS TECHNOLOGY LIMITED,
Patent Owner.

Case IPR2026-00413
Patent 11,871,174

**PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 11,871,174**

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1002	Excerpts from Prosecution History of the ’174 patent
1003	Declaration of Michael T. Johnson, Ph.D.
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1005	English Translation of Matsunari from Ex.1013
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1010	U.S. Patent No. 7,306,332 to Chen <i>et al.</i> (“Chen”)
1011	U.S. Patent App. Publ’n No. 2003/0002703 to Ma (“Ma”)
1012	English Translation of ’874 Application File History from Ex.1016
1013	Declaration of John Andrews for Translation of Japanese Unexamined Patent App. Publ’n No. JP2016039632A to Matsunari (“Matsunari”)
1014	Declaration of John Andrews for Translation of Japanese Unexamined Patent App. Publ’n No. JPH02104200A to Ono (“Ono”)
1015	Declaration of John Andrews for Translation of Japanese Unexamined Patent App. Publ’n No. JPS5681814A to Higuchi (“Higuchi”)

Exhibit No.	Description
1016	Declaration of John Andrews for Translation of Excerpts from the File History of Japanese Patent Application No. 2021-544874 (“’874 Application File History”)
1017	Int’l Patent App. Publ’n No. 2020/161545 to Villalpando <i>et al.</i>
1018	Japanese Patent No. 7295253B2 to Villalpando <i>et al.</i>
1019	Leo L. Beranek & Tim J. Mellow, <i>Acoustics: Sound Fields and Transducers</i> (Academic Press, 2012) (“Beranek”)
1020	Harry F. Olson, <i>Music, Physics and Engineering</i> (Dover Publications, 2nd ed. 1967) (“Olson”)
1021	Lawrence E. Kinsler, Austin R. Frey, Alan B. Coppens & James V. Sanders, <i>Fundamentals of Acoustics</i> (John Wiley & Sons, 4th ed. 2000) (“Kinsler”)
1022	Declaration of John Gaustad
1023	Jack Katz, <i>Handbook of Clinical Audiology</i> , Wolters Kluwer, 7th ed. (2015), Chapters 6, 38 (“Katz”)
1024	Harvey Dillon, <i>Hearing Aids</i> , Boomerang Press, 2nd ed. (2012), Chapter 5 (“Dillon”)
1025	A. N. Thiele, “Loudspeakers in Vented Boxes, Part I,” <i>Journal of the Audio Engineering Society</i> , vol. 19, no. 5 (1971) (“Thiele Part I”)
1026	A. N. Thiele, “Loudspeakers in Vented Boxes, Part II,” <i>Journal of the Audio Engineering Society</i> , vol. 19, no. 6 (1971) (“Thiele Part II”)
1027	W. E. Kock & F. K. Harvey, “Refracting Sound Waves,” <i>Journal of the Acoustical Society of America</i> , vol. 21, no. 5 (1949) (“Kock & Harvey”)

Exhibit No.	Description
1028	Allan D. Pierce, <i>Acoustics: An Introduction to Its Physical Principles and Applications</i> , McGraw-Hill (1981), Chapter 3 (“Pierce”)
1029	Philip M. Morse & K. Uno Ingard, <i>Theoretical Acoustics</i> , McGraw-Hill (1968), Chapter 6 (“Morse & Ingard”)
1030	Jean-François Allard & Noureddine Atalla, <i>Propagation of Sound in Porous Media</i> , John Wiley & Sons, 2nd ed. (2009), Chapters 2-4 (“Allard & Atalla”)

Petitioners Luxottica of America Inc. and Meta Platforms, Inc. (“Petitioners”) request *inter partes* review (“IPR”) of claims 1-28 of U.S. Patent No. 11,871,174 (“’174 patent,” Ex.1001), assigned to Solos Technology Limited (“PO”).

I. INTRODUCTION

The ’174 patent claims a well-known eyewear-audio arrangement in broad, functional language. Representative claim 1 recites: “A method to provide audio signals to a user from an eyewear device, comprising; generating audio signals within a chamber, the chamber is a part of a volume of the eyewear device; concentrating the audio signals for delivery to the user’s ear; and transmitting the audio signals to the user’s ear, the audio signals are transmitted through a port in the chamber.” The remaining challenged claims either recast the same arrangement as an apparatus or add known features such as chamber shape, acoustically reflective surfaces, and an external sound cover. None of those concepts were new.

Long before December 2018, the prior art had disclosed each of these features, including eyewear-mounted speakers, speaker chambers in eyewear, holes or ports directed toward the ear, parabolic sound-concentrating structures, and external sound-directing covers. Indeed, Applicant confronted such prior art during foreign prosecution but did not disclose it to the U.S. Patent Office during examination.

While the U.S. application remained pending, the Japanese Patent Office (“JPO”) rejected counterpart claims over Matsunari and Ono, finding that Matsunari

disclosed eyewear speakers in a cavity with holes directing sound toward the ear, and that Ono disclosed parabolic reflector structures that concentrate sound through an opening toward a user. Rather than distinguishing those disclosures on the merits, Applicant amended the Japanese claims. Yet the PO never disclosed Matsunari or Ono to the U.S. Examiner.

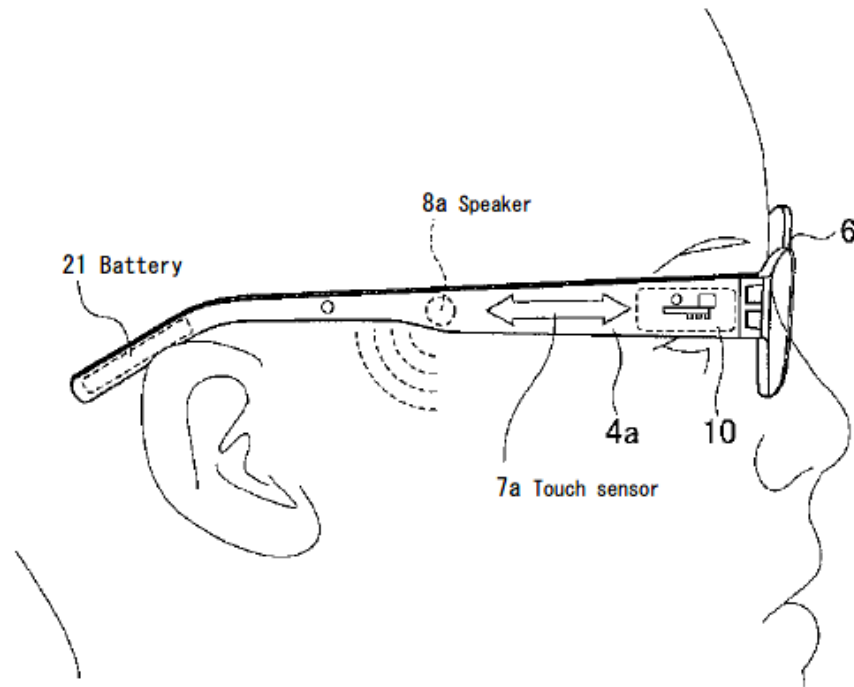
The prior art renders all challenged claims of the '174 patent unpatentable. The Board should institute review and cancel claims 1-28.

II. STATE OF THE ART

A. Matsunari

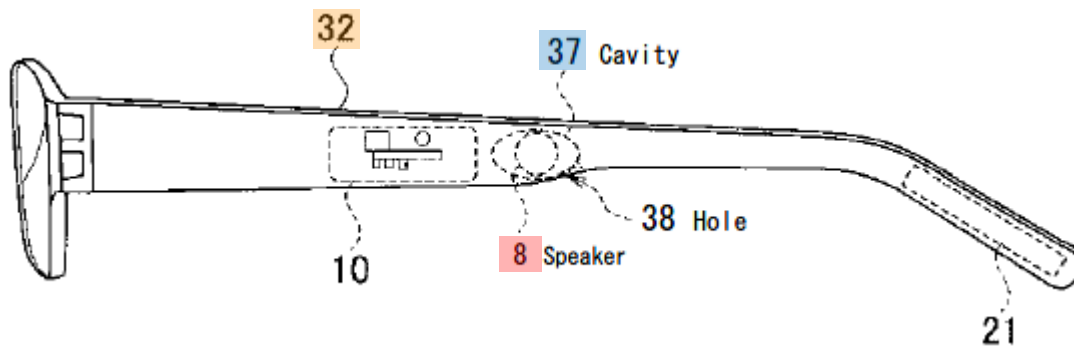
Matsunari discloses an eyeglass-type hearing aid designed to be “easy to operate” and to help the wearer hear “the voice of the person they are looking at.” Ex.1005¹, [0008].

¹ Ex.1013 is the translator’s declaration for the English translation of Matsunari.



Id., Fig.1(b).

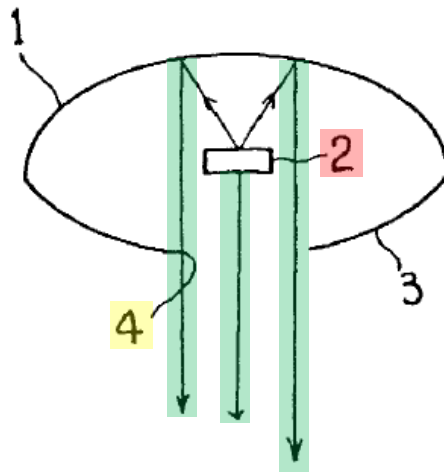
In one embodiment, the speaker (red) is placed in the temple (orange) and surrounded by “cavity 37” (blue), which is described as a “space designed to optimally output sound” from the speaker (red). *Id.*, [0054].



Id., Fig.10(annotated). Matsunari explains that multiple holes extend from that cavity toward the ear, so that sound is directed from the cavity toward the user while “reducing sound leakage.” *Id.*, [0055].

B. Ono

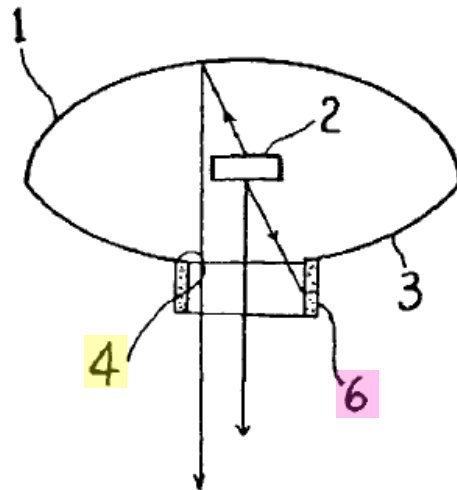
Ono discloses a hearing aid that uses parabolic reflectors to project sound in a “specific direction” without requiring earphones. Ex.1007², 3. Ono explains that sound from the speaker (red) is reflected as parallel sound waves and emitted through the opening (yellow) toward the user, where the waves are “focused into a sound beam” (green) and delivered only to a limited area around the listener. *Id.*, 2-3.



Id., Fig.1(annotated).

Ono also discloses a surrounding sound-absorbing structure (pink) so that “only sound waves traveling in a straight line” are emitted from the opening (yellow), concentrating the amplified sound. *Id.*, 3.

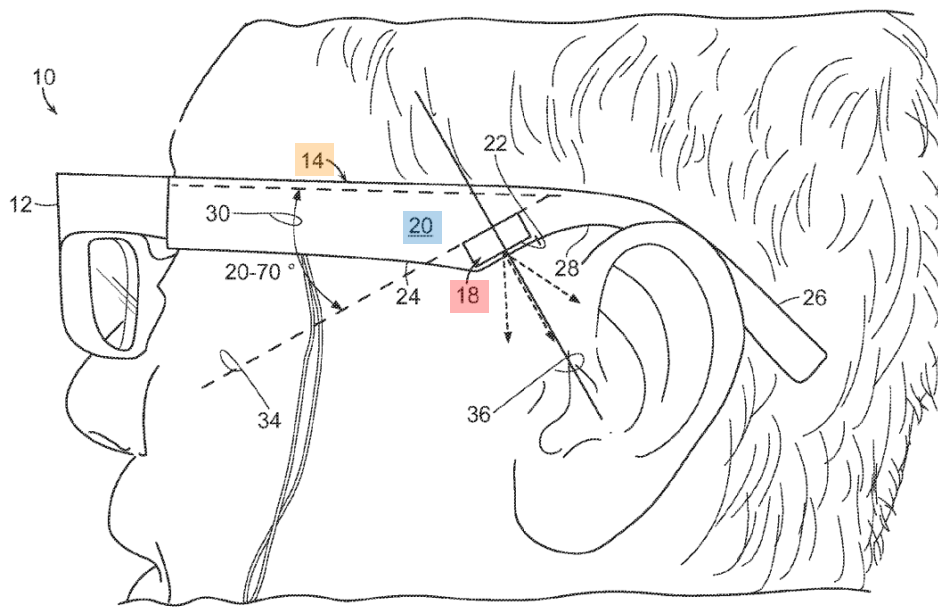
² Ex.1014 is the translator’s declaration for the English translation of Ono.



Id., Fig.3(annotated).

C. Chow

Chow discloses audio eyewear in which the side frame members have speakers oriented so the audio port “faces downwardly rearwardly,” directing sound toward the user’s ear. Ex.1006, [0043]. Chow explains that speaker 18 (red) is positioned “within cavity 20” (blue) in the side frame member (orange), with openings that allow sound to pass out of the frame toward the wearer. *Id.*, [0039].



Id., Fig.2(annotated).

Chow also discloses an attached sound deflecting structure that extends over part of the ear for “channeling sound” into the user’s ear while still allowing ambient sound to be heard. *Id.*, [0042]; *see also id.*, Fig.7.

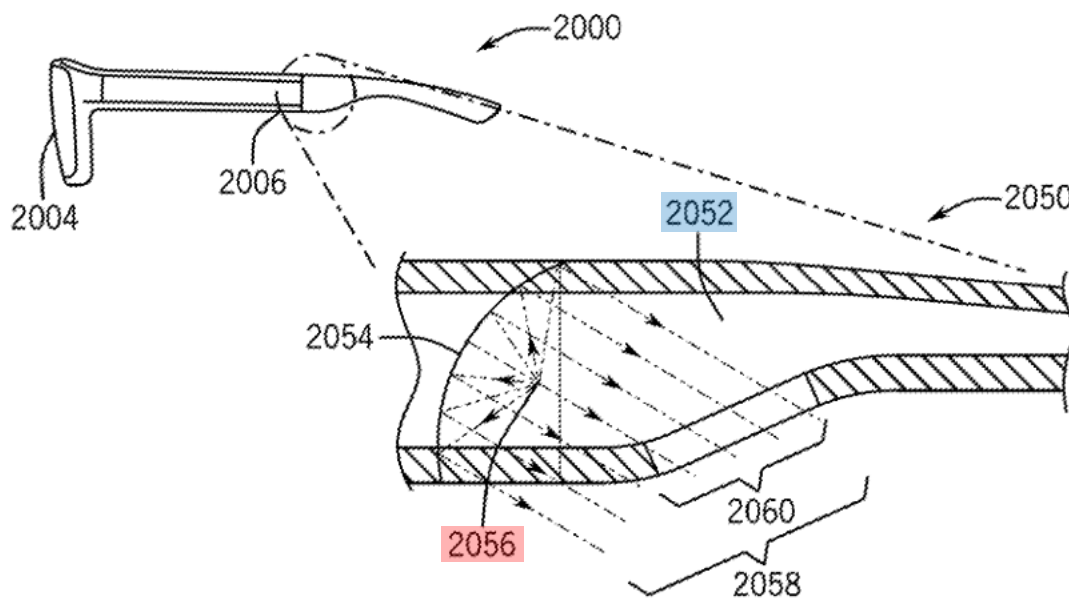
III. THE '174 PATENT

A. Overview

The '174 patent discloses delivering directional audio from eyewear. Ex.1001, 1:41-44. Its independent claims generally recite a chamber that is part of the eyewear volume, in which audio is generated and concentrated toward the user’s ear for emission through a port. *Id.*, cls.1, 14.

Much of the specification addresses modular eyewear architectures, such as interchangeable temples, insert modules, and associated electronics. *See id.*, 4:4-

19:58. Later, in column 19, the specification turns to the directional-audio embodiments relevant here. The patent then describes a speaker (red) mounted in a chamber (blue), an acoustic port that emits sound toward the user's ear, and curved or parabolic chamber surfaces that direct sound. *E.g., id.*, 19:59-21:21.



Id., Fig.20(annotated).

The '174 patent does not claim a new type of speaker. It claims applying directional-audio design features to eyewear.

B. Prosecution History

1. Related Japanese Application

PO filed Int'l Patent App. No. PCT/IB2020/000231 (Ex.1017), which claims priority to the U.S. application that later issued as the '174 patent. *Compare* Ex.1017 with Ex.1001. PO entered the Japanese national stage from that PCT application and

pursued claims substantially similar in scope to those that ultimately issued in the '174 patent. *Compare* Ex.1012, 3-7 *with* Ex.1001; *see also* Ex.1018.³

The related Japanese application included a claim that closely mirrors issued claim 1 of the '174 patent. As originally filed, Japanese claim 1 recited:

A method for providing an audio signal from a glasses device to a user, comprising the steps of: generating an audio signal in a chamber; concentrating the audio signal so that it reaches the user's ears; and transmitting the audio signal to the user's ears, wherein the chamber is part of the volume of the glasses device, and the audio signal is transmitted through a port in the chamber.

Ex.1012, 3.

³ Ex.1016 is the translator's declaration for the English translation submitted as Ex.1012. Ex.1012 translates excerpts from the file history of Japanese Patent Application No. 2021-544874, which is the Japanese national-phase application of Int'l Patent App. No. PCT/IB2020/000231 and issued as Japanese Patent No. 7295253 (Ex.1018). Ex.1022 is a declaration explaining how those file-history excerpts were obtained.

In October 2022, the JPO rejected numerous claims in the related Japanese application based on Matsunari (Ex.1005), Ono (Ex.1007), and Higuchi (Ex.1009⁴). Ex.1012, 11-15; *see also* Ex.1018, 40 (listing Matsunari/Ono/Higuchi). Regarding claims 1, 7-8, and 16, the JPO explained:

It is deemed that Cited Literature 1 [Matsunari] describes a spectacle type hearing aid (corresponding to the “eyeglass device” of the inventions according to Claims 1, 7, 8, and 16 of the present application; hereinafter, the same applies to “”), wherein a cavity 37 (“chamber”, “part of volume”) is formed in the temple 32 and surrounding the speaker 8, the cavity 37 is composed of a space for optimally outputting the sound of the speaker 8, a plurality of holes 38 (“port”, “acoustic port”) are formed from the cavity 37 toward the position of the ears, and the sound from the cavity 37 is output straight toward the ears by the plurality of holes 38 (“concentration”) (for example, paragraphs 0054 and 0055, and FIG. 10).

Ex.1012, 11. Regarding claims 2-4, 9, 11-12, and 17, the JPO explained:

Cited Literature 2 [Ono] describes a hearing aid that uses a sound generating device 2 and a reflector having a rotating parabolic surface

⁴ Ex.1015 is the translator’s declaration for the English translation of Higuchi.

to deliver focused sound waves as a sound beam to a user positioned opposite the opening 4, and provides a short cylindrical sound-absorbing material that extends downwards around the periphery of the opening 4 to absorb sound waves that are scattered and not traveling in a straight line, so that only sound waves traveling in a straight line are emitted from the opening 4, and the sound waves are concentrated and amplified only within a specific range (for example, page 2, upper right column, line 7 - lower left column, line 18; page 2, lower right column, line 19 - page 3, upper left column, line 7; FIG. 1 and 3).

[...]

Thus, in the invention described in Cited Literature 1 [Matsunari], there is no particular difficulty in applying the above-mentioned configuration of the reflector and the sound absorbing material to the configuration of the cavity and the port.

Id., 11-12. Regarding claims 6, 13-15, and 33-36, the JPO explained:

Cited Literature 3 [Higuchi] describes a hearing aid accessory that blocks external noise, which has a concave, unfolding hood 6 that attaches to eyeglass frames and is used by people with hearing loss when using hearing aids, etc. (for example, page 1, lower left column, line 8 - lower right column, line 11, FIGS. 1-4).

Therefore, no particular difficulty is found in applying the above-mentioned hearing aid accessory to the invention described in Cited Literature 1 [Matsunari].

Id., 13-14.

PO did not respond by arguing that the then-pending claims were patentable over any of Matsunari, Ono, or Higuchi. *Id.*, 22-26. PO amended the Japanese independent claims to incorporate subject matter that the JPO had not previously rejected. *Id.*, 26.

2. The '174 Patent

During prosecution, the U.S. Examiner rejected claims as obvious over Huang (Int'l Patent App. Publ'n No. 2020/206775), alone or with other references. Ex.1002, 224-230, 275-280. PO responded that Huang was not prior art and made no substantive amendments to the rejected claims. *Id.*, 190-208, 251-263. The Examiner accepted PO's position and indicated that the claims were allowable. *Id.*, 83-87, 160-165.

Prosecution continued through multiple requests for continued examination, including one accompanied by an information disclosure statement and filed after PO amended the counterpart Japanese independent claims in response to Matsunari, Ono, and Higuchi. *Id.*, 111-121, 179; Ex.1012, 9-28.

The '174 patent issued in January 2024. Ex.1001. Yet PO did not disclose Matsunari, Chow, Ono, Boyden, Higuchi, or Chen to the Examiner. *Id.*, References Cited.

IV. LEVEL OF ORDINARY SKILL

A hypothetical person of ordinary skill in the art (“POSA”) would have had at least a bachelor’s degree in mechanical or manufacturing engineering; mechatronics; electrical engineering plus coursework in mechanical engineering, manufacturing engineering, or mechatronics; or a similar technical degree, such as one related to acoustic design. Ex.1003, ¶20. A POSA would have also had at least 2 years of experience in eyewear design, consumer-electronics design, and/or acoustic design. *Id.* Work experience could substitute for formal education and additional formal education could substitute for work experience. *Id.*

This Petition does not turn on this specific definition of the level of ordinary skill. The claims would have been obvious from the perspective of a POSA under any reasonable definition. *Id.*, ¶23; *see also* ¶¶19-22.

V. CLAIM CONSTRUCTION

Petitioners do not believe construction of any term is required beyond the ordinary meaning informed by the intrinsic record. *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co. Ltd.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017); *Vivid Techs.*,

Inc. v. Am. Sci. & Eng'g, Inc., 200 F.3d 795, 803 (Fed. Cir. 1999); *see also* Ex.1003, ¶¶81-84.

Petitioners address “concentrate”/“concentrating” to confirm that they are not limited to any particular embodiment. *See* Ex.1003, ¶84. Independent claims 1 and 14 recite, respectively, “concentrating the audio signals for delivery to the user’s ear” and “the acoustic port is positioned in a wall of the chamber to concentrate emission of the audio signals from the chamber in a direction of the user’s ear....” Ex.1001, cls.1, 14. The specification uses “concentrate”/“concentrating” functionally to describe directing emission toward the user’s ear and does not require any particular chamber geometry, parallel wavefront, or number of reflectors. The dependent claims separately recite narrower limitations, including chamber shapes that contribute to concentrating (claims 2-4 and 18), a curved chamber inner surface around the speaker (claim 17), and external sound covers that contribute or reflect audio toward the ear (claims 10, 19). Thus, no express construction is necessary, and the terms should not be limited to the “generally parallel column of sound waves” example (*id.*, 22:50-58, 23:19-24) or any other specific geometry. *See also id.*, 20:62-21:1, 21:36-38, 22:1-3, 23:7-9, 24:46-49.

VI. STATEMENT OF RELIEF REQUESTED**A. Grounds**

Petitioners request IPR for the following grounds:

Ground	Reference(s)	Basis	Challenged Claims
1	Matsunari and Ono	§103	1-4, 11-12, 14, 17-18, 22
2	Matsunari, Ono, and Boyden	§103	5-9, 15-16, 24-28
3	Matsunari, Ono, and Chow	§103	10, 19
4	Matsunari, Ono, Chow, and Boyden	§103	20
5	Matsunari, Ono, Chow, and Higuchi	§103	21
6	Matsunari, Ono, and Chen	§103	13, 23
7	Chow and Ono	§103	1-4, 10-12, 14, 17-19, 22
8	Chow, Ono, and Boyden	§103	5-9, 15-16, 20, 24-28
9	Chow, Ono, and Chen	§103	13, 23
10	Chow, Ono, and Higuchi	§103	21

Petitioners also submit the expert declaration of Michael Johnson, Ph.D. (Ex.1003). *See* Ex.1003, ¶¶1-85, 414; *see also* Ex.1004.

B. Asserted References

The '174 patent's earliest claimed priority date is December 12, 2018. Ex.1001.

The references are prior art:

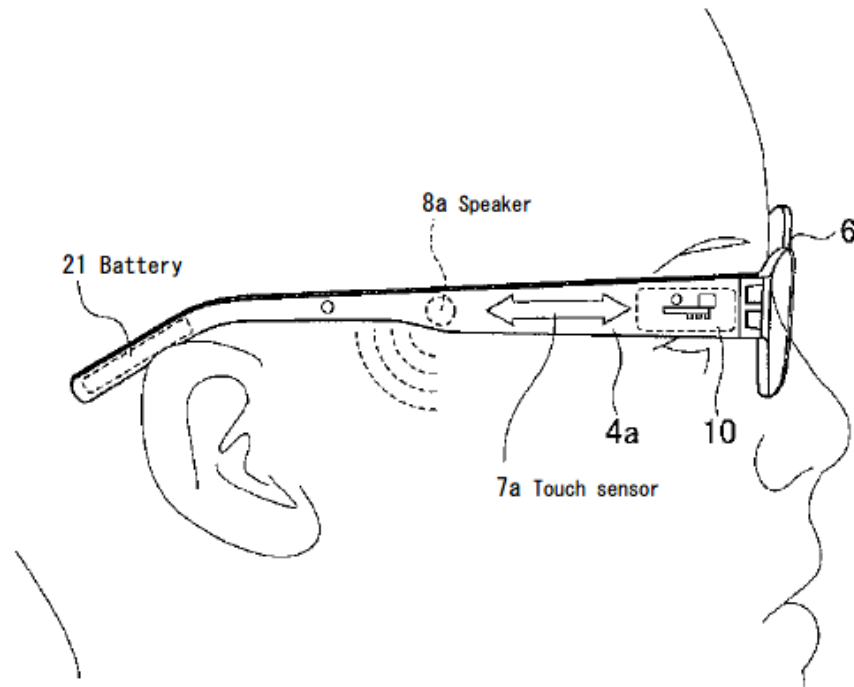
Ex.	Reference	Date	Art Type
1005	Matsunari	Filed: Jul. 28, 2015 Published: Mar. 22, 2016	§102(a)(1)
1006	Chow	Filed: Feb. 14, 2014 Published: Sep. 18, 2014	§§102(a)(1),(2)
1007	Ono	Filed: Oct. 13, 1988 Published: Apr. 17, 1990	§102(a)(1)
1008	Boyden	Filed: Jun. 11, 1998 Issued: Oct. 9, 2001	§§102(a)(1),(2)
1009	Higuchi	Filed: Dec. 6, 1979 Published: Jul. 4, 1981	§102(a)(1)
1010	Chen	Filed: Nov. 14, 2005 Issued: Dec. 11, 2007	§§102(a)(1),(2)

The references are analogous art because they are from the same field as the '174 patent, e.g., head-worn systems providing user audio. Ex.1003, ¶¶80, 58-79; Ex.1001, 1:42-44; *Unwired Planet, LLC v. Google Inc.*, 841 F.3d 995, 1000 (Fed. Cir. 2016). They are also pertinent to a problem the inventors were focused on, e.g., providing personal audio without blocking the ear. Ex.1003, ¶80.

VII. GROUND 1: CLAIMS 1-4, 11-12, 14, 17-18, AND 22 ARE OBVIOUS BASED ON MATSUNARI AND ONO

A. Rationale for Combination

Matsunari discloses an “eyeglass-type hearing aid.” Ex.1005, [0001], [0014], [0027], [0054].

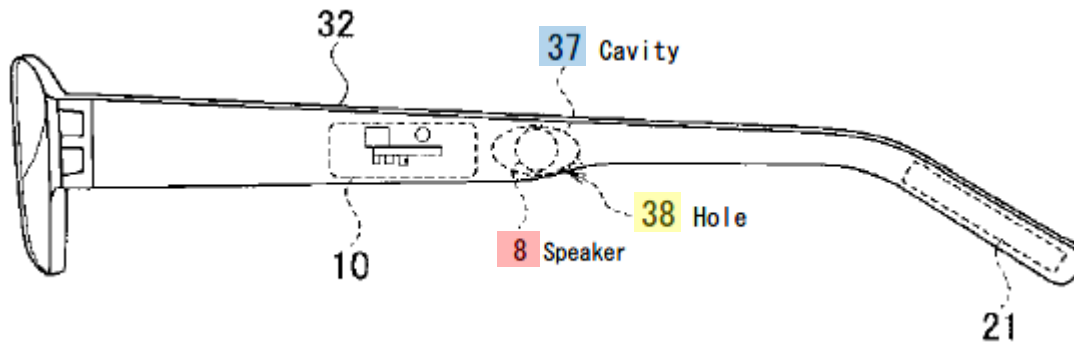


Id., Fig.1(b). Ono likewise discloses a hearing aid device. Ex.1007, 1-2 (“Title of Invention Hearing Aid”; “A hearing aid comprising a reflector...”; “The present invention relates to a hearing aid device.”). The references share the same field—hearing aids—and objective: improving user audibility without conventional in-ear earphones. Ex.1003, ¶97.

Eyeglass-type hearing aids requiring users to “put the earphones in their ears each time they want to hear sound” were inconvenient. Ex.1005, [0006]. Matsunari therefore seeks “to provide eyeglass-type hearing aids that are easy to operate and allow the user to easily hear the voice of the person they are looking at.” *Id.*, [0008]. Ono addresses the same general problem by providing a hearing aid that “does not require earphones” and instead directs amplified sound to the user through a focused acoustic structure. Ex.1007, 1-3.

The '174 patent identifies the same design objectives, stating: conventional in-ear earphones and earbuds are “occlusive,” may “obstruct[] the ear canal,” and can interfere with hearing ambient sounds; “sharp directivity for personal listening of audio” is desirable; and bone-conduction approaches have “low transmission efficiencies,” thereby delivering less sound energy to the user. Ex.1001, 1:55-65; *see also* Exs.1023-1024. When discussing the directional-audio embodiments, the patent likewise states the chambered speaker arrangement directs acoustic signals toward the user’s ear to provide a “personal listening experience” while “minimizing” sound audible to nearby others, and is designed to “concentrate and to project” acoustic signals toward the ear while attenuating acoustic energy in other directions. Ex.1001, 20:5-10, 24:46-51. These objectives align with Matsunari’s temple cavity and ear-facing holes, which direct sound toward the ear while reducing leakage (Ex.1005, [0054]-[0055]), and Ono’s parabolic reflector, which focuses sound toward a user without earphones (Ex.1007, 2-3). Ex.1003, ¶100.

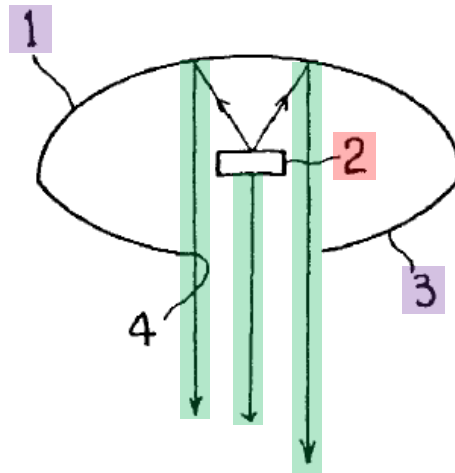
Consistent with these objectives, Matsunari’s eyewear includes, in one embodiment, a speaker 8 (red) in a temple and a cavity 37 (blue) surrounding the speaker, with hole 38 (yellow) extending from the cavity toward the user’s ear. Ex.1005, [0017], [0019], [0022], [0054]-[0055].



Id., Fig.10(annotated). Matsunari explains that “cavity 37 is a space designed to optimally output sound from the speaker.” *Id.*, [0054]. Matsunari therefore discloses the base directional-audio arrangement: a speaker housed in a cavity or chamber that channels sound toward the ear through an opening, reducing sound leakage and improving audibility. Ex.1003, ¶93.

Ono discloses its hearing aid “utilizes the principle of an acoustic lens using a parabolic surface of revolution to radiate sound waves in a specific direction.” Ex.1007, 3. For example, Ono discloses a “reflector, which is formed in a dish shape having a parabolic surface of revolution” with a “sound generating device (speaker) 2...positioned at the focal point of this first reflector.” Ex.1007, 2. According to Ono, “the sound generated from the sound generator is reflected by the first reflector as parallel sound waves toward the second reflector,” and “[m]ost of these sound waves are emitted from the opening of the second reflector towards the user.” *Id.*

Ono's Figure 1 illustrates this arrangement: reflectors 1 and 3 (purple) form an acoustic chamber structure within which speaker 2 (red) generates audio signals (green) for delivery toward the user through opening 4:



Id., Fig.1(annotated); Ex.1003, ¶94; *see also* Ex.1007, Figs.2-5.

Ono explains that “if the user is positioned in the direction of the sound wave radiation, amplified sound can be sent to a specific space around the user, and it can be used as a hearing aid that does not require earphones.” Ex.1007, 3. Ono thus expressly discloses the known acoustic principle that a sound-generating device used with a curved/parabolic reflective structure can concentrate sound from a speaker through an opening toward a target listener. Ex.1003, ¶95; *see also* Ex.1011, [0002] (disclosing “an earphone with a reflection disk to enhance the quality of sound received”), [0007], [0017].

A POSA seeking to enhance Matsunari's stated objective would have looked to known directional acoustic structures in hearing aids. Ex.1003, ¶101. Ono provides such a structure and shares Matsunari's acoustic goals. *Id.*

It would have been obvious to configure Matsunari's eyewear cavity using Ono's parabolic acoustic-reflector geometry and speaker positioning relative to that geometry. Ex.1003, ¶¶102-107. **First**, Ono's parabolic reflector arrangement was a known technique for improving the same type of directional-audio performance Matsunari already sought—directing sound toward the user through an ear-facing output while reducing dispersion. *Id.* **Second**, applying Ono's reflector geometry and speaker positioning to Matsunari's speaker-in-cavity arrangement would have furthered Matsunari's express goals of reducing sound leakage, improving audibility, and saving energy. *Id.* **Third**, once a POSA started from Matsunari's temple cavity and holes and sought a more focused output toward the user's ear, Ono's parabolic reflector geometry and speaker positioning would have been an obvious candidate because the available design approaches for directing speaker output from a small chamber through an ear-facing opening were finite and predictable. *Id.* **Fourth**, configuring Matsunari's cavity to include Ono's parabolic reflective surface, with Matsunari's speaker positioned relative to that surface to focus sound toward the ear-facing holes, would have been a routine optimization of result-effective acoustic parameters—including reflector curve/shape,

speaker/reflector positioning, and the geometry of the sound-output path—to achieve the concentrating of sound toward the wearer’s ear. *Id.*

Matsunari describes that its cavity and holes direct sound toward the ear and reduce “sound leakage.” Ex.1005, [0055]. Ono describes the same concentrated-audio objective: by using its reflector arrangement, “a parallel sound wave” is produced that “reach[es] the user positioned opposite the opening 4 locally,” while “sound in other areas” is decreased “thus avoiding disturbing other[s].” Ex.1007, 2. Ono’s optional sound-absorbing material further confirms Ono’s concentrated-audio objective: Ono explains that such material may absorb scattered sound near the opening so that only concentrated sound is emitted. *Id.*, 3. A POSA would have recognized that configuring Matsunari’s existing speaker-in-cavity arrangement to include Ono’s parabolic reflective geometry and speaker positioning would further Matsunari’s stated goal of directing sound toward the wearer’s ear while reducing leakage of sound to non-users and bystanders. Ex.1003, ¶108.

Matsunari explains that, “because sound energy is not dispersed [in its cavity embodiment], even quiet sounds can be easily heard, resulting in energy savings.” Ex.1005, [0055]. Ono likewise explains that its reflector structure creates a “focused...sound beam,” which “deliver[s] amplified sound only to the area around the user.” Ex.1007, 2. A POSA would have understood that directing a greater portion of the speaker’s acoustic energy toward the wearer’s ear would predictably

improve perceived loudness and intelligibility at the ear while reducing wasted acoustic output, thereby furthering Matsunari’s energy-savings objective. Ex.1003, ¶¶109-110.

A POSA would not have needed to bodily incorporate Ono’s entire hearing-aid structure; the relevant teaching is its parabolic reflector geometry and speaker positioning for concentrating sound toward a listener. *Id.*, ¶111. A POSA would have applied that teaching to Matsunari’s speaker-in-cavity arrangement by configuring the acoustic chamber region within Matsunari’s temple cavity to include a curved/parabolic reflective surface, positioning the speaker relative to that surface, and aligning the focused output with Matsunari’s ear-facing holes. Ex.1003, ¶111. That combination would retain Matsunari’s eyewear form factor, temple placement, and ear-facing sound-output path, while using Ono’s reflector geometry for its established concentrating function. *Id.*

Using parabolic reflectors to concentrate and direct sound was a mature acoustic technique before the ’174 patent’s 2018 priority date. *See* Ex.1003, ¶¶44-46; *see also* Ex.1019; Ex.1020, Ch. 4; Ex.1021; Ex.1027. Ma (Ex.1011) confirms that using a reflective structure to enhance speaker output was known and applied in the hearing-aid and earphone art. Ex.1011, [0002] (disclosing “an earphone with a reflection disk to enhance the quality of sound received”), [0007], [0017].

Incorporating a parabolic reflector structure in an eyewear temple cavity was a straightforward application of known acoustic design principles. Ex.1003, ¶114.

A POSA would have combined familiar elements by known methods to improve a similar device in the same field, addressing known design needs with predictable results. *See KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 417, 420-21 (2007). Matsunari discloses eyewear having a speaker/cavity/hole arrangement for directing sound toward the ear. Ono likewise discloses parabolic acoustic-reflector geometry with the sound-generating device positioned relative to the reflector’s focal point to focus sound through an opening toward a listener. A POSA would have reasonably expected success because applying Ono’s concentrating teachings to Matsunari’s temple cavity and ear-facing output path was a straightforward adaptation to Matsunari’s eyewear. Ex.1003, ¶113.

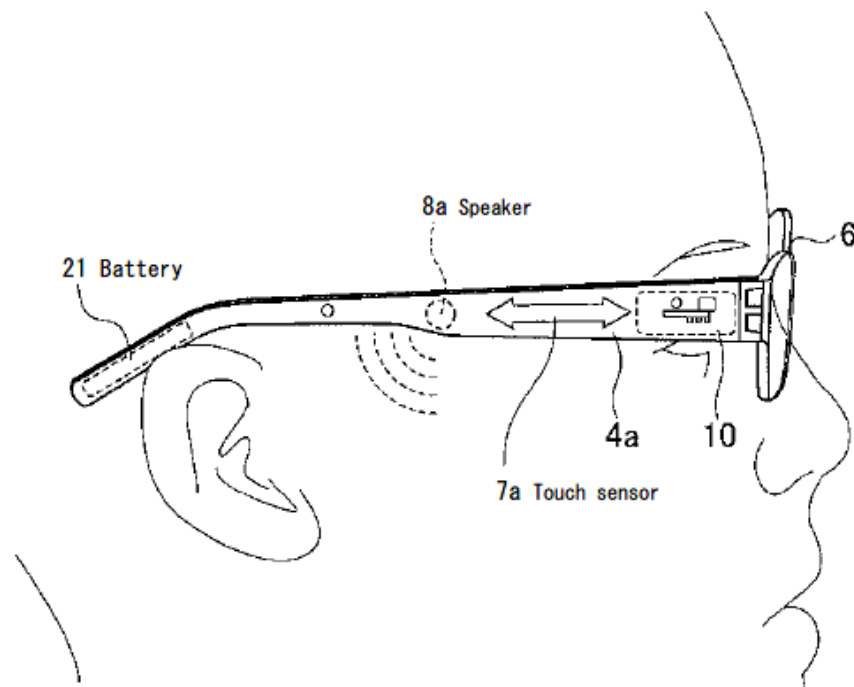
B. Claim 1

Claim 1 is directed to a method for generating, directing, and delivering audio to the user’s ear through a chamber in an eyewear device. Matsunari discloses the eyewear implementation, including the speaker, cavity/chamber, and ear-facing hole, while Ono discloses a parabolic acoustic reflector that concentrates generated sound through an opening toward a user. Accordingly, for the reasons below, the Matsunari-Ono combination renders claim 1 obvious. Ex.1003, ¶¶86-117.

1. 1[pre]

To the extent 1[pre] is limiting, Matsunari discloses the preamble of claim 1, which recites “[a] method to provide audio signals to a user from an eyewear device.” Ex.1003, ¶¶86-87.

Matsunari discloses “an eyeglass-type hearing aid that is easy to operate and allows the user to easily hear the voice of the person they are looking at.” Ex.1005, Abstract; *see also id.*, [0008], [0023], [0027], [0033] (“The amplified sound is output to speakers 8a and 8b, and the sound is then output from speakers 8a and 8b towards the ear canal.”), cl.1.



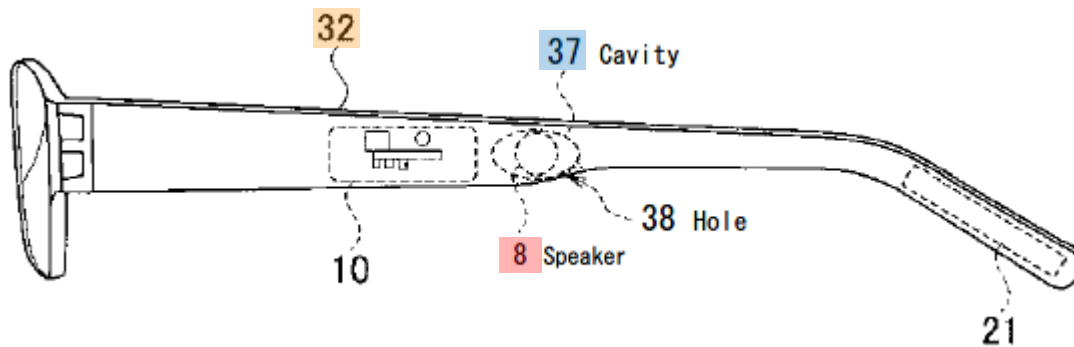
Id., Fig.1(b); *see also id.*, Figs.10-11.

2. 1[a]

This limitation recites “generating audio signals within a chamber, the chamber is a part of a volume of the eyewear device.” Matsunari discloses this limitation. Ex.1003, ¶¶88-91.

Matsunari discloses, in Embodiment 1, that “speaker 8a is located approximately in the center of the right frame 4a” and “speaker 8b is located approximately in the center of the left frame 4b.” Ex.1005, [0017], [0019]. Matsunari further explains that the amplifier outputs audio signals to speakers 8a/8b, and that the amplified sound is output from speakers 8a/8b toward the ear canal. *Id.*, [0022], [0027], [0033].

Matsunari further discloses that “Embodiment 6 has the same configuration as the eyeglasses-type hearing aid according to Embodiment 1,” but “further includes a cavity 37 that surrounds the speaker 8 within the temple 32,” and that “[t]he cavity 37 is a space designed to optimally output sound from the speaker 8.” *Id.*, [0054]. Thus, in Embodiment 6, speaker 8 generates sound within cavity 37. Ex.1003, ¶90. These features, including temple 32 (orange), cavity 37 (blue), and speaker 8 (red), are illustrated in Figure 10:



Ex.1005, Fig.10(annotated). As shown, temple 32 is part of the eyewear device, and temple 32 defines a chamber in the form of cavity 37 within the volume of the eyewear. Ex.1003, ¶91. Cavity 37 surrounds speaker 8 and is therefore the chamber in which the audio signals are generated. *Id.*

3. 1[b]

This limitation recites “concentrating the audio signals for delivery to the user’s ear.” Matsunari and Ono render this limitation obvious. Ex.1003, ¶¶92-114.

Matsunari explains that cavity 37 is “a space designed to optimally output sound from the speaker 8,” and that sound from speaker 8 is output through cavity 37 and holes 38 directly toward the ear. Ex.1005, [0054]-[0055]. Matsunari further explains that this arrangement reduces “sound leakage,” and that, because sound energy is not dispersed, allows even quiet sounds to be easily heard. *Id.*, [0055]. Thus, Matsunari discloses a speaker-in-cavity arrangement that directs sound toward the user’s ear while reducing dispersion and leakage. Ex.1003, ¶93.

Ono discloses using parabolic acoustic-reflector geometry to concentrate such sound toward a listener. Ono explains that its reflector arrangement produces sound

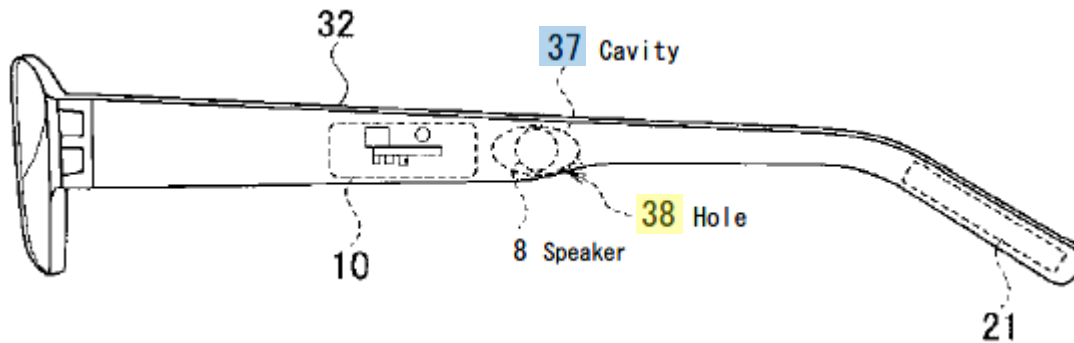
waves “focused into a sound beam” that reach the user “locally” through an opening.

Ex.1007, 2. For the reasons discussed above (*supra* §VII.A), a POSA would have been motivated to combine Matsunari’s speaker-in-cavity arrangement with Ono’s parabolic reflective geometry and speaker positioning to focus the sound to the user’s ear through Matsunari’s ear-facing holes. Ex.1003, ¶¶102-114. In the resulting combination, the chamber would concentrate the audio signals generated by the speaker for delivery to the user’s ear. *Id.*

4. 1[c]

This limitation recites “transmitting the audio signals to the user’s ear, the audio signals are transmitted through a port in the chamber.” Matsunari and Ono render this limitation obvious. Ex.1003, ¶¶115-117.

Matsunari discloses transmitting sound from the cavity to the user’s ear through openings in the cavity. Matsunari explains that “multiple holes are formed extending from the cavity and toward the ear,” and that “the sound from the cavity 37 is output directly towards the ear through the multiple holes 38, thereby reducing sound leakage.” Ex.1005, [0054]-[0055]. Those holes 38 (yellow) are ports in the cavity (blue) through which the audio signals are transmitted toward the user’s ear. Ex.1003, ¶116.



Ex.1005, Fig.10(annotated).

Accordingly, in the resulting combination, the chamber would transmit the audio signals generated by the speaker through its ports toward the user's ear.

Ex.1003, ¶117.

Therefore, claim 1 is obvious based on Matsunari and Ono. *Id.*, ¶¶86-117.

C. Claim 2

Matsunari and Ono render obvious claim 2. Ex.1003, ¶¶118-120.

Ono discloses an acoustic-reflector arrangement including “a first reflector having a parabolic surface of revolution,” a sound-generating device positioned at the focal point of the reflector, and a second reflector with a central opening. Ex.1007, 2. Ono explains that sound from the speaker is reflected as parallel sound waves toward the second reflector, emitted through the opening toward the user, and focused into a sound beam. *Id.*, 3; *see also id.*, Figs.1-5. Thus, Ono discloses parabolic reflector geometry whose shape contributes to concentrating audio signals for delivery to a user. Ex.1003, ¶119.

For the reasons discussed in the rationale for combination (*supra* §VII.A), a POSA would have been motivated to configure Matsunari’s chamber-facing boundary with Ono’s generally parabolic reflective geometry, and position the speaker relative to that geometry. Ex.1003, ¶120. The resulting chamber shape would contribute to concentrating the audio signals. *Id.*

D. Claim 3

Matsunari and Ono render obvious claim 3. Ex.1003, ¶¶121-123.

Ono discloses opposing first and second reflectors having parabolic surfaces of revolution, with the first “formed in a dish shape” and a “sound generating device (speaker) 2” positioned at its focal point. Ex.1007, 2; *see also id.*, Figs.1-5. Thus, Ono discloses curved parabolic reflector surfaces positioned relative to the speaker to direct reflected sound toward the user. Ex.1003, ¶122.

For the reasons discussed in the rationale for combination, 1[b], and claim 2 (*supra* §§VII.A, VII.B.3, VII.C), a POSA would have been motivated to configure Matsunari’s cavity/chamber with Ono’s parabolic reflective geometry and position Matsunari’s speaker relative to that geometry. *Id.*, ¶123. The resulting chamber shape would provide a curved surface to the speaker used in generating the audio signals. *Id.*

E. Claim 4

Matsunari and Ono render obvious claim 4. *Supra* §VII.C-D; Ex.1003, ¶¶124-125.

As discussed for claim 3, Ono discloses a dish-shaped reflector with parabolic geometry, and a POSA would have been motivated to configure Matsunari's cavity/chamber with that geometry. Ex.1007, 2; *supra* §VII.D; Ex.1003, ¶125. The resulting chamber shape would have been generally parabolic. Ex.1003, ¶125.

F. Claim 11

Matsunari and Ono render obvious claim 11 for the reasons discussed for claim 3. *Supra* §VII.D; Ex.1003, ¶¶126-127.

G. Claim 12

Matsunari and Ono render obvious claim 12 for the reasons discussed for 1[a]. *Supra* §VII.B.2; Ex.1003, ¶¶128-129.

H. Claim 14

Claim 14 recites an apparatus counterpart to the method of claim 1. Matsunari discloses an eyewear device having a temple cavity, speaker, and ear-facing holes/ports, while Ono discloses parabolic acoustic-reflector geometry and speaker positioning relative to that geometry for concentrating and directing sound through an opening toward a user. For the reasons discussed in the rationale for combination, a POSA would have been motivated, with a reasonable expectation of success, to

apply Ono’s geometry and speaker-positioning teachings to Matsunari’s speaker-in-cavity arrangement. *Supra* §VII.A. The resulting combination renders claim 14 obvious. Ex.1003, ¶¶130-143.

1. 14[pre]

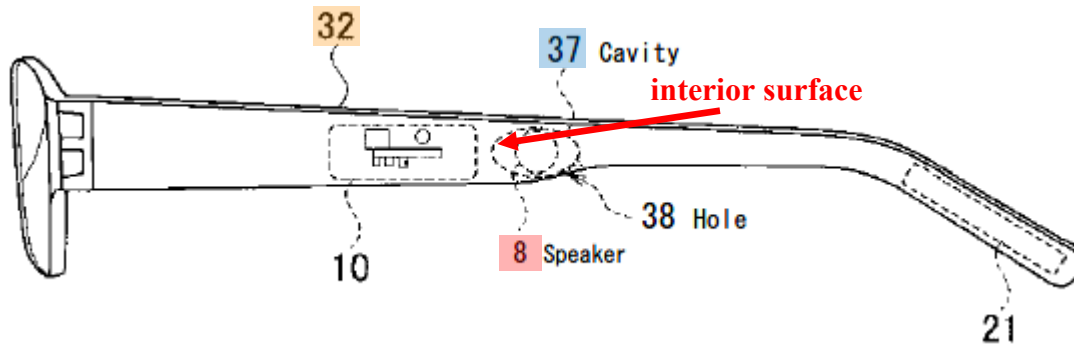
To the extent 14[pre] is limiting, Matsunari discloses the preamble of claim 14, which recites “[a]n apparatus to provide audio signals to a user from an eyewear device.” Ex.1003, ¶131.

As discussed for 1[pre], Matsunari discloses an eyeglass-type hearing aid that includes speakers mounted in the eyeglass temples and outputs audio signals from those speakers toward the user’s ears. *Supra* §VII.B.1; Ex.1003, ¶131.

2. 14[a]

Matsunari discloses 14[a], which recites “a chamber, the chamber is defined by an interior surface, the chamber is a part of a volume of the eyewear device, the chamber further comprising:” Ex.1003, ¶¶132-134.

As discussed for 1[a], Matsunari discloses a chamber in the form of cavity 37, which surrounds speaker 8 and is formed within temple 32, part of the eyeglass-type hearing aid. *Supra* §VII.B.2. Cavity 37 is bounded by the inner walls of temple 32, and those walls provide an interior surface of the chamber surrounding speaker 8. Ex.1003, ¶133. Matsunari’s Figure 10 illustrates this arrangement, showing cavity 37 (blue) surrounding speaker 8 (red) within temple 32 (orange):



Ex.1005, Fig.10(annotated).

3. 14[b]

Matsunari discloses 14[b], which recites “at least one speaker, the at least one speaker to generate audio signals, the at least one speaker is contained within the volume.” Ex.1003, ¶135.

As discussed for 1[a] and 14[a], Matsunari discloses cavity 37 within temple 32 of the eyeglass-type hearing aid, with speaker 8 contained in that cavity and used to generate audio signals for output toward the user’s ear. *Supra* §§VII.B.2, VII.H.2. Because cavity 37 and speaker 8 are within temple 32, speaker 8 is contained within the volume of the eyewear device. Ex.1003, ¶135.

4. 14[c]

Matsunari and Ono render obvious 14[c], which recites “an acoustic port, the acoustic port is positioned in a wall of the chamber to concentrate emission of the audio signals from the chamber in a direction of the user’s ear when the user wears the eyewear device.” Ex.1003, ¶¶136-139.

As discussed for 1[b]-1[c], Matsunari discloses transmitting sound from cavity 37 toward the user's ear through holes 38 when the eyewear device is worn. *Supra* §§VII.B.3-4. Matsunari explains that “multiple holes are formed extending from cavity 37 toward the ear,” and that “[t]he sound from the cavity 37 is output directly toward the ear through the multiple holes 38, thereby reducing sound leakage.” Ex.1005, [0054]-[0055]. Those holes 38 are acoustic ports positioned in a wall of cavity 37, and they provide the ear-facing output path through which sound is emitted from the chamber toward the wearer's ear. Ex.1003, ¶¶137-138.

As discussed for 1[b] and the rationale for combination, Ono discloses using parabolic acoustic-reflector geometry and speaker positioning to concentrate sound through an opening toward a user. *Supra* §VII.B.3. Ono explains that its reflector arrangement produces sound waves “focused into a sound beam” that reach the user “locally” through an opening, and that sound in other areas is decreased. Ex.1007, 2-3. A POSA would have been motivated to apply Ono's parabolic reflective geometry and speaker-positioning teachings to Matsunari's speaker-in-cavity arrangement, with the focused output aligned with Matsunari's ear-facing holes 38, for the reasons discussed for the rationale for combination. *Supra* §VII.A; Ex.1003, ¶138.

In the resulting combination, holes 38 remain acoustic ports in the wall of cavity 37 and are positioned along the ear-facing output path. Ex.1003, ¶139. The

reflector geometry directs generated sound toward those ports, and the ports' placement and orientation in the chamber wall cause the concentrated chamber output to be emitted toward the user's ear. The reflector surface and wall-port arrangement therefore operate together to concentrate emission from the chamber in the direction of the user's ear. *Id.*

5. 14[d]

Matsunari and Ono render obvious 14[d], which recites “an outer surface, the outer surface is exterior to the inner surface.” Ex.1003, ¶¶140-143.

As discussed for 14[a], Matsunari's cavity 37 is defined by the inner walls of temple 32, which provide the chamber's interior surface. *Supra* §VII.H.2. As illustrated in Matsunari Figure 10, the temple structure defining cavity 37 also has an outer surface opposite and exterior to that interior surface. Ex.1003, ¶¶141-142; *see also* Ex.1007, Fig.1. That same surface is both an outer surface of the temple and an outer surface of the wall structure defining the chamber. *Id.* Thus, Matsunari discloses the recited outer surface. Ex.1003, ¶¶142-143. Because the combination retains Matsunari's eyewear form factor, temple structure, and cavity while configuring the acoustic-chamber region to include Ono's parabolic reflective geometry (*supra* §VII.A), it would likewise retain that outer surface. Ex.1003, ¶143.

Therefore, claim 14 is obvious based on Matsunari and Ono. *Id.*, ¶¶140-143.

I. Claim 17

Matsunari and Ono render obvious claim 17. Ex.1003, ¶¶144-147.

As discussed for 14[a]-14[b], Matsunari discloses a chamber in the form of cavity 37, with speaker 8 contained within that cavity. *Supra* §§VII.H.2-3. As discussed for claim 3 and limitation 1[b], Ono discloses parabolic acoustic-reflector geometry in which curved reflector surfaces are positioned relative to a sound-generating device/speaker to focus sound toward a user. *Supra* §§VII.D, VII.B.3. In particular, Ono discloses a first reflector “formed in a dish shape having a parabolic surface of revolution,” with “sound generating device (speaker) 2” positioned at the focal point of that reflector, and a second reflector, also having a parabolic surface of revolution, positioned opposite the first reflector. Ex.1007, 2. Thus, Ono discloses a parabolic inner sound-reflecting surface arranged around the speaker to focus sound generated by the speaker. Ex.1003, ¶¶145-146.

A POSA would have been motivated to configure Matsunari’s cavity to include Ono’s parabolic reflective geometry, with Matsunari’s speaker positioned relative to that geometry. *Id.*, ¶147. The resulting chamber would have an inner surface forming a curved shape around the speaker. *Id.*

J. Claim 18

Matsunari and Ono render obvious claim 18 for the reasons discussed for claims 4 and 17. *Supra* §§VII.E, VII.I; Ex.1003, ¶¶148-149.

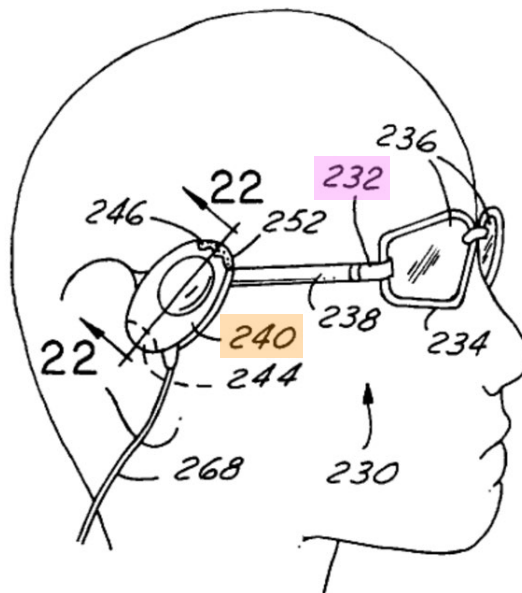
K. Claim 22

Matsunari and Ono render obvious claim 22 for the reasons discussed for 1[a] and 14[a]. *Supra* §§VII.B.2, VII.H.2; Ex.1003, ¶¶150-152.

VIII. GROUND 2: CLAIMS 5-9, 15-16, AND 24-28 ARE OBVIOUS BASED ON MATSUNARI, ONO, AND BOYDEN

A. Overview of Boyden

Boyden discloses “[a]coustic modules adapted to be worn on the head of a wearer, such as with...eyeglasses.” Ex.1008, Abstract; *see also* Ex.1003, ¶¶65-69. Figure 20 shows acoustic module 240 (orange) fastened to eyeglasses 232 (pink) near the wearer’s ear:



Ex.1008, Fig.20(annotated); *see also id.*, 4:59-63.

Boyden identifies a coupled speaker/enclosure problem in small wearable modules: enclosure acoustic stiffness can dominate speaker behavior, producing a

high resonance frequency and poor low-frequency response. Ex.1008, 2:1-5; *see also* Exs.1025-1026. Boyden’s transducer is preferably sealed into a module wall, and Boyden teaches damping material to “suppress undesired resonance within the enclosure.” *Id.*, 5:1-8, 5:36-50; Ex.1003, ¶¶67-68.

Boyden further teaches material and surface-treatment choices for wearable speaker modules: the module walls are preferably “substantially acoustically inert,” “non-radiative and absorbing,” and the “walls and interiors of the modules” may include “coated surfaces, or liners made from more acoustically efficient materials” to provide “the best acoustical properties.” *Id.*, 5:54-67. Boyden applies those teachings to its eyeglass-mounted module, which is similar in “construction, materials, operation and performance.” *Id.*, 12:5-7.

B. Claim 5

Matsunari, Ono, and Boyden render obvious claim 5. Ex.1003, ¶¶153-168.

As discussed for claims 1-4, the Matsunari-Ono combination renders obvious an eyewear chamber that generates, concentrates, and directs sound toward the user’s ear. *Supra* §§VII.B-E. Matsunari’s cavity and holes output sound directly toward the ear while reducing sound leakage and avoiding dispersion of acoustic energy, and Ono’s parabolic reflectors focus sound through an opening toward the user. Ex.1005, [0054]-[0055]; Ex.1007, 2-3; Ex.1003, ¶155.

Ono itself provides the sound-reflecting inner-surface teaching: its reflector surfaces reflect speaker-generated sound toward the opening and user. Ex.1007, 2-3; Ex.1003, ¶166; *see also* Exs.1028-1030.

Boyden teaches selecting materials and surface treatments for wearable speaker modules, including walls made from “a substantially acoustically inert material, that is, non-radiative and absorbing,” and module interiors with “coated surfaces, or liners made from more acoustically efficient materials” to provide “the best acoustical properties.” Ex.1008, 5:54-67. Boyden applies related construction and materials to its eyeglass-mounted acoustic module. *Id.*, 12:5-7. Boyden identifies specific suitable materials, including “[h]eavy gauge woven impregnated fabrics, most conventional plastic materials, and carbon fiber composites.” Ex.1008, 5:54-62.

A POSA would have been motivated, with a reasonable expectation of success, to apply Boyden’s material-selection teachings in the Matsunari-Ono eyewear chamber by retaining Ono’s sound-reflecting chamber-facing surface while using Boyden’s “non-radiative and absorbing” material for another eyewear portion, such as the surrounding temple housing or wall. Ex.1003, ¶¶163, 166-168. The inner surface would reflect useful acoustic energy toward the output, while the absorbing-material portion would reflect less incident acoustic energy and reduce unwanted acoustic reradiation, furthering Matsunari’s leakage- and energy-

reduction objectives and Ono's focusing objective. *Id.*; see Ex.1005, [0055]; Ex.1007, 2-3; Ex.1008, 5:36-67. The resulting inner chamber surface would therefore have greater acoustic reflectivity than the identified absorbing portion. Ex.1003, ¶¶167-168.

C. Claim 6

Matsunari, Ono, and Boyden render obvious claim 6. Ex.1003, ¶¶169-172.

The '174 patent characterizes vibration damping as minimizing speaker-induced mechanical vibration imparted to the chamber wall and attenuating its transmission through the eyewear. Ex.1001, 21:12-21, 23:32-24:14.

In the combination, a POSA would have been motivated, with a reasonable expectation of success, to apply Boyden's damping and material-treatment teachings to the lower-reflectivity portion identified for claim 5, such as a chamber-wall or adjoining temple-housing portion (*supra* §VIII.B). Ex.1003, ¶¶167, 172. Because that portion forms or adjoins the wall defining Matsunari's speaker-containing cavity, speaker reaction forces and cavity-pressure fluctuations would load and excite the wall or housing portion, allowing vibration to propagate through the temple structure. Ex.1003, ¶171; see Ex.1005, [0054], Fig.10. Boyden preferably seals its transducer into a module wall and teaches damping material to suppress enclosure resonance, together with non-radiative, absorbing walls and coated surfaces or liners. Ex.1008, 5:1-8, 5:36-67. Boyden also confirms the relevance of

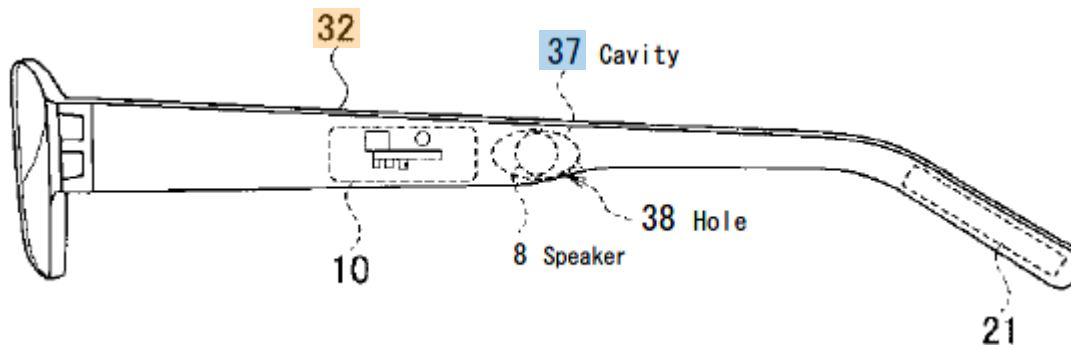
that structure-borne path by recognizing direct low-frequency coupling where module walls or pads contact the wearer's temples. *Id.*, 10:16-24. Further, as Kinsler (Ex.1021) explains, loudspeaker diaphragms are oscillators and dissipative frictional forces and mechanical resistance damp oscillation by dissipating mechanical energy, including through internal friction and forces associated with sound radiation in a vibrating membrane. *See* Ex.1021, 18, 24, 30-31, 115-116. Beranek (Ex.1019) separately confirms the enclosure-level effect that added acoustic absorption reduces resonance peaks and increases the damping constant. *See* Ex.1019, 10, 12-14.

A POSA therefore would have selected from Boyden's disclosed material, coating, and liner options a damping treatment that deformed with that wall or housing portion and dissipated its cyclic mechanical energy, thereby reducing transmission through the temple and unwanted reradiation as sound while preserving Ono's reflective inner surface. Ex.1003, ¶¶169-172.

D. Claims 7-8

Matsunari, Ono, and Boyden render obvious claims 7-8. Ex.1003, ¶¶173-176.

Matsunari discloses cavity 37 surrounding speaker 8 within temple 32. Ex.1005, [0054]; *see also id.*, Fig.10. Figure 10 shows that temple 32 (orange) includes portions forward and rear of cavity 37 (blue):



Id., Fig.10(annotated). Temple 32 provides contiguous structural paths extending forward and rearward from cavity 37. For the reasons discussed for claims 5-6 (*supra* §§VIII.B-C), a POSA would have located the vibration-absorbing portion either forward of the chamber (claim 7) or rear of the chamber (claim 8), thereby dissipating speaker-induced vibration before propagation along the eyewear. Ex.1003, ¶¶174-176.

E. Claim 9

Matsunari, Ono, and Boyden render obvious claim 9. Ex.1003, ¶¶177-180.

As discussed for claims 5-6, the combination's chamber includes a higher-reflectivity, chamber-facing inner surface, while the lower-reflectivity portion uses Boyden's materials for the vibration-damping and non-radiative functions explained above. *Supra* §§VIII.B-C. As discussed for 14[d], the chamber wall has an outer surface exterior to the inner surface. *Supra* §VII.H.5; Ex.1003, ¶179.

A POSA would have been motivated, with a reasonable expectation of success, to make that outer chamber-wall surface the vibration-absorbing portion by applying the selected absorbing material there. Ex.1003, ¶¶179-180. Because the

outer surface is mechanically coupled to the chamber wall, the absorbing material would deform with the wall and dissipate part of its cyclic strain energy before vibration propagated into the temple, while leaving Ono’s reflective inner surface exposed and reducing unwanted acoustic reradiation. *Id.*; *see* Ex.1008, 5:1-8, 5:36-67.

F. Claim 15

Matsunari, Ono, and Boyden render obvious claim 15 for the reasons discussed for claims 5 and 9. *Supra* §§VIII.B, VIII.E; Ex.1003, ¶¶181-182.

G. Claim 16

Matsunari, Ono, and Boyden render obvious claim 16. Ex.1003, ¶¶183-186.

As discussed for claims 9 and 15, the Matsunari-Ono-Boyden chamber includes a higher-reflectivity chamber-facing inner surface and an outer chamber surface outside the ear-directed chamber/port path. *Supra* §§VIII.E, VIII.F. Boyden teaches module walls made from “a substantially acoustically inert material, that is, non-radiative and absorbing,” and further teaches wall/interior surface treatments, including “coated surfaces,” to provide “the best acoustical properties.” Ex.1008, 5:54-67.

A POSA would have been motivated, with a reasonable expectation of success, to apply an absorbing material as a coating or surface treatment on the chamber wall’s outer surface. Ex.1003, ¶¶184-186. That placement leaves the

sound-reflecting chamber-facing surface exposed while the coating absorbs acoustic energy, such as transmitted through the wall. *Id.* Boyden applies related construction and materials to its eyeglass-mounted module, making this implementation straightforward and predictable. Ex.1008, 12:5-7.

H. Claims 24-28

Matsunari, Ono, and Boyden render obvious claims 24-28 for the reasons discussed for claims 5-9. *Supra* §§VIII.B-E; Ex.1003, ¶187.

IX. GROUND 3: CLAIMS 10 AND 19 ARE OBVIOUS BASED ON MATSUNARI, ONO, AND CHOW

A. Claim 10

Matsunari, Ono, and Chow render obvious claim 10. Ex.1003, ¶¶188-201.

As discussed for claim 1, the Matsunari-Ono combination renders obvious an eyewear-mounted chamber arrangement that generates, concentrates, and directs sound toward the user's ear. *Supra* §VII.B.

Chow discloses an external sound-cover structure attached to eyewear for further directing sound toward the user's ear. Ex.1003, ¶¶191-192. Specifically, Chow discloses a sound-deflecting surface 66 (orange) that “extends from an outer surface of the at least one side frame member 64 and over a portion of the user's ear for channeling sound from a speaker...into the user's ear while also allowing ambient sound to be heard.” Ex.1006, [0042].



Id., Fig.7(annotated). Chow explains that such “sound channel members,” including the sound-deflecting surface, are “removably attached by magnetic or mechanical attachment fittings” to the side frame members. *Id.*, [0042]; *see also id.*, [0041], Fig.6 (sound tube 60).

A POSA would have been motivated to attach an external sound-channel member of the kind disclosed in Chow, including a sound-deflecting surface, to the eyewear in the Matsunari-Ono-Chow combination to further concentrate sound emitted from Matsunari’s ear-facing holes toward the wearer’s ear while maintaining an open-ear arrangement. Ex.1003, ¶¶195, 201. Doing so would have advanced the same objectives reflected in the references: Matsunari reduces leakage and avoids dispersing acoustic energy, Ono focuses generated sound toward the ear-facing

output path, and Chow channels sound from an eyewear speaker into the user's ear while still allowing ambient sound to be heard. *Id.*; see Ex.1005, [0055]; Ex.1007, 2-3; Ex.1006, [0041]-[0042]. The modification would have been straightforward and predictable because Chow's sound-channel member is an external eyewear attachment designed for ear-directed audio delivery, and using such a member would not require changing the internal chamber operation of the Matsunari-Ono combination. Ex.1003, ¶197.

B. Claim 19

Matsunari, Ono, and Chow render obvious claim 19. Ex.1003, ¶¶202-206.

As discussed for 14[c], in the Matsunari-Ono combination, Matsunari's holes 38 remain the acoustic ports positioned in the wall of cavity 37, and sound is emitted through those ports toward the user's ear. *Supra* §VII.H.4. As discussed for claim 10, Chow discloses an attached external sound cover, including sound-deflecting surface 66, that channels sound from an eyewear speaker into the user's ear while allowing ambient sound to be heard. *Supra* §IX.A. As shown in Chow's Figure 7, the ear-facing side of sound-deflecting surface 66 (orange) provides the cover's inner surface for channeling sound toward the user's ear, and the opposite side of the cover provides the outer surface:



Id., Fig.7(annotated).

For the reasons discussed for claim 10 (*supra* §IX.A), a POSA would have been motivated to attach an external sound cover of the kind disclosed in Chow to the Matsunari-Ono eyewear and to position and configure that cover so that audio signals emitted from Matsunari's acoustic ports impinge on and reflect off the cover's ear-facing inner surface toward the user's ear. Ex.1003, ¶¶205-206.

**X. GROUND 4: CLAIM 20
IS OBVIOUS BASED ON MATSUNARI, ONO, CHOW, AND BOYDEN**

Matsunari, Ono, Chow, and Boyden render obvious claim 20. Ex.1003, ¶¶212-220.

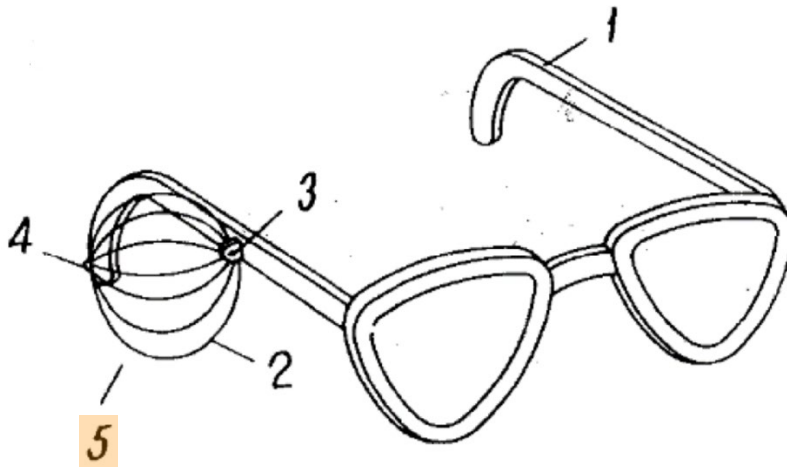
As discussed for claim 19 in Ground 3, the attached sound-deflecting surface provides an external sound cover whose existing ear-facing inner surface receives audio from the acoustic port and reflects it toward the ear; the opposite side provides the outer surface. *Supra* §IX.B. Because the audio reflects from that surface, the material forming it is the claimed first material and provides substantially for reflection; the cover's geometry determines the reflected direction. Ex.1003, ¶¶205-206; *see* Ex.1006, [0042]; *see also* Ex.1003, ¶¶48-49.

Boyden teaches wearable-module walls made from “substantially acoustically inert,” “non-radiative and absorbing” material, and “coated surfaces” for obtaining desired acoustic properties. Ex.1008, 5:54-67; *see also id.*, 12:5-7. A POSA would have been motivated to preserve Chow's existing inner surface and form the outward-facing side from, or coat it with, an absorbing material like Boyden's, so the exposed face forms the cover's outer surface. Ex.1003, ¶¶215, 217-220; Ex.1008, 5:54-67. This placement preserves the reflecting/channeling function while the second material absorbs acoustic energy and reduces outward reradiation, consistent with Boyden's objective of reducing radiation beyond the wearer's immediate environment. Ex.1003, ¶¶218-220; *see also* Ex.1008, 6:18-23. It would, thus, have been obvious to use a first material for the inner surface that provides substantially for reflection and a second material for the outer surface that provides substantially for absorption of acoustic energy. Ex.1003, ¶220.

**XI. GROUND 5: CLAIM 21
IS OBVIOUS BASED ON MATSUNARI, ONO, CHOW, AND HIGUCHI**

A. Overview of Higuchi

Higuchi discloses “[a]n auxiliary device for hearing aids comprising multiple arc-shaped segments that cover the ears, rotatably attached to an eyeglass frame.” Ex.1009, 1. “[S]everal segments 2 are combined to form a hood 5 that covers the ears,” with the segments “rotatably mounted around pivot points 3 and 4” near the earpieces of the eyeglass frame. *Id.* Higuchi’s figures show the resulting eyeglass-mounted, arc-shaped hood (orange) geometry:



Id., Fig.1(annotated); *see also id.*, Figs.3-4; Ex.1003, ¶75.

B. Claim 21

Matsunari, Ono, Chow, and Higuchi render obvious claim 21. Ex.1003, ¶¶221-231.

As discussed for claim 19 in Ground 3, the Matsunari-Ono-Chow combination includes an external sound cover of the kind disclosed in Chow whose inner surface

reflects sound emitted from the acoustic port toward the user’s ear. *Supra* §IX.B; Ex.1006, [0042].

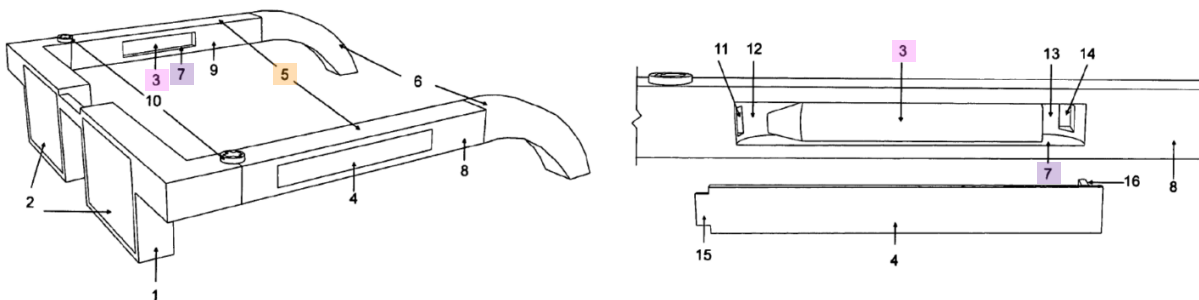
Higuchi discloses an eyeglass-mounted hood formed from arc-shaped segments that cover the ear, providing a shape concave toward the user’s ear. Ex.1009, 1, Figs.1, 3-4; Ex.1003, ¶¶223-224.

A POSA would have been motivated, with a reasonable expectation of success, to apply Higuchi’s arc-shaped, ear-facing geometry to the combination’s external sound cover to further guide sound toward the user’s ear, thereby providing a cover shape concave toward the user’s ear. *Id.*, ¶¶229-230.

XII. GROUND 6: CLAIMS 13 AND 23 ARE OBVIOUS BASED ON MATSUNARI, ONO, AND CHEN

A. Overview of Chen

Chen discloses eyewear having a temple assembly with a removable cartridge housed in a temple compartment. Ex.1003, ¶¶76-79. Chen explains that its temple assembly is comprised of “a temple, removable cartridge, [and] cartridge compartment that can accommodate and conceal one or multiple said cartridges,” and that the cartridge “comprises of materials and components including electronic or non-electronic or any combination thereof.” Ex.1010, 2:55-65. Figures 1-2 show cartridge 3 (pink) positioned within temple 5 (orange) and secured within cartridge compartment 7 (purple):



Id., Figs.1-2. Chen explains that this modular design “allows the addition of diverse functions to eyewear through the installment of cartridges comprised of different, unique capabilities,” and notes consumer interest in augmented eyewear functions beyond vision correction, including “music playing and cell phone capabilities.” *Id.*, 4:22-24, 1:28-31. Chen confirms its cartridge is “not limited” to thermal regulation and may include “any other function(s)” permitted by the cartridge components, materials, and dimensions. *Id.*, 5:64-6:3. Chen further discloses its modular cartridge design provides “flexibility to add functionalities...to eyewear in an integrated and concealed manner.” Ex.1010, 2:43-45.

B. Claim 13

Matsunari, Ono, and Chen render obvious claim 13. Ex.1003, ¶¶232-247.

As discussed for 1[a] and claim 12, in the Matsunari-Ono combination, Matsunari’s temple-mounted speaker-in-cavity arrangement is retained, while Ono’s parabolic reflective geometry and speaker-positioning teachings are applied to focus generated sound toward Matsunari’s ear-facing holes. *Supra* §§VII.B.2, VII.G.

As summarized above, Chen discloses an eyewear temple assembly including a removable cartridge housed in a cartridge compartment within the temple. *Supra* §XII.A. Chen explains that its temple assembly includes “a temple, removable cartridge, [and] cartridge compartment that can accommodate and conceal one or multiple said cartridges,” and that the cartridge can include electronic/non-electronic components. Ex.1010, 2:55-65. Chen’s modular cartridge design allows “diverse functions” to be added to eyewear through installable cartridges, including functions such as music playing and cell-phone capabilities. *Id.*, 4:22-24, 1:28-31.

A POSA would have been motivated to implement the temple-mounted speaker/audio components of the Matsunari-Ono combination in a removable temple cartridge/module of the kind disclosed in Chen so that the audio hardware could be inserted into, removed from, replaced, upgraded, or serviced as a unit within the eyewear temple. Ex.1003, ¶241; *see* Ex.1010, 2:2-5, 2:10-15, 3:55-60. In doing so, the Matsunari-Ono arrangement would retain the speaker’s positioning relative to the chamber/reflective geometry and the ear-facing output path discussed for claim 1; the cartridge/module would provide a removable temple-mounted housing for those audio components, not change the chamber’s sound-generating, concentrating, or port-output functions. Ex.1003, ¶244. Doing so would have predictably used a cartridge/module like Chen’s for its intended purpose—adding functional components to eyewear in a concealed temple compartment—while retaining the

Matsunari-Ono audio arrangement's speaker, chamber, and ear-facing output path for generating and concentrating sound toward the user's ear. Ex.1003, ¶245; *see* Ex.1010, 2:55-65, 4:22-24.

Chen's removable cartridge is a modular cartridge housed within a cartridge compartment of the eyewear temple and therefore corresponds to the claimed temple insert module. Ex.1010, 2:55-3:8, cl.1, Figs.1-2; Ex.1003, ¶247. Accordingly, in the Matsunari-Ono-Chen combination, locating Matsunari's speaker within a removable temple cartridge/module of the kind disclosed in Chen, while maintaining the speaker's relationship to the chamber and ear-facing output path, would have yielded a speaker located within a temple insert module of the eyewear device. *Id.*

The '174 patent's use of the term is consistent with that mapping: it describes a "temple insert module" ("TIM") as releasably coupleable with and installed into an eyewear temple and, in some embodiments, as including a speaker and speaker port. Ex.1001, 7:64-8:42.

C. Claim 23

Matsunari, Ono, and Chen render obvious claim 23. Ex.1003, ¶¶248-252.

As discussed for claim 22, the Matsunari-Ono combination renders obvious a chamber located within a temple of the eyewear device. *Supra* §VII.K. As discussed for claim 13, Chen discloses a removable temple cartridge/module housed within a cartridge compartment in the temple, and a POSA would have been motivated to

implement the temple-mounted audio components of the Matsunari-Ono combination in such a removable temple cartridge/module. *Supra* §XII.B.

More specifically, a POSA would have been motivated to have the removable cartridge itself define the chamber. A POSA would form the cavity in the cartridge shell around the speaker and reflector, with holes through the cartridge’s ear-facing wall aligned with a corresponding wearer-side opening in the temple compartment. Ex.1005, [0054]-[0055]; Ex.1010, 5:38-6:4; Ex.1003, ¶250. Retaining features such as a lid, restraints, or tabs and slots would secure the cartridge and maintain that alignment. *See* Ex.1010, 6:5-51, 8:55-9:8.

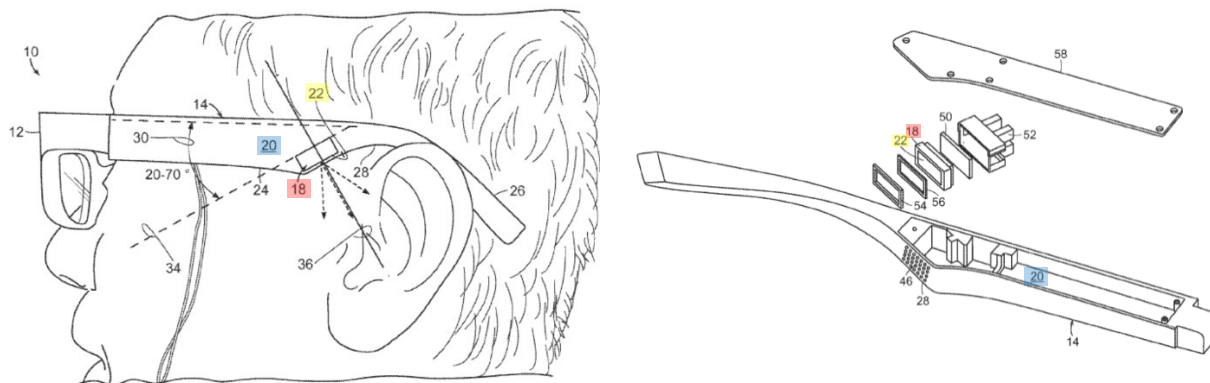
Keeping the speaker, chamber, reflector, and port in one replaceable acoustic subassembly would preserve the geometry on which Matsunari’s optimized output and Ono’s concentration depend while furthering Chen’s replacement/service objective. Ex.1003, ¶¶250-252; *see* Ex.1007, 2-3; Ex.1010, 4:6-21. Thus, in the combination, the chamber itself would be located within Chen’s temple insert module, with a reasonable expectation of success. Ex.1003, ¶252.

XIII. GROUND 7: CLAIMS 1-4, 10-12, 14, 17-19, AND 22 ARE OBVIOUS BASED ON CHOW AND ONO

A. Rationale for Combination

Chow discloses an “eyewear spectacle with audio speakers in the temple.” Ex.1006, Title. Chow explains that earphones had conventionally been used “when privacy is desired or it is desired not to disturb others,” but that prior approaches

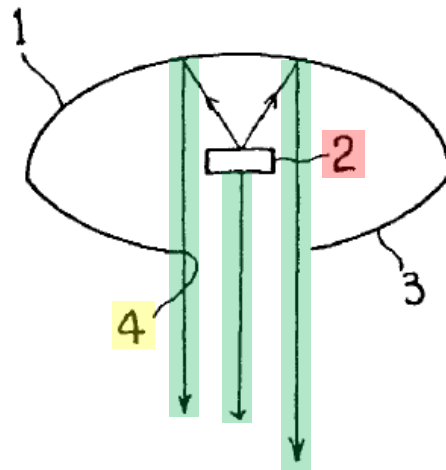
could be “bulky, cumbersome, or unreliable.” *Id.*, [0004]. To address that problem, Chow places speakers in the eyewear temple and directs “sound downwardly and rearwardly into the user’s ear.” *Id.*, Abstract; *see also id.*, Figs.2, 4. In one embodiment, the speaker 18 (red) is “positioned within cavity 20” (blue) in the temple and outputs sound through an “audio port 22” (yellow). *Id.*, [0039].



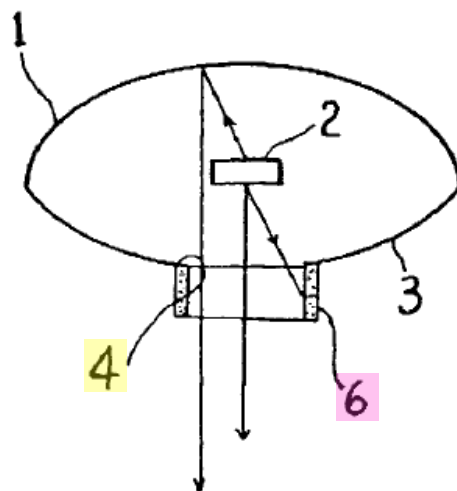
Id., Figs.2, 4. Chow’s eyewear include: speaker 18, including audio port 22, positioned within temple cavity 20; lower transition surface 28 defining audio openings 46 in the cavity wall; and an output path through those openings directed downwardly and rearwardly toward the wearer’s ear. Ex.1003, ¶¶257-258, 274.

Ono discloses multiple known sound concentration mechanisms. *Id.*, ¶262, 324. For example, as discussed for Ground 1, Ono discloses using parabolic acoustic-reflector geometry to concentrate and project sound from a speaker through an opening toward a user. *Supra* §VII.A. Ono explains that sound (green) generated by speaker 2 (red) is reflected by parabolic reflector 1 and directed through opening

4 (yellow) toward the user, delivering amplified sound only to a limited area and avoiding disturbing others. Ex.1007, 2-3.



Id., Fig.1(annotated). As another example, Ono discloses placing sound-absorbing material 6 (pink) around opening 4 (yellow) of second reflector 3 so that scattered sound is absorbed and “only sound waves traveling in a straight line are emitted,” thereby concentrating amplified sound to a specific range. *Id.*, 3.



Id., Fig.3(annotated).

A POSA would have been motivated to concentrate the sound output from Chow's speakers and, to do so, would have looked to one or more of Ono's disclosed sound-concentration techniques⁵. Ex.1003, ¶¶253, 319, 359. For example, it would have been obvious to modify Chow's eyewear to include a chamber-defining reflector structure having Ono's generally parabolic geometry around a speaker—whether formed by the cavity wall or provided as a reflector insert or liner within the cavity—and the speaker is positioned and oriented relative to that structure, consistent with Ono's parabolic-reflector teaching, so that sound generated by the speaker is reflected toward and through openings. *Id.*, ¶253. In another example, it would have been obvious to concentrate the sound from Chow's eyewear by placing Ono's sound-absorbing material around each of Chow's audio openings, thereby absorbing scattered, off-axis sound while permitting ear-directed sound to pass through the openings. *Id.*, ¶319. In yet another example, it would have been obvious to apply both modifications to Chow's eyewear, with the parabolic chamber surface directing sound toward openings and the sound-absorbing material attenuating

⁵ In this ground, Petitioners rely on Ono's teachings concerning sound concentration using sound-absorbing material for claims 1, 10-12, 14, 19, and 22, and on Ono's teachings concerning parabolic acoustic reflectors for claims 1-4, 10-12, 14, 17-19, and 22.

residual off-axis sound at those openings. *Id.*, ¶359. It would have been obvious to apply Ono’s teachings in any of these ways for several reasons. *Id.*, ¶¶264-271, 326-331, 360.

First, each approach would have furthered Chow’s express objective of private listening without disturbing others. *Id.*, ¶¶265, 327, 360. Chow identifies privacy and avoiding disturbance to others as goals, and Ono teaches a known parabolic reflective surface that directs sound toward a user while reducing sound elsewhere. Ex.1006, [0004]; Ex.1007, 2-3. Ono further teaches sound-dampening material that additionally or alternatively reduces sound elsewhere. Ex.1007, 2-3. Applying Ono’s sound concentration teachings to Chow’s eyewear would have predictably directed more emitted sound toward the wearer while reducing off-axis leakage to bystanders. Ex.1003, ¶265.

Second, applying Ono’s sound-concentration techniques would have improved directionality and audibility at the ear. *Id.*, ¶¶266, 328, 360. Chow’s eyewear already directs sound from a temple speaker toward the user’s ear through a cavity and audio port. Ex.1006, Abstract, [0039], Figs.2, 4. Ono discloses multiple mechanisms that would improve directionality and audibility. For example, Ono’s parabolic reflective speaker chamber directs parallel sound through an output opening toward the listener, concentrating the sound and improving directionality and audibility. Ex.1003, ¶266; *see* Ex.1007, 2-3. Ono also uses sound-absorbing

material 6 at its audio port to absorb the off-axis scattered sound while permitting concentrated sound to be emitted. Ex.1007, 3. By suppressing off-axis sound and increasing the proportion of emitted sound directed toward the wearer’s ear, this mechanism concentrates the sound. Ex.1003, ¶328.

Third, Chow and Ono address the same class of non-occluding personal-audio/hearing-aid devices that deliver sound without requiring in-ear earphones. *Id.*, ¶¶267, 329, 360. Chow touts that users need not “hold a speaker in place” or have “electronics behind the[] ear, or earbuds blocking their ear.” Ex.1006, [0013]. Ono likewise explains that its focused-output hearing aid “does not require earphones.” Ex.1007, 2-3. That shared open-ear architecture would have motivated the combination. Ex.1003, ¶267.

Fourth, applying Ono’s sound-concentration teachings to Chow’s eyewear would have involved routine adjustment of known acoustic design parameters. *Id.*, ¶¶268-269, 330, 360. Those adjustments would include configuring the reflector curvature and the speaker’s position relative to the reflector to direct reflected sound toward Chow’s openings, and sizing and positioning sound-absorbing material around those openings to attenuate off-axis output. *Id.*, ¶¶268-269, 330. Because Ono’s sound-concentration mechanisms were known, a POSA would have expected these routine design choices to improve sound delivery to the wearer’s ear. Ex.1003, ¶¶269, 330; *see* Ex.1007, 1-3.

Chow’s discussion of beam forming reinforces these rationales. Ex.1003, ¶270. Chow identifies “beam forming” as a known way to achieve “privacy or peace and quiet for others,” while criticizing bulky “multi-speaker beam forming” approaches as “bulky, cumbersome, or unreliable.” Ex.1006, [0004]. A POSA would have understood Chow’s criticism as limited to bulky multi-speaker arrays, not Ono’s acoustic techniques, and thus would have been motivated to use Ono to advance Chow’s privacy objective in a compact wearable device. Ex.1003, ¶270.

A POSA would have had a reasonable expectation of success in incorporating Ono’s sound-concentration teachings into Chow’s eyewear. *Id.*, ¶¶271, 331, 360. Chow already discloses a temple-mounted speaker positioned in a cavity that directs sound toward the wearer’s ear through audio ports/openings. Ex.1006, Abstract, [0039]-[0040], [0043], Figs.2, 4. Ono similarly discloses a speaker-and-chamber arrangement that concentrates sound toward a listener, as well as using sound-absorbing material around the output opening to concentrate sound. Ex.1007, 2-3. Each approach would have used known acoustic components and techniques for their established functions and predictably directed more sound toward the wearer’s ear while reducing off-axis leakage, while retaining Chow’s overall eyewear structure. Ex.1003, ¶360.

These approaches fit *KSR*: they combine familiar acoustic elements according to known methods to improve a similar device in the same field, address known

design needs, and yield predictable results. *See KSR*, 550 U.S. 398 at 417, 420-21; *supra* §VII.A.

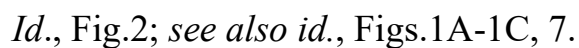
B. Claim 1

Chow and Ono render claim 1 obvious under each approach described above, for the reasons below and in the rationale for combination. Ex.1003, ¶¶254-276, 320-331, 361-362.

1. 1[pre]

To the extent 1[pre] is limiting, Chow discloses it. Ex.1003, ¶¶254-255, 320, 361.

Chow discloses audio eyewear 10 with speakers in side frame members that direct sound toward the user's ear. Ex.1006, [0043]; *see also id.*, [0007], [0010], [0038], [0040], [0042]. "Speaker 18, for example, is oriented such that the audio port 22 of speaker 18, faces downwardly rearwardly at an angle 30 away from the at least one side frame member 14, for directing sound downwardly rearwardly into the user's ear generally along a vertical plane." *Id.*, [0043]; *see also* Abstract, [0022].



Chow discloses this limitation. Ex.1003, ¶¶256-258, 321, 361.

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Ex.1003, ¶¶257-258. Chow’s speaker 18 (red) generates sound within that side-frame cavity/chamber for output toward the user’s ear. *Id.*; see Ex.1006, Abstract, [0039], [0043], Figs.2-4.

3. 1[b]

Chow and Ono render this limitation obvious. Ex.1003, ¶¶259-272, 322-331, 362.

Chow discloses that “audio port 22 of speaker 18[] faces downwardly rearwardly...for directing sound downwardly rearwardly into the user’s ear.” Ex.1006, [0043]; *see also id.*, Abstract, [0039]-[0040], Fig.2. Chow identifies privacy and not disturbing others as objectives of its eyewear audio system. *Id.*, [0004].

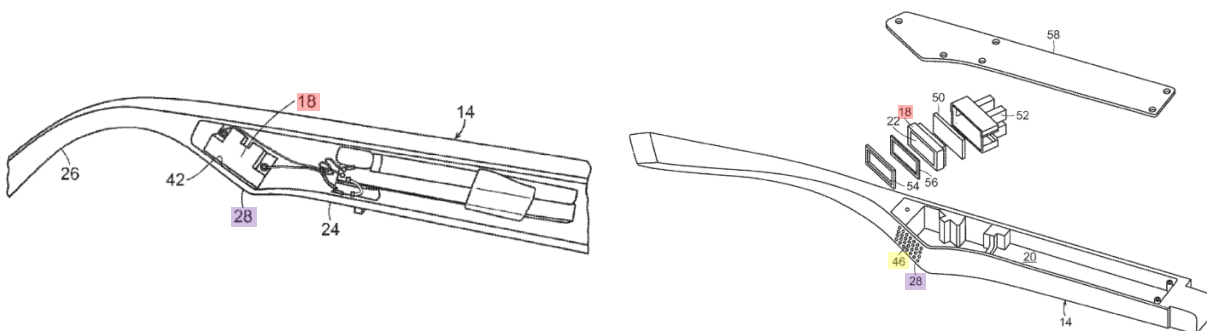
As discussed for limitation 1[b] in Ground 1 and in the rationale for combination, Ono discloses using parabolic acoustic-reflector geometry to direct sound toward a user. *Supra* §§VII.B.3, VII.A. Ono explains that sound is directed through opening 4 toward the user and delivered “only to the area around the user,” while sound in other areas is decreased. Ex.1007, 2-3. Ono also discloses sound-absorbing material 6 around opening 4 of second reflector 3 so that scattered sound is absorbed and only straight-traveling sound is emitted, thereby concentrating the amplified sound to a specific range. *Id.*, 3.

For the reasons discussed in the rationale for combination (*supra* §XIII.A), a POSA would have been motivated to apply Ono’s parabolic-reflector geometry, sound-absorbing material, or both to Chow’s eyewear. Ex.1003, ¶¶264-271, 326-331, 360. In each case, the Chow-Ono combination would concentrate audio signals for delivery to the user’s ear. Ex.1003, ¶362.

4. 1[c]

Chow and Ono render this limitation obvious. Ex.1003, ¶¶273-276, 333-334, 361.

Chow explains that speaker 18 is positioned within cavity 20 in side frame member 14 and is mounted against lower transition surface 28. Ex.1006, [0039]. That “lower transition surface 28 defines audio openings 46 for allowing sound from speaker 18 to pass through.” *Id.*, [0039]. These features, including speaker 18 (red), lower transition surface 28 (purple), and openings 46 (yellow), are illustrated in Figures 3-4:



Id., Figs.3(excerpt), 4; Ex.1003, ¶¶274, 334, 361.

Chow further discloses that speaker 18 is oriented so that audio port 22 faces downwardly and rearwardly “for directing sound downwardly rearwardly into the user’s ear.” Ex.1006, [0043]; *see also id.*, Abstract, [0038]-[0040]. Thus, sound generated by speaker 18 within cavity 20 passes from audio port 22 through openings 46 in the cavity wall toward the user’s ear. Ex.1003, ¶¶274, 334, 361.

For the reasons discussed in the rationale for combination (*supra* §XIII.A), applying Ono’s sound-concentration teachings to Chow’s eyewear would preserve that chamber output path: sound generated within cavity 20 would continue to be emitted through cavity-wall openings toward the user’s ear. Ex.1003, ¶¶274, 334, 361; *supra* §XIII.A.

Therefore, claim 1 is obvious over Chow and Ono. *Id.*, ¶¶276, 334, 362.

C. Claims 2-4

Chow and Ono render claims 2-4 obvious. Ex.1003, ¶¶277-285, 363.

For the reasons discussed in the rationale for combination (*supra* §XIII.A), a POSA would have applied Ono’s parabolic-reflector geometry to Chow’s eyewear, either alone or together with Ono’s sound-absorbing material, to concentrate sound toward Chow’s ear-facing openings. Ex.1003, ¶¶264-271, 360, 363.

As discussed for claims 2-4 in Ground 1, Ono discloses that generally parabolic reflector geometry around a speaker, with the speaker positioned relative

to that geometry, concentrates generated sound toward an output opening. *Supra* §§VII.C-E.

As described in the rationale for combination, Chow's cavity 20 would include a chamber-defining reflector structure having Ono's generally parabolic geometry around the speaker—whether formed by the cavity wall or provided as a reflector insert or liner—and the speaker would be positioned and oriented relative to that structure so that reflected sound is directed toward and through openings. Ex.1003, ¶¶269, 279-285, 363. Applying Ono's known reflector geometry and speaker-positioning teachings to Chow's existing speaker-in-cavity arrangement would have been a straightforward use of a known acoustic technique to improve a similar device, with predictable results. *Id.*, ¶¶269-271.

The resulting chamber shape would contribute to concentrating the audio signals, as recited in claim 2; provide a curved surface relative to the speaker, as recited in claim 3; and be generally parabolic, as recited in claim 4. Ex.1003, ¶¶279, 282, 285, 363.

D. Claim 10

As discussed for claim 10 in Ground 3, Chow discloses the additional external sound cover recited in claim 10. *Supra* §IX.A.

A POSA would have been motivated to use Chow's external sound-channel member in each case because Chow's side frame and downward-and-rearward ear-

facing output path would be retained, and the member would further the same ear-directed, open-ear audio objectives discussed. Ex.1003, ¶¶286-289, 335-338, 361. Chow discloses directing sound toward the ear through its ear-facing port/openings, Ono provides sound-concentration teachings, and Chow's external sound-channel member is designed to channel sound from an eyewear speaker into the user's ear while still allowing ambient sound to be heard. Ex.1003, ¶¶288, 337, 361; *see* Ex.1006, [0041]-[0042]. Using that member would have been straightforward and predictable because Chow discloses attaching such sound-channel members to the eyewear side frame members for ear-directed audio delivery. Ex.1003, ¶¶288, 337, 361.

E. Claim 11

Chow and Ono render claim 11 obvious for the reasons discussed for 1[a] in this ground. *Supra* §XIII.B.2; Ex.1003, ¶¶290-291, 339-340, 361. Chow's speaker generates the audio signals within the cavity and would continue to generate them whether a POSA applied Ono's parabolic-reflector geometry, sound-absorbing material, or both. Ex.1003, ¶¶291, 339, 361.

F. Claim 12

Chow and Ono render claim 12 obvious for the reasons discussed for 1[a] and claim 11 in this ground. *Supra* §§XIII.B.2, XIII.E; Ex.1003, ¶¶292-293, 341-342, 361. Chow positions the speaker within cavity 20 formed in side frame member

14—the eyewear temple—and the speaker would remain temple-mounted in each case. Ex.1006, Title, [0007], [0018], [0039].

G. Claim 14

1. 14[pre]

To the extent 14[pre] is limiting, Chow discloses it. Ex.1003, ¶¶295, 343, 361.

As discussed for 1[pre] in this ground, Chow discloses “[a]udio eyewear” having speakers in side frame members that “direct[] sound downwardly and rearwardly into the user’s ear.” Ex.1006, Abstract; *see also id.*, Title, [0038], [0043].

2. 14[a]

Chow and Ono render this limitation obvious. Ex.1003, ¶¶297, 345, 361.

As discussed for 1[a], Chow discloses a “speaker assembly within an audio chamber defined by the left side frame member,” with speaker 18 positioned within cavity 20 formed within side frame member 14. Ex.1006, [0018], [0039]. These disclosures establish that cavity 20 is the chamber volume defined by the side-frame structure. Ex.1003, ¶¶297, 345. Because cavity 20 is formed within the side-frame/temple structure, it is part of the eyewear volume and is defined by surrounding interior surfaces. *Id.*

For the reasons explained in the rationale for combination (*supra* §XIII.A), a POSA would have applied Ono’s sound-concentration teachings to Chow’s

eyewear. Ex.1003, ¶¶298, 345, 361. The POSA would have done so while retaining a chamber within Chow’s side frame and defining it by an interior surface—Chow’s existing cavity surface, a cavity surface modified to have Ono’s generally parabolic geometry, or the chamber-facing surface of a reflector insert or liner—with the chamber in each case remaining part of the eyewear volume. *Id.*

3. 14[b]

Chow and Ono render this limitation obvious. Ex.1003, ¶¶300, 347, 361.

As discussed for 1[a] and 14[a], Chow discloses speaker 18 positioned within cavity 20 formed within side frame member 14, which is part of the eyewear device’s volume. *Supra* §§XIII.B.2, XIII.G.2; Ex.1006, [0039]. Chow further discloses that speaker 18 generates sound that passes through audio openings 46 and is directed toward the user’s ear. Ex.1006, [0039], [0043]; *see also id.*, Abstract, [0038]-[0040]. A POSA would have been motivated to apply Ono’s sound-concentration teachings while retaining the speaker within the eyewear volume to generate the audio signals. Ex.1003, ¶¶300, 347, 361.

4. 14[c]

Chow and Ono render this limitation obvious. Ex.1003, ¶¶303, 348, 362.

As discussed for 1[b]-1[c] in this ground, Chow discloses an ear-facing output path from its temple-mounted speaker cavity. *Supra* §§XIII.B.3-4. Chow’s lower transition surface 28—part of the side-frame wall defining cavity 20—“defines

audio openings 46 for allowing sound from speaker 18 to pass through,” with the speaker/audio port oriented downwardly rearwardly toward the user’s ear. Ex.1006, [0039], [0043]; *see also id.*, Abstract, Figs.3-4. Thus, Chow discloses acoustic port/openings in a wall of the chamber/cavity for emitting sound toward the user’s ear when the eyewear is worn. Ex.1003, ¶¶304, 351, 362.

For the reasons explained in the rationale for combination (*supra* §XIII.A), a POSA would have applied Ono’s sound-concentration teachings to Chow’s eyewear while retaining openings in lower transition surface 28 along Chow’s ear-facing output path. Ex.1003, ¶¶305, 351, 362. In each case, the resulting arrangement would position openings in the chamber wall to concentrate sound from the chamber toward the user’s ear. Ex.1003, ¶¶305, 351, 362.

5. 14[d]

Chow and Ono render this limitation obvious. Ex.1003, ¶¶306, 352, 361.

As discussed for 14[a], Chow’s cavity 20 is defined by the interior surfaces of side frame member 14. *Supra* §XIII.G.2. As illustrated in Chow Figures 3-4, the side-frame structure defining cavity 20 also has an outer surface opposite and exterior to that chamber-facing interior surface. Ex.1006, Figs.3-4; Ex.1003, ¶¶307, 353; *see also* Ex.1007, Fig.1. That same surface is both an outer surface of the side-frame/temple structure and an outer surface of the wall structure defining the chamber. Ex.1003, ¶¶307, 353, 361. If Ono’s reflector geometry is instead provided

as a chamber-defining insert or liner, that structure likewise has an outer surface opposite and exterior to its chamber-facing inner surface. *Id.* Adding Ono’s sound-absorbing material around the openings would not alter either surface relationship. *Id.* Thus, the recited outer surface would be present in each case. Ex.1003, ¶¶307, 353, 361.

Therefore, claim 14 is obvious based on Chow and Ono. *Id.*, ¶¶294-307, 343-353, 361-362.

H. Claim 17

Chow and Ono render claim 17 obvious. Ex.1003, ¶¶308-310, 363.

As discussed for claim 17 in Ground 1, Ono discloses parabolic reflector geometry having a curved inner reflector surface arranged around speaker 2. *Supra* §VII.I. For the reasons explained in the rationale for combination (*supra* §XIII.A) and for claims 2-4 (*supra* §XIII.C), a POSA would have been motivated to configure Chow’s eyewear to include Ono’s parabolic reflective geometry, with the speaker positioned relative to that geometry. Ex.1003, ¶¶310, 363. The resulting chamber would have an inner surface forming a curved shape around the speaker. *Id.*

I. Claim 18

Chow and Ono render claim 18 obvious. Ex.1003, ¶¶311-312, 363. As discussed for claims 4 and 17 in this ground, the combination’s chamber-defining

inner surface curves around speaker and has Ono’s generally parabolic geometry.

Supra §§XIII.C, XIII.H; Ex.1003, ¶¶312, 363.

J. Claim 19

Chow and Ono render claim 19 obvious. Ex.1003, ¶¶313-317, 354-357, 361.

As discussed for 14[c], Chow’s cavity-wall openings would be retained in each case, and audio signals would be emitted through them toward the user’s ear. *Supra* §XIII.G.4. As discussed for claim 10, a POSA would have been motivated to use Chow’s external sound-channel member in each case because Chow’s side frame and ear-facing output path would be retained. *Supra* §XIII.D; Ex.1003, ¶¶315, 355, 361.

Chow’s external sound-channel member includes sound-deflecting surface 66, which extends “over a portion of the user’s ear” to channel sound into the user’s ear, has an ear-facing inner surface and an opposite outer surface, and is configured to attach to the eyewear. Ex.1006, [0041]-[0042], Fig.7; Ex.1003, ¶¶315, 356, 361. Audio signals emitted through the combination’s acoustic port/openings would impinge on and reflect off the ear-facing inner surface of sound-deflecting surface 66 toward the user’s ear. Ex.1003, ¶¶317, 357, 361.

K. Claim 22

Chow and Ono render claim 22 obvious for the reasons discussed for 1[a] and 14[a]. *Supra* §§XIII.B.2, XIII.G.2; Ex.1003, ¶¶318, 358, 361. Chow forms cavity

20 within side frame member 14—the temple of the eyewear—(Ex.1006, Title, [0007], [0018], [0039]), and the cavity would remain in that temple in each case. Ex.1003, ¶¶318, 358, 361.

**XIV. GROUND 8: CLAIMS 5-9, 15-16, 20, AND 24-28
ARE OBVIOUS OVER CHOW, ONO, AND BOYDEN**

Ground 8 builds on the Ground 7 Chow-Ono combination and adds Boyden’s material teachings. Together with Boyden, the Ground 7 application of Ono’s parabolic-reflector geometry (*supra* §XIII.A)—either alone or with Ono’s sound-absorbing material—render claims 5-9, 15-16, and 24-28 obvious. For claim 20, however, the particular Ono sound-concentration technique (*supra* §XIII.A) is immaterial because the claim’s material limitations concern an external sound cover, not the mechanism used to concentrate sound within the chamber or at its output. Ex.1003, ¶¶364-365, 386-389.

A. Claim 5

Chow, Ono, and Boyden render claim 5 obvious. Ex.1003, ¶¶366-371.

As discussed in Ground 7, applying Ono’s parabolic-reflector geometry—whether alone or together with Ono’s sound-absorbing material—renders obvious an eyewear chamber that generates, concentrates, and directs sound toward the user’s ear. *Supra* §§XIII.A-B; Ex.1003, ¶367.

As discussed for claim 5 in Ground 2, Boyden teaches material and surface-treatment selections for wearable speaker modules, including module walls made

from “a substantially acoustically inert material, that is, non-radiative and absorbing,” and “coated surfaces” or “liners made from more acoustically efficient materials” to provide “the best acoustical properties.” *Supra* §VIII.B; Ex.1008, 5:54-67; *see also id.*, 12:5-7.

A POSA would have been motivated, with a reasonable expectation of success, to apply Boyden’s material-selection teachings to the Chow-Ono eyewear chamber. Ex.1003, ¶369. Whether Ono’s reflector geometry is formed by the cavity wall or an insert/liner, the chamber-facing surface performs Ono’s reflecting function and would be retained. *Id.* A POSA would have used a non-radiative, absorbing material like Boyden’s for another portion so that it reflected less incident acoustic energy and reduced unwanted acoustic reradiation. *Id.*; *see* Ex.1006, [0039]-[0043]; Ex.1007, 2-3; Ex.1008, 5:54-67. The chamber-facing inner surface would therefore have greater acoustic reflectivity than that absorbing portion. Ex.1003, ¶371.

B. Claim 6

Chow, Ono, and Boyden render claim 6 obvious. Ex.1003, ¶¶372-374.

Ground 2 explains Boyden’s damping and material-treatment teachings and why a POSA would have been motivated, with a reasonable expectation of success, to apply those teachings to a lower-reflectivity portion of the Matsunari-Ono eyewear (*supra* §VIII.C); that reasoning likewise applies to the lower-reflectivity

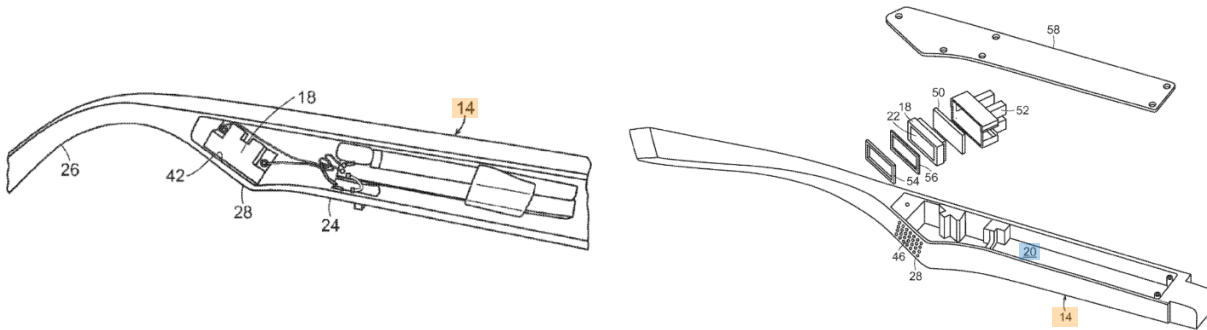
portion of the Chow-Ono eyewear identified for claim 5. Ex.1003, ¶373. Chow mounts its speaker within cavity 20 against the inner side of lower transition surface 28. Ex.1006, [0039]. Speaker reaction forces and cavity-pressure fluctuations therefore would load and excite the cavity wall and adjoining side-frame or reflector structure, permitting vibration to propagate through the eyewear. Ex.1003, ¶373; *see* Ex.1008, 5:1-8, 5:36-67, 10:16-24.

A POSA would have been motivated, with a reasonable expectation of success, to apply the selected Boyden-based damping treatment to the lower-reflectivity portion identified for claim 5, where it would deform with the structure and dissipate part of its cyclic mechanical energy before the vibration propagated through the eyewear or reradiated as sound. Ex.1003, ¶¶372-374.

C. Claims 7-8

Chow, Ono, and Boyden render claims 7-8 obvious. Ex.1003, ¶¶375-378.

Chow discloses that “[s]peaker 18 can be positioned within cavity 20 formed within the at least one side frame member 14” (Ex.1006, [0039]), and Figures 3-4 show portions of side frame member 14 (orange) forward and rear of cavity 20 (blue):



Ex.1006, Figs.3(excerpt), 4. Side frame member 14 provides contiguous structural paths extending forward and rearward from cavity 20. For the reasons discussed for claims 5-6 in this ground (*supra* §§XIV.A-B) and claims 7-8 in Ground 2 (*supra* §VIII.D), a POSA would have located the vibration-absorbing portion either forward of the chamber (claim 7) or rear of the chamber (claim 8), thereby dissipating speaker-induced vibration before propagation along the eyewear. Ex.1003, ¶¶376-378.

D. Claim 9

Chow, Ono, and Boyden render claim 9 obvious. Ex.1003, ¶¶379-381.

As discussed for claims 5-6, the Chow-Ono-Boyden combination renders obvious a higher-reflectivity, chamber-facing inner surface, while the lower-reflectivity portion uses Boyden's materials for the vibration-damping and non-radiative functions explained above. *Supra* §§XIV.A-B. As discussed for 14[d] in Ground 7, the chamber-defining wall or reflector structure has an outer surface exterior to the inner surface. *Supra* §XIII.G.5; Ex.1003, ¶381.

A POSA would have been motivated, with a reasonable expectation of success, to apply the selected Boyden-based damping treatment to the chamber's outer surface to make it vibration-absorbing. Ex.1003, ¶¶380-381. Because the outer surface is mechanically coupled to the chamber-defining wall or reflector, the treatment would deform with the structure and dissipate part of its cyclic strain energy, while preserving Ono's reflective inner surface and reducing unwanted acoustic reradiation. *Id.*; see Ex.1008, 5:1-8, 5:36-67.

E. Claim 15

Chow, Ono, and Boyden render obvious claim 15 for the reasons discussed for claims 5 and 9. *Supra* §§XIV.A, XIV.D; Ex.1003, ¶382.

F. Claim 16

Chow, Ono, and Boyden render claim 16 obvious. Ex.1003, ¶¶383-385.

As described in Ground 7, the opposite or back face of a chamber-defining reflector insert or liner within Chow's cavity 20 would be the claimed outer surface, while its chamber-facing face would be the higher-reflectivity inner surface. *Supra* §§XIII.A, XIV.D; Ex.1003, ¶384. Boyden teaches non-radiative and absorbing wall materials, acoustic damping material, and "coated surfaces" for module walls/interiors, and cautions against fill that loads the diaphragm. Ex.1008, 5:37-50, 5:63-67.

A POSA would have been motivated to coat that outer surface with an absorbing material of the kind taught by Boyden. Ex.1003, ¶385. That placement would leave the reflective face exposed and avoid occupying cavity volume or obstructing Chow’s port path, while the coating would absorb acoustic energy transmitted through the liner. *Id.* Applying the coating before installing the liner would have been routine. *Id.*

G. Claim 20

Chow, Ono, and Boyden render claim 20 obvious. Ex.1003, ¶¶386-389.

As discussed for claim 19 in Ground 7, the Chow-Ono combination retains Chow’s external sound cover with an existing ear-facing, sound-reflecting inner surface and an opposite outer surface, regardless of which Ono sound-concentration technique is used. *Supra* §XIII.J. For the reasons in Ground 4 (*supra* §X), a POSA would have been motivated to preserve that inner surface and form the outward-facing side from, or coat it with, an absorbing material like Boyden’s, with the material of the inner surface providing substantially for reflection of the audio signals and the material of the outer surface providing substantially for absorption of acoustic energy. Ex.1003, ¶¶387-389; *see* Ex.1008, 5:54-67.

H. Claims 24-28

When Ono's parabolic-reflector geometry is applied as described in Ground 7 (*supra* §XIII.A), Chow, Ono, and Boyden render obvious claims 24-28 for the reasons discussed for claims 5-9. *Supra* §§XIV.A-D; Ex.1003, ¶¶390-391.

XV. GROUND 9: CLAIMS 13 AND 23 ARE OBVIOUS OVER CHOW, ONO, AND CHEN

Chow, Ono, and Chen render obvious claims 13 and 23. Ex.1003, ¶¶392-404.

A. Claim 13

Chow, Ono, and Chen render claim 13 obvious. Ex.1003, ¶¶394-401.

As discussed for 1[a] and claim 12 in Ground 7, the Chow-Ono combination would retain the speaker within cavity 20 formed in side frame member 14, which forms part of the eyewear temple. *Supra* §§XIII.B.2, XIII.F. As discussed for claim 13 in Ground 6, Chen discloses an eyewear temple assembly having a removable cartridge/module housed in a temple compartment and teaches using such cartridges to add functionality to eyewear. *Supra* §XII.B; Ex.1010, 2:55-65.

For the reasons discussed in Ground 6 (*supra* §XII.B), a POSA would have been motivated, with a reasonable expectation of success, to incorporate the temple-mounted speaker assembly in the Chow-Ono combination into a removable temple cartridge/module of the kind disclosed in Chen, thereby allowing the audio hardware to be installed, removed, replaced, upgraded, or serviced as a unit. Ex.1003, ¶397; *see also* Ex.1010, 4:14-24.

In the resulting arrangement, the cartridge/module would provide a removable temple housing for the speaker and its associated audio components while preserving the speaker's relationship to cavity 20 and the ear-facing output path. Ex.1003, ¶¶398-400. Because that removable cartridge/module is inserted into and housed within the temple, it is a temple insert module containing speaker 18. *Id.*, ¶401.

B. Claim 23

Chow, Ono, and Chen render claim 23 obvious. Ex.1003, ¶¶402-404.

As discussed for claim 22 in Ground 7, the Chow-Ono combination would include a cavity—a chamber—within the eyewear temple. *Supra* §XIII.K. For the reasons discussed for claim 13 in this ground (*supra* §XV.A), a POSA would have been motivated to incorporate the temple-mounted speaker assembly in the Chow-Ono combination into a removable temple cartridge/module of the kind disclosed in Chen. Ex.1003, ¶403.

In that arrangement, the cartridge shell would define the cavity and carry the speaker, cavity walls, lower transition surface, audio openings, and any reflector or sound-absorbing material used to concentrate sound. Ex.1006, [0039], Figs.3-4; Ex.1003, ¶403. The cartridge's audio openings would align with Chen's wearer-side opening, while restraints or tabs and slots would maintain alignment after replacement. Ex.1010, 5:38-6:4, 6:5-51, 8:55-9:8. Keeping the complete acoustic

subassembly together preserves Chow’s output path while achieving Chen’s serviceability benefit. Ex.1003, ¶¶403-404; *see* Ex.1010, 4:6-21.

**XVI. GROUND 10: CLAIM 21
IS OBVIOUS OVER CHOW, ONO, AND HIGUCHI**

Chow, Ono, and Higuchi render claim 21 obvious. Ex.1003, ¶¶405-411.

As discussed for claim 19 in Ground 7, the Chow-Ono combination would include an attached external sound cover of the kind disclosed in Chow, whose ear-facing inner surface reflects sound emitted through openings toward the user’s ear. *Supra* §XIII.J; Ex.1006, [0042].

As discussed in Ground 5, Higuchi discloses eyeglass-mounted hood 5 formed from arc-shaped segments 2 that cover the ear and provide a shape concave toward the user’s ear. *Supra* §XI; Ex.1009, 1, Figs.1, 3-4; Ex.1003, ¶408.

For the reasons discussed in Ground 5 (*supra* §XI), a POSA would have been motivated, with a reasonable expectation of success, to apply Higuchi’s arc-shaped, ear-facing geometry to Chow’s external sound cover to further guide sound emitted through openings toward the user’s ear. Ex.1003, ¶¶409-411. The resulting cover in the Chow-Ono-Higuchi combination would have an inner surface concave toward the user’s ear while preserving Chow’s attachment and sound-channeling functions, without changing the speaker, chamber, acoustic port, or Ono sound-concentration features. *Id.*, ¶¶410-411; *see* Ex.1006, [0042].

XVII. SECONDARY CONSIDERATIONS

Petitioners are not aware of any evidence of secondary considerations. Ex.1003, ¶¶412-413. If PO identifies evidence of secondary considerations, Petitioners request an opportunity to respond.

XVIII. STIPULATION

Petitioners stipulate that, if *inter partes* review is instituted, Petitioners will not pursue in *Solos Technology Limited v. Meta Platforms, Inc. et al.*, No. 1:26-cv-10304 (D. Mass. 2026) (“Litigation”), against any challenged claim of the ’174 patent: (1) any invalidity ground that was raised or reasonably could have been raised in this IPR; or (2) any invalidity ground under 35 U.S.C. §§ 102 or 103 that relies on any prior-art reference asserted in Grounds 1-10 of the Petition, whether alone or with system art or other prior art unavailable in IPR. If institution is denied or later vacated, this stipulation has no effect.

**XIX. MANDATORY NOTICES,
GROUNDS FOR STANDING, AND FEE PAYMENT**

A. Real Parties-In-Interest (37 C.F.R. §42.8(b)(1))

The real parties in interest for Petitioners are: Luxottica of America Inc.; Oakley, Inc.; EssilorLuxottica USA Inc.; and Meta Platforms, Inc.

Luxottica of America Inc. further identifies the following entities without conceding that these entities are, in fact, real parties in interest: EssilorLuxottica America SAS; Luxottica Group SPA; Essilor International SAS; EssilorLuxottica S.A.; Luxottica SRL; Luxottica Tristar (Dongguan) Optical Co. Ltd.; and EssilorLuxottica (Thailand) Ltd.

Meta Platforms, Inc. further identifies the following entity without conceding that this entity is, in fact, a real party in interest: Meta Platforms Technologies, LLC (formerly known as Facebook Technologies, LLC, which was formerly known as Oculus VR, LLC).

B. Related Matters (37 C.F.R. §42.8(b)(2))

The parties are engaged in district court litigation in *Solos Technology Limited v. Meta Platforms, Inc. et al.*, No. 1:26-cv-10304 (D. Mass.). In that action, PO asserted the '174 patent and U.S. Pat. Nos. 12,216,339 (“the '339 patent”), 11,082,055 (“the '055 patent”), 10,651,866 (“the '866 patent”), and 10,306,389 (“the '389 patent”). Both the '174 and '339 patents claim priority to the same provisional

application. The '866 patent claims priority through the application that issued as the '055 patent.

The '055 patent is currently the subject of AIA Review Nos. IPR2026-00412 and IPR2026-00420. The '339 patent is currently the subject of AIA Review No. IPR2026-00376.

C. Lead and Backup Counsel (37 C.F.R. §42.8(b)(3))

Petitioners provide the following designation of counsel.

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D. Service Information (37 C.F.R. §42.8(b)(4))

Please direct all correspondence to lead counsel and back-up counsel at the addresses shown above. Petitioners also consent to electronic service by email to:

MLB-Luxottica-IPR-174@morganlewis.com; and

PH-Meta-Solos-IPR@paulhastings.com.

E. Standing

The '174 patent is available for IPR, and no bar or estoppel applies.

The Office may charge any fees due to Deposit Account 50-0310.

XX. CONCLUSION

Petitioners request institution and cancellation of all claims of the '174 patent.

Dated: August 14, 2026

By: /Jacob L. Peterson/

Jacob L. Peterson (Reg. No. 65,096)

MORGAN, LEWIS & BOCKIUS LLP

*Attorney for Petitioner,
Luxottica of America Inc.*

APPENDIX: LISTING OF CLAIMS FROM U.S. PATENT NO. 11,871,174

Claim 1

- 1[pre]** A method to provide audio signals to a user from an eyewear device, comprising;
- 1[a]** generating audio signals within a chamber, the chamber is a part of a volume of the eyewear device;
- 1[b]** concentrating the audio signals for delivery to the user's ear; and
- 1[c]** transmitting the audio signals to the user's ear, the audio signals are transmitted through a port in the chamber.

Claim 2

The method of claim 1, wherein a shape of the chamber contributes to the concentrating.

Claim 3

The method of claim 2, wherein the shape provides a curved surface to a speaker, and the speaker is used in the generating.

Claim 4

The method of claim 2, wherein the shape is generally parabolic.

Claim 5

The method of claim 1, wherein an inner surface of the chamber has a first acoustic reflectivity and at least a portion of the eyewear device has a second acoustic reflectivity, the first acoustic reflectivity is greater than the second acoustic reflectivity.

Claim 6

The method of claim 5, the portion absorbs vibrational energy.

Claim 7

The method of claim 6, wherein the portion is forward of the chamber.

Claim 8

The method of claim 6, wherein the portion is rear of the chamber.

Claim 9

The method of claim 6, wherein the portion is an outer surface of the chamber.

Claim 10

The method of claim 1, wherein an external sound cover contributes to the concentrating, the external sound cover is attached to the eyewear device.

Claim 11

The method of claim 1, wherein a speaker is used in the generating.

Claim 12

The method of claim 11, wherein the speaker is located within a temple of the eyewear device.

Claim 13

The method of claim 11, wherein the speaker is located within a temple insert module of the eyewear device.

Claim 14

14[pre] An apparatus to provide audio signals to a user from an eyewear device, comprising:

- 14[a]** a chamber, the chamber is defined by an interior surface, the chamber is a part of a volume of the eyewear device, the chamber further comprising:
- 14[b]** at least one speaker, the at least one speaker to generate audio signals, the at least one speaker is contained within the volume;
- 14[c]** an acoustic port, the acoustic port is positioned in a wall of the chamber to concentrate emission of the audio signals from the chamber in a direction of the user's ear when the user wears the eyewear device; and
- 14[d]** an outer surface, the outer surface is exterior to the inner surface.

Claim 15

The apparatus of claim 14, wherein the interior surface has a larger acoustic reflectivity than an acoustic reflectivity of the outer surface.

Claim 16

The apparatus of claim 15, wherein the outer surface is coated with a material that absorbs acoustic energy.

Claim 17

The apparatus of claim 14, wherein the inner surface forms a curved shape around the at least one speaker.

Claim 18

The apparatus of claim 17, wherein the curved shape is generally parabolic.

Claim 19

The apparatus of claim 14, further comprising: an external sound cover, the external sound cover has an inner surface and an outer surface, the external sound cover is configured to attach to the eyewear device, wherein in operation, the audio signals emitted from the acoustic port reflect off of the inner surface toward the user's ear.

Claim 20

The apparatus of claim 19, wherein a first material used for the inner surface provides substantially for reflection of the audio signals and a second material used for the outer surface provides substantially for absorption of acoustic energy.

Claim 21

The apparatus of claim 19, wherein a shape of the external sound cover is concave towards the user's ear.

Claim 22

The apparatus of claim 14, wherein the chamber is located within a temple of the eyewear device.

Claim 23

The apparatus of claim 14, wherein the chamber is located within a temple insert module of the eyewear device.

Claim 24

The apparatus of claim 14, wherein an inner surface of the chamber has a first acoustic reflectivity and at least a portion of the eyewear device has a second acoustic reflectivity, the first acoustic reflectivity is greater than the second acoustic reflectivity.

Claim 25

The apparatus of claim 24, the portion absorbs vibrational energy.

Claim 26

The apparatus of claim 25, wherein the portion is forward of the chamber.

Claim 27

The apparatus of claim 25, wherein the portion is rear of the chamber.

Claim 28

The apparatus of claim 25, wherein the portion is an outer surface of the chamber.

CERTIFICATE OF COMPLIANCE

Pursuant to 37 C.F.R. §42.24(d), the undersigned certifies that this PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 11,871,174 contains 13,970 words according to the word-processing program used to prepare this paper. The foregoing word count complies with the 14,000-word type-volume limit specified by 37 C.F.R. §42.24(a)(1).

Dated: August 14, 2026

By: /Jacob L. Peterson/

Jacob L. Peterson (Reg. No. 65,096)

MORGAN, LEWIS & BOCKIUS LLP

CERTIFICATE OF SERVICE

The undersigned hereby certifies that on the date below copies of this **PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 11,871,174, PETITIONERS’ POWERS OF ATTORNEY, AND EXHIBITS 1001-1030** are being served by FedEx on the Patent Owner at the correspondence address of record for the subject patent as follows:

Caldwell LLC
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A courtesy copy is being sent by email on this day to Patent Owner’s counsel of record in the Litigation as follows:

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Dated: August 14, 2026

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