

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD., and
SAMSUNG ELECTRONICS AMERICA, INC.,

Petitioners

v.

ZOPHONOS INC.,

Patent Owner

Case IPR2026-00084

U.S. Patent No. 11,204,736

**Petition for *Inter Partes* Review of
U.S. Patent No. 11,204,736**

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PETITIONERS' EXHIBIT LIST

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1001	U.S. Patent 11,204,736 (“’736Pat.”)
1002	Declaration of Chris Kyriakakis, Ph.D. (“ <i>Kyriakakis</i> ”)
1003	Curriculum Vitae of Chris Kyriakakis, Ph.D.
1004	File History of U.S. Patent No. 11,204,736 (“ <i>File History</i> ”)
1005	U.S. Patent Application Publication 2015/0195641 (“ <i>DiCenso641</i> ”)
1006	U.S. Patent Application Publication 2014/0254842 (“ <i>Smith</i> ”)
1007	U.S. Patent Application Publication 2014/0337902 (“ <i>Holland</i> ”)
1008	U.S. Patent Application Publication 2008/0031481 (“ <i>Warren</i> ”)
1009	U.S. Patent Application Publication 2015/0170645 (“ <i>DiCenso645</i> ”)
1010	U.S. Patent Application Publication 2008/0137873 (“ <i>Goldstein873</i> ”)
1011	NOT USED
1012	U.S. Patent Application Publication 2005/0058181 (“ <i>Lyle</i> ”)
1013	C. Wiernicki and W. Karoly, “Ultrasound: Biological Effects and Industrial Hygiene Concerns,” Am. Ind. Hyg. Assoc. J., 46:488–496 (1985) (“ <i>Wiernicki</i> ”)
1014	U.S. Patent Application Publication 2011/0058056 (“ <i>Lindahl</i> ”)
1015	U.S. Patent 7,991,171 (“ <i>Snow</i> ”)
1016	Excerpts from Microsoft Computer Dictionary (5th ed. 2002) (“ <i>Computer Dictionary</i> ”)
1017	Excerpts from Robert Oshana, “DSP Software Development Techniques Embedded and Real-Time Systems” (2006) (“ <i>Oshana</i> ”)
1018	Excerpts from Thomas D. Rossing, Richard F. Moore, and Paul A. Wheeler, “The Science of Sound” (3rd ed. 2002) (“ <i>Rossing</i> ”)
1019	U.S. Patent Application Publication 2013/0003998 (“ <i>Kirkeby</i> ”)
1020	U.S. Patent Application Publication 2015/0371643 (“ <i>Ramo</i> ”)
1021	U.S. Patent 8,767,970 (“ <i>Eppolito</i> ”)
1022	U.S. Patent 7,970,144 (“ <i>Avendano</i> ”)

LISTING OF CHALLENGED CLAIMS

Claim 1	
1[pre]	A system comprising:
1[a]	a data source;
1[b]	at least one cluster of at least one computing device,
1[c]	the at least one computing device including:
1[c][i]	a sound sensing mechanism, configured to sense a noise; and
1[c][ii]	an electronic bus which is configured to transmit and receive data from the data source,
1[c][iii]	wherein the data source is in electronic communication with the at least one cluster and at least one output device;
1[d]	a memory, containing computer-executable instructions; and
1[e]	a processor configured to execute the computer-executable instructions to cause the processor to perform functions including:
1[e][i]	identifying one or more sounds within the noise;
1[e][ii]	isolating the one or more sounds; and
1[e][iii]	determining if one or more of the isolated one or more sounds includes a frequency outside of a predetermined threshold.

Claim 2	
2[a]	The system as recited in claim 1, further comprising: an interfacing mechanism, the interfacing mechanism including:
2[b]	a network adapter, configured to transmit and receive the data through both wired and wireless communication; and
2[c]	at least one input mechanism, configured to:
2[d]	manipulate the interfacing mechanism; and
2[e]	vary the output of the at least one output device.
Claim 3	
3	The system as recited in claim 1, wherein the sound-sensing mechanism is an omnidirectional transducer.
Claim 4	
4	The system as recited in claim 1, wherein the sound-sensing mechanism is selected from the group consisting of: an ultrasonic transducer; an infrasonic transducer; and a microwave transducer.
Claim 5	
5	The system as recited in claim 4, wherein the sensed noise includes infrasonic or ultrasonic soundwaves.
Claim 6	
6	The system as recited in claim 1, wherein the predetermined threshold equates to a frequency determined to pose a risk of harm to a user's hearing capabilities.

Claim 7	
7	The system as recited in claim 1, wherein the computer-executable instructions further include: if one or more of the isolated one or more sounds includes the frequency outside of the predetermined threshold, notifying a user, via a notification, that one or more of the isolated one or more sounds includes the frequency outside of the predetermined threshold.
Claim 8	
8	The system as recited in claim 1, wherein the computer-executable instructions further include steps selected from the group consisting of: panning the sensed noise; and equalizing the sensed noise.
Claim 9	
9	The system as recited in claim 1, further comprising: an in-ear device, wherein an audio output of the in-ear device auto-adjusts based on signal energy sensed within a cluster or surrounding clusters.
Claim 10	
10	The system as recited in claim 1, wherein the altering the one or more of the isolated one or more sounds so that the frequency does not fall outside of the predetermined threshold is performed automatically.
Claim 11	
11[pre]	A method of managing sensed noise, comprising:
11[a]	providing at least one data source;

11[b]	providing at least one cluster of at least one computing device,
11[c]	the at least one computing device including:
11[c][i]	a sound sensing mechanism, configured to sense a noise; and
11[c][ii]	an electronic bus configured to transmit and receive data from the data source,
11[c][iii]	wherein the data source is in electronic communication with the at least one cluster and at least one output device:
11[d]	providing a memory, containing computer-executable instructions; and
11[e]	providing a processor to execute the computer-executable instructions to cause the processor to perform steps comprising:
11[e][i]	identifying one or more sounds within the noise;
11[e][ii]	isolating the one or more sounds; and
11[e][iii]	determining if one or more of the isolated one or more sounds includes a frequency outside of a predetermined threshold.
Claim 12	
12[a]	The method as recited in claim 11, further comprising: providing an interfacing mechanism, the interfacing mechanism including:
12[b]	a network adapter, configured to transmit and receive the data through both wired and wireless communication; and
12[c]	at least one input mechanism, configured to:

12[d]	manipulate the interfacing mechanism; and
12[e]	vary the output of the at least one output device.
Claim 13	
13	The method as recited in claim 11, wherein the sound-sensing mechanism is selected from the group consisting of: an omnidirectional transducer; an ultrasonic transducer; an infrasonic transducer; an electro-optical transducer; and a microwave transducer.
Claim 14	
14	The method as recited in claim 13, wherein the sensed noise includes infrasonic, ultrasonic, visible, or radio waves.
Claim 15	
15	The method as recited in claim 11, wherein the predetermined threshold equates to a frequency determined to pose a risk of harm to a user's hearing capabilities.
Claim 16	
16	The method as recited in claim 11, further comprising: if one or more of the isolated one or more sounds includes the frequency outside of the predetermined threshold, notifying a user, via a notification, that one or more of the isolated one or more sounds includes the frequency outside of the predetermined threshold.
Claim 17	
17	The method as recited in claim 11, further comprising: panning the sensed noise.

Claim 18	
18	The method as recited in claim 11, further comprising: adding one or more audio effects to the sensed noise.
Claim 19	
19	The method as recited in claim 11, further comprising: equalizing the sensed noise.
Claim 20	
20	The method as recited in claim 11, wherein the altering the one or more of the isolated one or more sounds so that the frequency does not fall outside of the predetermined threshold is performed automatically.
Claim 21	
21[a]	The system of claim 1, further comprising: the at least one output device, including:
21[a][i]	a power source for operating the output device;
21[a][ii]	a speaker for outputting sound; and
21[a][iii]	a communication mechanism, for receiving electronic information from the data source; and
21[a][iv]	a display.
Claim 22	
22	The system of claim 21, wherein the power source and the display are varied outputs.

Claim 23	
23[a]	The method of claim 11, further comprising: providing the at least one output device, including:
23[a][i]	a power source for operating the output device;
23[a][ii]	a speaker for outputting sound; and
23[a][iii]	a communication mechanism, for receiving electronic information from the data source; and
23[a][iv]	a display.
Claim 24	
24	The method of claim 23, wherein the power source and the display are varied outputs.
Claim 25	
25	The system of claim 1, further comprising: a transmission medium comprising a wireless transceiver configured to wirelessly transmit and receive data from the data source.
Claim 26	
26	The method of claim 11, further comprising: providing a transmission medium comprising a wireless transceiver configured to wirelessly transmit and receive data from the data source.

Claim 27	
27[a]	The system of claim 1, wherein if one or more of the isolated one or more sounds includes the frequency outside of the predetermined threshold, altering the one or more of the isolated one or more sounds so that the frequency does not fall outside of the predetermined threshold; and
27[b]	outputting the isolated one or more sounds on the at least one output device.
Claim 28	
28[a]	The method of claim 11, wherein if one or more of the isolated one or more sounds includes the frequency outside of the predetermined threshold, altering the one or more of the isolated one or more sounds so that the frequency does not fall outside of the predetermined threshold; and
28[b]	outputting the isolated one or more sounds on the at least one output device.
Claim 32	
32[pre]	A system comprising:
32[a]	a data source;
32[b]	at least one cluster of at least one computing device,
32[c]	the at least one computing device including:
32[c][i]	a noise sensing mechanism configured to sense a noise; wherein the sensed noise includes infrasonic, ultrasonic, visible, audio or radio waves;

32[c][ii]	an electronic bus which is configured to transmit and receive data from the data source,
32[c][iii]	wherein the data source is in electronic communication with at least one cluster and at least one output device;
32[d]	a memory, containing computer-executable instructions; and
32[e]	a processor configured to execute the computer-executable instructions to cause the processor to perform functions including:
32[e][i]	identifying one or more frequencies within the noise;
32[e][ii]	isolating the one or more frequencies; and
32[e][iii]	determining if one or more of the isolated one or more frequencies includes a frequency outside of a predetermined threshold,
32[e][iv]	wherein if one or more of the isolated one or more frequencies includes the frequency outside of the predetermined threshold, transmitting an alert to another computing device regarding the frequency of the one or more of the isolated one or more frequencies being outside of the predetermined threshold.

I. INTRODUCTION

Petitioners Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc. (“Petitioners” or “Samsung”) request *inter partes* review of claims 1-28, 32 of U.S. Patent No. 11,204,736 (“the ’736 patent”).

II. GROUNDS FOR STANDING (37 C.F.R. § 42.104(A))

Petitioners certify that the ’736 patent is available for *inter partes* review (“IPR”), and that Petitioners are not barred or estopped from requesting IPR to challenge the claims on the grounds herein.

III. STATEMENT OF PRECISE RELIEF REQUESTED FOR EACH CLAIM CHALLENGED

A. Claims for Which Review is Requested

Petitioners respectfully request review of claims 1-28, 32 (“Challenged Claims”) of the ’736 patent, and cancellation of these claims under 35 U.S.C. § 311 as unpatentable.

B. Statutory Grounds of Challenge

For purposes of this proceeding only, Petitioners apply the earliest alleged priority date of the ’736 patent: 09/23/2014. The AIA applies. The Challenged

Claims should be canceled as unpatentable based on the following prior art references and grounds:¹

Reference	Date(s)	Prior Art At Least Under
US20150195641 ("DiCenso641") (EX1005)	01/06/2014 (filed)	§102(a)(2)
US20140254842 ("Smith") (EX1006)	09/11/2014 (published)	§102(a)(1)
US20140337902 ("Holland") (EX1007)	05/12/2014 (filed)	§102(a)(2)
US20080031481 ("Warren") (EX1008)	02/07/2008 (published)	§102(a)(1)
US20150170645 ("DiCenso645") (EX1009)	12/13/2013 (filed)	§102(a)(2)
US20080137873 ("Goldstein873") (EX1010)	06/12/2008 (published)	§102(a)(1)

Ground	Claims	Basis
1A	1, 4-11, 13-20, 25-28	§103: <i>DiCenso641</i> , <i>Smith</i>
1B	2, 12	§103: <i>DiCenso641</i> , <i>Smith</i> , <i>Holland</i>

¹ Petitioners do not concede that any Challenged Claims satisfy requirements for patentability that cannot be raised in IPR.

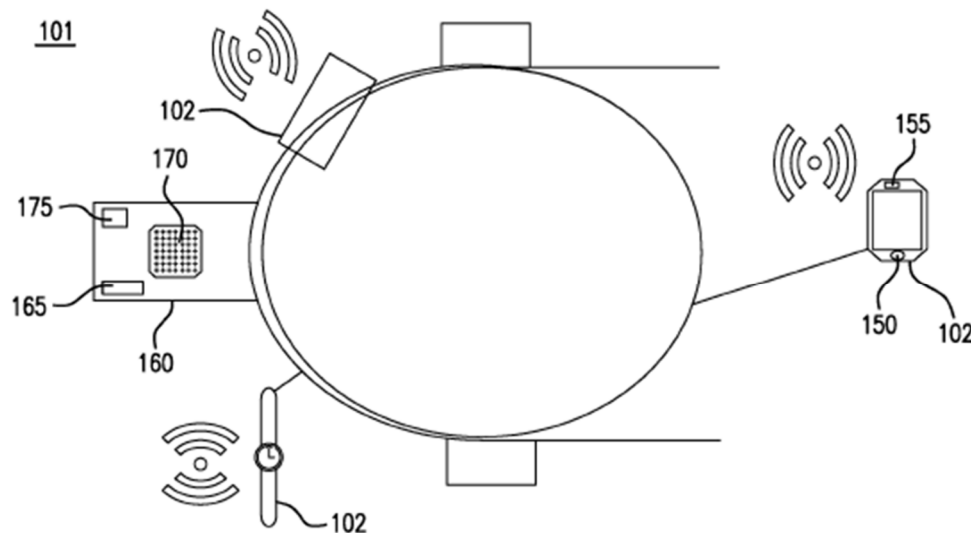
Ground	Claims	Basis
1C	3	§103: <i>DiCenso641, Smith, Warren</i>
1D	21-24	§103: <i>DiCenso641, Smith, DiCenso645</i>
1E	32	§103: <i>DiCenso641, Smith, Goldstein873</i>
2A	1, 4-11, 13-20, 25-28	§103: <i>DiCenso641, Goldstein873, Smith</i>
2B	2, 12	§103: <i>DiCenso641, Goldstein873, Smith, Holland</i>
2C	3	§103: <i>DiCenso641, Goldstein873, Smith, Warren</i>
2D	21-24	§103: <i>DiCenso641, Goldstein873, Smith, DiCenso645</i>
2E	32	§103: <i>DiCenso641, Smith, Goldstein873</i>

IV. OVERVIEW OF THE '736 PATENT

The '736 patent is directed to a system with devices “having the ability to sense the frequency and magnitude of audio signals,” and using this information to control audio output. *'736Pat.*, 8:22-32. Previously, professionals (e.g., at concert venues) and/or software controlled the audio to produce the desired output. *See id.*, 1:37-47. Prior systems, however, lacked granular control of a given individual listener’s audio output. *See id.*, 2:3-19.

The '736 patent describes a system with “clusters of various computing devices and wearable computers with sound management techniques and methods” that can sense the sound and control audio output. *Id.*, 8:9-32. An audio control source collects audio data via integrated devices and adjusts outputs so that desired sounds are intelligible, such as “important intercom announcements.” *Id.*, 8:35-40.

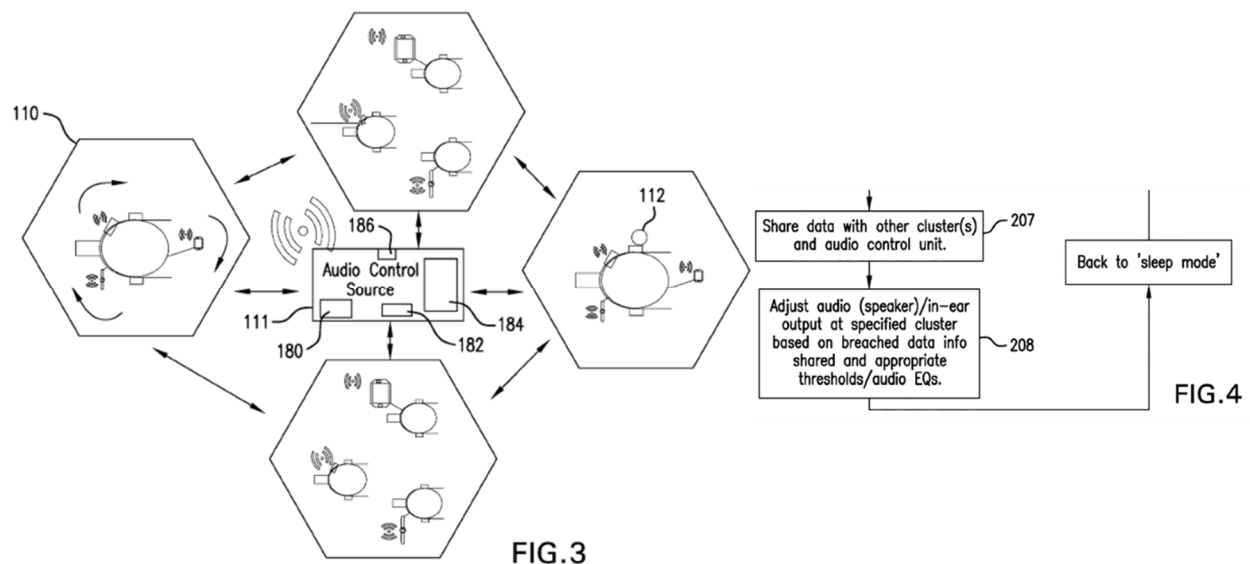
Figure 1 illustrates a cluster 101 including computing device 102 with sound sensing mechanism 150 and wireless transceiver 155. *See id.*, 11:36-44



'736Pat., FIG. 1

An output device 160 includes a speaker 170 and communications mechanism 175. *See id.*, 12:48-13:5. The output device 160 “is located within said at least one cluster 101.” *Id.*, 13:2-13:5. In some embodiments, the system includes in-ear systems. *Id.*, 8:51-63, 12:57-58, FIG. 3 (element 112).

Figure 3 illustrates audio control source 111 communicating with clusters. “The embodiment depicted [in figure 3] shows devices that sense audio signal energy within the confines of a single cluster and then sends data directly to an audio control unit and other clusters.” *Id.*, 13:6-9. The audio control source 111 adjusts “any connected output devices ... to ensure high quality/fidelity output.” *Id.*, 13:13-16; 13:40-43, FIG. 4 (step 208); *see also id.*, 8:51-63 (adjusting “in-ear monitors”), 13:2-5 (adjusting speakers).



‘736Pat., FIG. 3, FIG. 4 (excerpted)

The ’736 patent states the system performs “the functions of sensing and isolating frequency bands associated with music instruments/human voices.” *Id.*, 8:66-9:2. The sensing devices sense the audio. *Id.*, 13:59-61, FIG. 5 (step 305). The “instruments and/or frequencies are identified and isolated from the sensed audio”

(step 310), and the signal amplitude is manipulated (step 315). *Id.*, 13:62-14:3, FIG. 5.

In addition, the '736 patent discloses notifying the user (step 325) when the sensed audio is hazardous to hearing (step 320). *Id.*, 15:62-16:3, FIG. 5. Further, the system controls the dynamic range of the sensed audio to remove the hazardous audio (step 330). *Id.*, 16:4-13, FIG. 5. The system may also perform additional functions, including panning the audio (step 335), “add[] depth and texture to audio output” (step 340), and equalizing the audio (step 345). *See id.*, 16:12-16, FIGs. 5-6.

V. OVERVIEW OF THE PRIMARY PRIOR ART REFERENCES

The prior art references analyzed in the grounds below are analogous to the '736 patent because they are within the same field of endeavor as the '736 patent and are reasonably pertinent to one or more problems addressed by the '736 patent. *Kyriakakis*, ¶¶50-61.

A. *DiCenso641* (EX1005)

DiCenso641 is directed generally to “a system or method for generating a user controllable auditory environment for a user.” *DiCenso641*, [0019]. A user personalizes or customizes his/her auditory environment “using system 100 by setting different user preferences applied to different types or groups of sounds selected by an associated user interface.” *Id.*, [0023]. For example, a user interface

“allows user 120 to create a personalized or customized auditory experience by setting his/her preferences ... for associated sound types to indicate which sounds to amplify, cancel, add or insert, or attenuate, respectively.” *Id.*, [0028]. *DiCenso641* also discloses that “[o]ther functions may be used to enhance a sound by providing equalization or filtering, selective attenuation or amplification of one or more frequencies of an associated sound, or replacing an undesired sound with a more pleasant sound (using a combination of cancellation and addition/insertion, for example).” *Id.*

DiCenso641 discloses that “system 100 includes a wearable device 130 that includes at least one microphone, at least one speaker, and a microprocessor-based digital signal processor (DSP).” *Id.*, [0022]. Wearable device 130 may be implemented by multiple earpieces 134² “that each contain an associated speaker and one or more microphones or transducers.” *Id.* The “earpieces 134, may also be equipped with wireless communication (integrated Bluetooth or Wi-Fi) to connect with various external sound sources, an external user interface, or other similar wearable devices.” *DiCenso641*, [0025].

² *DiCenso641* interchangeably refers to component 134 as “headphones or ear buds” (*DiCenso641*, [0022]), “earpieces” or “ear pieces” (*id.*, [0022], [0023], [0025], [0027]), and “devices” (*id.*, [0024]).

DiCenso641 discloses implementing the user interface “within a separate mobile or wearable device, such as a smartphone” which “include[s] an associated microprocessor and/or digital signal processor that may also be used to provide additional processing power to augment the capabilities of the main system microprocessor and/or DSP.” *Id.*, [0027]. *DiCenso641* also discloses that “mobile device 320 may provide additional processing power for system 300.” *Id.*, [0039]. For example, “an unprocessed audio stream may be sent to mobile device 320, which processes the audio stream and sends this modified audio stream back to DSP 310.” *Id.*

Changes made “using the user interface are communicated to the wearable device 130 to control corresponding processing of input signals to create auditory output signals that implement the user preferences.” *Id.*, [0028]. Signals captured by one or more microphones 312 are processed and modified based on user preferences, and “[t]he modified signal is output to amp(s) 314 and speaker(s) 316 to generate the auditory environment for the user.” *Id.*, [0042].

B. *Smith* (EX1006)

Smith discloses a system and method for providing both hearing enhancement and hearing protection. *See Smith*, Abstract. Earpiece 101 includes one or multiple microphones 102. *See Smith*, [0020] (“[E]arpiece 101 can substantially contain a microphone 102, electronics 103, a connector 104, and a speaker 105. The

microphone 102 can pick up ambient sound and can transduce the sound into a signal, such as an analog electronic signal.”). When more than one microphone is used, “[e]ach microphone 102 can be comparatively more sensitive to a different portion of the audio spectrum.” *Id.* [0025]. For example, *Smith* discloses that “one microphone 102 can be sensitive to infrasound (such as sound having a frequency less than 20 Hz) and another microphone 102 can be sensitive to ultrasound (such as sound having a frequency greater than 20 kHz).” *Id.*, [0026]. *Smith* discloses that “[s]uch sounds outside of the audible range can be converted to the audible range for enhanced hearing.” *Id.*

Smith’s system also “can alert the user to otherwise inaudible sounds. Such sounds can be inaudible due to their frequency content and/or amplitude. Such inaudible sounds can be reproduced at an increased amplitude and/or different frequency so that they can be heard by the user.” *Id.*, [0027]. *Smith* also explains that “inaudible sounds can be replaced with other sounds, such as a warning, voice identification or other identification.” *Id.*

To identify individual sounds, *Smith* discloses storing sound signatures for various sounds, including inaudible sounds (*id.*, [0028]), and comparing inaudible sounds to their sound signature stored in the database and providing an indication to the user if a match is found (*id.*, [0029]).

VI. LEVEL OF ORDINARY SKILL IN THE ART

A person of ordinary skill in the art at the time of the alleged invention of the '736 patent ("POSITA"), which for purposes of this proceeding is no earlier than September 23, 2014, would have had a Bachelor of Science (or equivalent) in electrical engineering, computer science, audio engineering, or a similar field and at least two years of experience in the design of digital audio systems and associated signal processing in hearing instruments such as earphones, hearing aids, and/or hearing protectors. A greater amount of education could compensate for fewer years of work experience and vice versa. *Kyriakakis*, ¶22.

VII. CLAIM CONSTRUCTION

Petitioners are unaware of any "prior claim construction determination" by any tribunal. *See* 37 C.F.R. §42.100(b).

Here, given the close correlation and substantial identity between the prior art references and the Challenged Claims, Petitioners submit that no express constructions of the claims are necessary, and the claims should be given their ordinary meaning.³ *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312-13 (Fed. Cir. 2005) (en banc).

³ Petitioners reserve all rights to raise claim construction arguments and other arguments in any parallel or future litigation concerning the '736 patent. For

VIII. DETAILED EXPLANATION OF GROUNDS

A. Ground 1A: *DiCenso641* and *Smith* Render Obvious Claims 1, 4-11, 13-20, and 25-28

1. Claim 1

a. 1[pre]

To the extent the preamble is limiting, *DiCenso641* teaches this feature.⁴ *Kyriakakis*, ¶¶64-65. *DiCenso641* discloses “a **system** or method for generating a user controllable auditory environment for a user that may be personalized or customized in response to user preferences for particular types or groups of sounds.”⁵ *DiCenso641*, [0019].

b. 1[a]

DiCenso641 teaches this feature. *Kyriakakis*, ¶¶66-70.

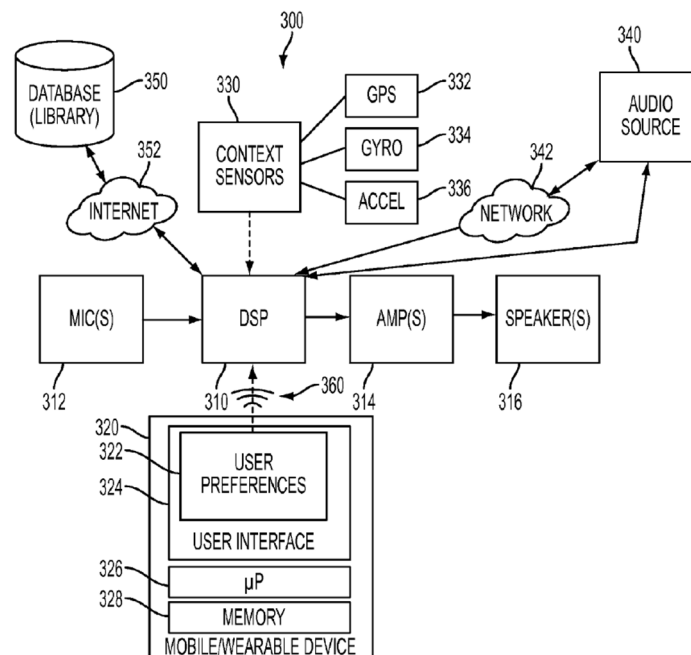
example, comparing the claims to the accused products in the litigation may raise controversies that require construction of certain claim terms.

⁴ Petitioners use the term “teaches” as including both express teachings or those fairly suggested to a POSITA. *In re Baird*, 16 F.3d 380, 383 (Fed. Cir. 1994); *In re Keller*, 642 F.2d 413, 425 (CCPA 1981) (“The test for obviousness is ... what the combined teachings of the references would have suggested to those of ordinary skill in the art.” (citations omitted)).

⁵ All **bold**/*italics*/color emphases and annotations added unless noted otherwise.

DiCenso641 discloses that “system 100 includes a wearable device 130 that includes at least one microphone, at least one speaker, and a microprocessor-based digital signal processor (DSP) as illustrated and described in greater detail with reference to FIGS. 2-6.” *DiCenso641*, [0022]. *DiCenso641* discloses that “[w]earable device 130, which may be implemented within earpieces 134, may also be equipped with wireless communication (integrated Bluetooth or Wi-Fi) to connect with various external sound sources, an external user interface, or other similar wearable devices.” *Id.*, [0025].

DiCenso641’s figure 3 depicts components of its system in communication with mobile device 320:



DiCenso641, FIG. 3

DiCenso641 discloses that “mobile device 320 may provide additional processing power for system 300.” *Id.*, [0039]. For example, *DiCenso641* explains that “an unprocessed audio stream may be sent to mobile device 320, which processes the audio stream and sends this modified audio stream back to DSP 310” of wearable device 130. *Id.* *DiCenso641* also discloses that “[t]he modified signal is output to amp(s) 314 and speaker(s) 316 to generate the auditory environment for the user.” *Id.*, [0042]; *see also id.*, [0076] (“The user listens to music on his in-ear devices, **streamed directly from his mobile device**. The system plays back the music in a very spatial way that allows him to hear the sounds of his surroundings.”).

Accordingly, *DiCenso641* teaches a mobile device 320 sending a modified audio stream to wearable device 130 for providing to the user via speaker(s) 316 (“a data source”). *Kyriakakis*, ¶70.

c. 1[b]

DiCenso641 teaches this feature. *Kyriakakis*, ¶¶71-78.

DiCenso641 discloses “system 100 includes a wearable device 130 that includes at least one microphone, at least one speaker, and a microprocessor-based digital signal processor (DSP).” *DiCenso641*, [0022]. *DiCenso641* also discloses implementing wearable device 130 by multiple earpieces 134⁶ “that each contain an

⁶ *See* footnote 2.

associated speaker and one or more microphones or transducers.” *Id.*; *see also id.*, [0024] (“[U]ser 120 wears two in-ear or intra-aural devices 134 (one in each ear)”). *DiCenso641* discloses that wearable device 130, which may be implemented within earpieces 134, is “equipped with wireless communication (integrated Bluetooth or Wi-Fi) to connect with various external sound sources, an external user interface, **or other similar wearable devices.**” *Id.*, [0025]. Thus, a POSITA would have understood *DiCenso641*’s disclosure encompass earpieces 134 communicating with each other via wireless communication (such as Bluetooth or Wi-Fi). *Kyriakakis*, ¶74. A POSITA would also have understood that, when implemented by earpieces 134, wearable device 130 comprises a pair of earpieces 134 each containing a speaker and one or more microphones or transducers, and at least one of which includes a DSP. *Kyriakakis*, ¶74. Finally, a POSITA would have understood that a device that includes a DSP comprises a “computing device.” *Kyriakakis*, ¶¶75-77 (discussing *Computer Dictionary* and *Oshana*).

Accordingly, *DiCenso641* teaches a pair of earpieces 134 (“at least one cluster”) including a first earpiece having a DSP (“of at least one computing device”). *Kyriakakis*, ¶78.

d. 1[c]

As discussed in §VIII.A.1.c, *DiCenso641* teaches at least one computing device.

(i) 1[c][i]

DiCenso641 teaches this feature. *Kyriakakis*, ¶¶79-81.

DiCenso641 discloses that the earpieces 134 each contain “one or more microphones or transducers, which may include an ambient microphone to detect ambient sounds within the ambient auditory environment.” *DiCenso641*, [0022]. *DiCenso641* also explains that ambient sounds include, for example, “traffic noise 102, a voice from a person 104 talking to user 120, various types of alerts 106, voices from a crowd or conversations 108 either not directed to user 120 or in a different spatial location than voice from person 104, nature sounds 110, and music 112.” *Id.*, [0019].

Accordingly, *DiCenso641* teaches a first earpiece 134 including an ambient microphone (“a sound sensing mechanism”) to detect ambient sounds within the ambient auditory environment (“configured to sense a noise”). *Kyriakakis*, ¶81.

(ii) 1[c][ii]

DiCenso641 teaches this feature. *Kyriakakis*, ¶¶82-90.

DiCenso641 discloses that “[w]earable device 130, which may be implemented within earpieces 134, may also be equipped with wireless communication (integrated Bluetooth or Wi-Fi) to connect with various external sound sources, an external user interface, or other similar wearable devices.” *DiCenso641*, [0025]. *DiCenso641* discloses that “the user interface may be

implemented within a separate mobile or wearable device, such as a smartphone” *Id.*, [0027]. Thus, *DiCenso641* discloses earpieces 134 wirelessly communicating with mobile device 320. *Kyriakakis*, ¶83; *see also DiCenso641.*, [0023], [0039], FIG. 3 (wireless communications link 360).

DiCenso641 also discloses the mobile device 320 providing “additional processing power for system 300.” *Id.*, [0039]. For example, *DiCenso641* discloses earpieces 134 sending an unprocessed audio stream and receiving back a modified audio stream from mobile device 320. *Id.* (“an unprocessed audio stream may be sent to mobile device 320, which processes the audio stream and sends this modified audio stream back to DSP 310”). *Kyriakakis*, ¶84.

The specification of the ’736 patent does not refer to a “bus” or an “electronic bus.” It does, however, state that the computing device comprises a wireless transceiver for communicating with the audio control source/data source. *See, e.g., ’736Pat.*, 6:31-33, 12:58-63, 16:56-64. Additionally, claims 25 and 26 recite that a transmission medium for wirelessly transmitting and receiving data from the data source comprises a wireless transceiver. *Id.*, claims 25 & 26. Accordingly, a POSITA would have understood “an electronic bus which is configured to transmit and receive data from the data source” as recited in claim 1 to encompass a wireless transceiver. *Kyriakakis*, ¶85.

A POSITA would have understood *DiCenso641* disclosing earpieces 134 being “equipped with wireless communication (integrated Bluetooth or Wi-Fi)” to encompass *DiCenso641*’s earpieces 134 including a wireless transceiver. *Kyriakakis*, ¶86. A POSITA would also have understood that because earpieces 134 include integrated Bluetooth technology, earpieces 134 necessarily include a transceiver because Bluetooth is a two way communication protocol and must both receive and transmit information. *Kyriakakis*, ¶86 (discussing *Lyle*); *see also Lyle* (EX1012), [0002] (“Bluetooth® technology ... us[es] **a frequency hopping tranceiver** [*sic*].”).⁷

A POSITA would also have understood *DiCenso641* to teach each of earpieces 134 sending an unprocessed audio stream captured by the microphones on the respective earpiece 134 to mobile device 320 and receiving back a modified audio stream from mobile device 320 for outputting on the speaker(s) of the respective earpiece 134. *Kyriakakis*, ¶87. For example, *DiCenso641* discloses receiving a signal from multiple microphones. *DiCenso641*, [0042] (disclosing “generating a customized or personalized user controllable auditory environment based on sounds from the ambient auditory environment **by receiving a signal**

⁷ *Lyle* is used to demonstrate a POSITA’s knowledge; it is not part of the unpatentability ground.

representing the sounds in the ambient auditory environment of the user **from one or more microphones 312.**”). *DiCenso641* also discloses generating separate signals for outputting on the speakers of the respective earpieces. For example, *DiCenso641* discloses dividing a received ambient audio signal into component signals before “generating a left signal and a right signal for each of the plurality of component signals based on a corresponding desired spatial position for the type of sound within the auditory environment of the user, combining the left signals into a combined left signal, and combining the right signals into a combined right signal.” *Id.*, [0007]. *DiCenso641* explains that “[t]he combined left signal is provided to a first speaker and the combined right signal is provided to a second speaker.” *Id.*; see also *id.*, [0045]. As such, a POSITA would have understood each of *DiCenso641*’s earpieces 134 to include a wireless transceiver to wirelessly communicate with mobile device 320. *Kyriakakis*, ¶88.

At a minimum, a POSITA would have found it obvious to include a wireless transceiver in each earpiece 134 because *DiCenso641* already discloses using a wireless transceiver for the wearable device 130 to communicate with the mobile device 320, and it also discloses the mobile device generating a left signal and a right signal for output. *Kyriakakis*, ¶89. Thus, incorporating a wireless transceiver in each earpiece would have amounted to mere application of a known technique (using a wireless transceiver to communicate between a mobile device and a wearable

device) to a similar device (*DiCenso641*'s two earpieces) ready for improvement to yield predictable results (the mobile device transmitting left and right signals to left and right earpieces, respectively). *Kyriakakis*, ¶89.

Accordingly, *DiCenso641* teaches a pair of earpieces 134 including a first earpiece having integrated Bluetooth or Wi-Fi technology that includes a wireless transceiver (“an electronic bus”) for sending, for example, an unprocessed audio stream and receiving back a modified audio stream (“which is configured to transmit and receive data”) from mobile device 320 (“from the data source”). *Kyriakakis*, ¶90.

(iii) 1[c][iii]

DiCenso641 teaches this feature. *Kyriakakis*, ¶¶91-94.

As discussed in §VIII.A.1.d(ii), *DiCenso641* teaches earpieces 134 each in wireless communication with mobile device 320. As also discussed in §VIII.A.1.c, a POSITA would have understood that each earpiece 134 includes a speaker and one or more microphones or transducers, and at least one earpiece includes a DSP. *Kyriakakis*, ¶93. Thus, a POSITA would have understood *DiCenso641* to disclose a pair of earpieces 134 including a second earpiece having at least a speaker and one or more microphones or transducers. *Kyriakakis*, ¶93.

Accordingly, *DiCenso641* teaches the mobile device 320 in wireless communication (“wherein the data source is in electronic communication”) with a

first earpiece of earpieces 134 (“with the at least one cluster”) and the second earpiece (“and at least one output device”). *Kyriakakis*, ¶94.

e. 1[d]

DiCenso641 teaches this feature. *Kyriakakis*, ¶¶95-98.

DiCenso641 discloses device 130 “includes at least one microphone, at least one speaker, and **a microprocessor-based digital signal processor (DSP).**” *DiCenso641*, [0022]; *see also id.*, [0032] (disclosing “digital signal processor (DSP) 310 in communication with one or more microphones 312, one or more amplifiers 314 and one or more speakers 316.”); *Kyriakakis*, ¶96. *DiCenso641* also discloses its “functions or logic may be performed by hardware and/or software executed by a programmed microprocessor. Functions implemented at least partially by software may be stored in a computer program product comprising a non-transitory computer readable storage medium having stored data representing code or instructions executable by a computer or processor to perform the indicated function(s).” *DiCenso641*, [0031]. Thus, a POSITA would have understood that the functionality described with respect to microprocessor-based DSP 310 are performed by executing code stored in a computer readable storage medium accessible to the DSP 310. *Kyriakakis*, ¶97_.

Accordingly, *DiCenso641* teaches a computer readable storage medium (“a memory”) containing code or instructions executable by DSP 310 (“containing computer-executable instructions”). *Kyriakakis*, ¶98.

f. 1[e]

DiCenso641 teaches this feature. *Kyriakakis*, ¶¶99-102.

As discussed in §VIII.A.1.e, *DiCenso641* teaches a microprocessor-based DSP 310 (“a processor”) implementing functionality by executing code or instructions stored in a computer readable storage medium (“configured to execute the computer-executable instructions”). *Kyriakakis*, ¶101.

Moreover, because as discussed herein and in §VIII.A.1.e, *DiCenso641*’s DSP 310 operates by executing code stored in a computer readable storage medium, the *DiCenso641-Smith* combination teaches that when the code stored in the computer readable storage medium is executed by DSP 310, the microprocessor performs operations that meet the claim elements discussed in §§VIII.A.1.f(i)-VIII.A.1.f(iii) and the dependent claims discussed below.

(i) 1[e][i]

DiCenso641 teaches this feature. *Kyriakakis*, ¶¶103-105.

DiCenso641 discloses that the system may communicate with a local or remote database or library 350 that “include[s] sound libraries having stored sounds and/or associated signal characteristics for use by DSP 310 in **identifying a**

particular type or group of sounds from the ambient audio environment.”

DiCenso641, [0040]. *DiCenso641* also discloses “generat[ing] a customized or personalized user controllable auditory environment based on sounds from the ambient auditory environment by receiving a signal representing the sounds in the ambient auditory environment of the user from one or more microphones 312.” *Id.*, [0042]. To do so, “DSP 310 processes the signal ... to identify at least one of a plurality of types of sounds in the ambient auditory environment.” *Id.*; *see also id.*, claims 1, 15, & 22.

Accordingly, *DiCenso641* teaches DSP 310 identifying at least one of a plurality of types of sounds in the ambient auditory environment (“identifying one or more sounds within the noise”). *Kyriakakis*, ¶105.

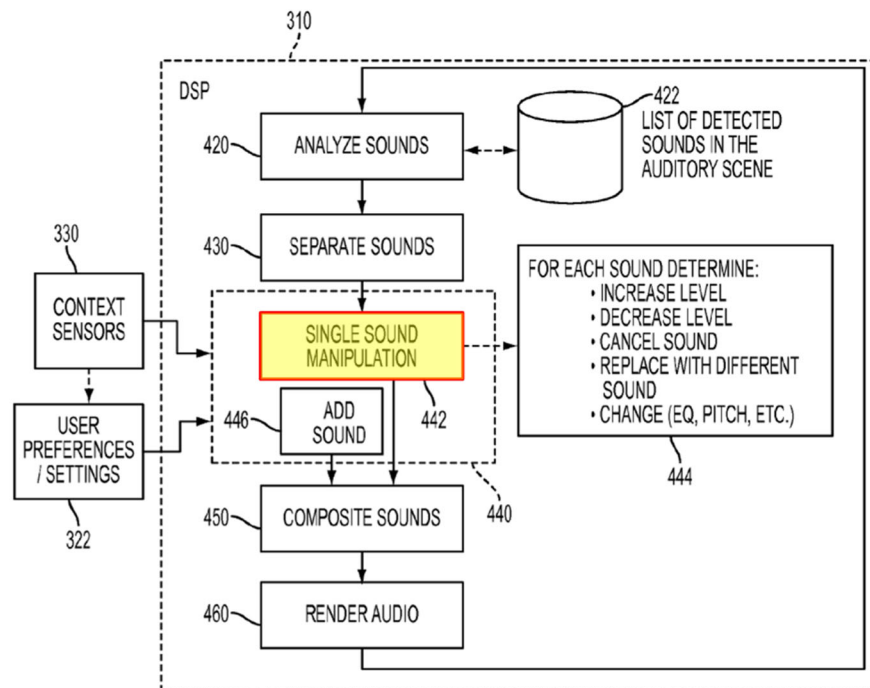
(ii) 1[e][ii]

DiCenso641 teaches this feature. *Kyriakakis*, ¶¶106-110.

DiCenso641’s “DSP 310 processes the signal ... to identify at least one of a plurality of types of sounds in the ambient auditory environment.” *DiCenso641*, [0042]. *DiCenso641* explains that “DSP 310 receives user preferences 322 corresponding to each of the plurality of types of sounds and modifies the signal for each type of sound in the ambient auditory environment based on the corresponding user preference.” *Id.* Modifying the signal “include[s] increasing level or volume, decreasing level or volume, canceling a particular sound, replacing a sound with a

different sound (a combination of cancelling and inserting/adding a sound), or changing various qualities of a sound, such as equalization, pitch, etc.” *Id.*, [0044].

Before modifying the signal, *DiCenso641* discloses that “DSP 310 may **separate sounds or divide signals associated with particular sounds** as represented at 430. Each sound type or group may be modified or manipulated as represented at 442.” *Id.* In Figure 4, *DiCenso641* describes step 442 as “single sound manipulation.”



DiCenso641, FIG. 4 (annotated)

Thus, a POSITA would have understood *DiCenso641* to disclose separating sounds to enable individual sounds to be modified (or manipulated) without impacting other sounds. *Kyriakakis*, ¶109. For example, user interface 324 “allows user 120 to create

a personalized or customized auditory experience by setting his/her preferences indicated by symbols 140, 142, 144, 146, for associated sound types to indicate which sounds to amplify, cancel, add or insert, or attenuate, respectively.” *DiCenso641*, [0028]. Thus, a POSITA would have understood *DiCenso641* to disclose separating the sounds from one another (or isolating the sounds) in order to individually modify or manipulate such sounds. *Kyriakakis*, ¶109.

Accordingly, *DiCenso641* teaches DSP 310 separating sounds or dividing signals associated with particular sounds (“isolating the one or more sounds”) before modifying the signals based on corresponding user preferences. *Kyriakakis*, ¶110.

(iii) 1[e][iii]

DiCenso641-Smith teaches this feature. *Kyriakakis*, ¶¶111-120.

Smith discloses that its earpiece 101 includes one or multiple microphones 102. *See Smith*, [0020] (“[E]arpiece 101 can substantially contain a microphone 102 [to] pick up ambient sound and [] transduce the sound into ... an analog electronic signal.”), [0025] (“More than one microphone 102 can be used.”). *Smith* discloses that the “[o]ne or more microphones 102 can be sensitive to one or more portions of the audio spectrum that are considered to be outside of the audible range. For example, one microphone 102 can be sensitive to infrasound (such as sound having a frequency less than 20 Hz) and another microphone 102 can be sensitive to ultrasound (such as sound having a frequency greater than 20 kHz).” *Id.*, [0026].

Smith further discloses that “sounds outside of the audible range can be converted to the audible range for enhanced hearing. Thus, infrasound can be up converted in frequency and ultrasound can be down converted in frequency to facilitate processing and/or human hearing.” *Id.* *Smith* also discloses that its system “can alert the user to otherwise inaudible sounds. **Such sounds can be inaudible due to their frequency content and/or amplitude. Such inaudible sounds can be reproduced at an increased amplitude and/or different frequency so that they can be heard by the user.**” *Id.*, [0027]. To do so, *Smith* discloses storing sound signatures for various sounds, including inaudible sounds, in a database. *See id.*, [0028]. *Smith* also discloses comparing inaudible sounds to their sound signature stored in the database and providing an indication to the user if a match is found. *Id.*, [0029]. Thus, a POSITA would have understood *Smith* to disclose identifying sounds outside of the audible range and that doing so entails determining that the sound includes a frequency outside of the audible range—*e.g.*, less than 20 Hz or greater than 20 kHz. *Kyriakakis*, ¶114.

A POSITA would have been motivated to modify *DiCenso641* in view of *Smith* to determine, for example, when a sound includes a frequency greater than 20 kHz. *Kyriakakis*, ¶115. Indeed, both *DiCenso641* and *Smith* are directed to systems and methods for providing an altered auditory environment for a user. For example, *DiCenso641* discloses the user interface “allows user 120 to create a personalized or

customized auditory experience by setting his/her preferences ... for associated sound types to indicate which sounds to amplify, cancel, add or insert, or attenuate, respectively.” *DiCenso641*, [0028]. *Smith* similarly discloses a system and method for modifying select sounds within an ambient environment. *Smith*, [0082] (“[A] user can select which types of noise are to be attenuated and the level of attenuation. For example, the user can select to attenuate gunshot noise by 12 dB, dog barking by 6 dB, and car noise by 3 dB.”), [0085].

A POSITA would have recognized the benefit of implementing *Smith*’s teachings for processing inaudible sounds in *DiCenso641*’s system. *Kyriakakis*, ¶116. For example, a POSITA would have understood converting sounds outside the audible range to the audible range and/or that alerting the user to otherwise inaudible sounds would provide enhanced hearing and awareness, and an enhanced auditory environment. *Kyriakakis*, ¶116. A POSITA would also have understood that identifying inaudible sounds would enable such sounds to be altered (*e.g.*, reproduced at a different frequency) and potentially replaced with other sounds, such as an alert, a warning, or other identification. *Kyriakakis*, ¶116. A POSITA would thus have been motivated to modify DSP 310’s programming to also perform the additional processing steps described by *Smith* on audio streams. *Kyriakakis*, ¶116.

A POSITA would also have been motivated to modify *DiCenso641*’s earpieces 134 to incorporate additional microphones—for example, at least one

microphone sensitive to infrasound and one microphone sensitive to ultrasound—as taught by *Smith* to enable this additional capability taught by *Smith* in *DiCenso641*’s system. *Kyriakakis*, ¶117. A POSITA would have recognized that including, for example, at least ultrasound microphone in order to incorporate *Smith*’s teaching for identifying and processing otherwise inaudible sounds would promote, or at a minimum be consistent with, *DiCenso641*’s stated objective to generate a user controllable auditory environment. *Kyriakakis*, ¶117. A POSITA would also have had a reasonable expectation of success at least because *DiCenso641* expressly contemplates having more than one microphone in each earpiece 134. *See DiCenso641*, [0022] (“Wearable device 130 may be implemented by headphones or ear buds 134 that each contain an associated speaker and **one or more microphones or transducers**”); *Kyriakakis*, ¶117.

The combination would have been obvious to a POSITA because it would have amounted to mere use of a known technique (*Smith*’s teaching of identifying and processing inaudible sounds) to improve a similar system (*DiCenso641*’s system for providing a personalized or customized auditory experience via earpieces 134) in the same way (by allowing the user to be aware of, for example, otherwise inaudible infrasonic and ultrasonic sounds). *Kyriakakis*, ¶118.

As discussed in §VIII.A.1.f(ii), a POSITA would have understood *DiCenso641* to disclose separating the sounds from one another (or isolating the

sounds) in order to individually modify or manipulate such sounds. *Kyriakakis*, ¶119. A POSITA would have found it obvious that in the *DiCenso641-Smith* combination, the DSP 310 would continue to first separate (or isolate) sounds identified within signals captured by the microphones 312 before performing the further processing taught by *Smith*. Thus, for example, the *DiCenso641-Smith* combination would first separate (or isolate) the portion of the signal comprising ultrasonic frequencies, and then down convert those frequencies as taught by *Smith* to allow the user to hear them. *Kyriakakis*, ¶119. A POSITA would have recognized that doing so would have promoted, or at least remain consistent with, *DiCenso641*'s stated goal of allowing a user to “create a personalized or customized auditory experience by setting his/her preferences ... for **associated sound types** to indicate **which sounds** to amplify, cancel, add or insert, or attenuate, respectively.” *DiCenso641*, [0028]; *Kyriakakis*, ¶119.

Accordingly, the *DiCenso641-Smith* combination teaches DSP 310 determining whether a sound includes, for example, a frequency greater than 20 kHz (“determining if one or more of the isolated one or more sounds includes a frequency outside of a predetermined threshold”). *Kyriakakis*, ¶120.

2. Claim 4

DiCenso641-Smith teaches this claim. *Kyriakakis*, ¶¶121-126.

As discussed in §VIII.A.1.f(iii), a POSITA would have found it obvious to modify *DiCenso641*'s earpieces 134 to incorporate additional microphones—*e.g.*, at least one microphone sensitive to ultrasound—as taught by *Smith. Kyriakakis*, ¶122. A POSITA would also have understood that a microphone sensitive to infrasound comprises an infrasonic transducer and that a microphone sensitive to ultrasound comprises an ultrasonic transducer. *DiCenso641*, [0022] (disclosing that the earpieces 134 each contains “**one or more microphones or transducers**”); *Smith*, [0020] (microphone 102 “**transduce[s] the sound into a signal, such as an analog electronic signal**”); *Kyriakakis*, ¶¶123-124 (discussing *Computer Dictionary* and *Rossing*). Indeed, the '736 patent itself acknowledges that the sound-sensing mechanism is a microphone, and that a microphone is a type of transducer. *'736Pat.*, 13:59-61 (“At step 305, audio/noise is sensed by one or more audio sensing devices ... [that] are microphones.”), 14:4-10 (disclosing “sens[ing] audio **using an audio transducer such as a microphone**”).

Accordingly, the *DiCenso641-Smith* combination teaches *DiCenso641*'s earpieces 134 including at least one ultrasonic microphone (“an ultrasonic transducer”) or infrasonic microphone (“infrasonic transducer”). *Kyriakakis*, ¶126.

3. Claim 5

DiCenso641-Smith teaches this claim. *Kyriakakis*, ¶¶127-129.

As discussed in §VIII.A.1.f(iii), the *DiCenso641-Smith* combination teaches the sound captured by microphones 312 of earpieces 134 including sound with a frequency outside of the audible range (*e.g.*, greater than 20 kHz) (“ultrasonic soundwaves”). *Kyriakakis*, ¶129.

4. Claim 6

DiCenso641-Smith teaches this claim. *Kyriakakis*, ¶¶130-132.

As discussed in §VIII.A.1.f(iii), the *DiCenso641-Smith* combination teaches DSP 310 determining whether sound(s) detected by earpiece(s) 134 include a frequency outside of the audible range (*e.g.*, greater than 20 kHz) and, if so, down converting such sound(s) outside of the audible range to the audible range. A POSITA would also have understood that frequencies greater than 20 kHz comprise frequencies determined to pose a risk of harm to a user’s hearing capabilities. *Kyriakakis*, ¶131. For example, a POSITA would have appreciated it was known in the art that ultrasonic sounds (*i.e.*, sounds having a frequency greater than 20 kHz) were at some point determined to pose a risk of harm to a user’s hearing capabilities. *See, e.g., Wiernicki* at 13-14 (“These standards are consistent in that they present exposure limits to prevent subjective effects at one-third octave bands centered at or below 20 kHz **and exposure limits for one-third octave bands at 20 kHz and**

above to prevent thermal effects and hearing loss from possible subharmonics.”)⁸; *Kyriakakis*, ¶131.

Accordingly, the *DiCenso641-Smith* combination teaches determining whether sound(s) include a frequency greater than 20 kHz (“determining if one or more of the isolated one or more sounds includes a frequency outside of a predetermined threshold”), which comprises frequencies known in the art to pose a risk of harm to a user’s hearing capabilities (“wherein the predetermined threshold equates to a frequency determined to pose a risk of harm to a user’s hearing capabilities”). *Kyriakakis*, ¶132.

5. Claim 7

DiCenso641-Smith teaches this claim. *Kyriakakis*, ¶¶133-139.

As discussed in §VIII.A.1.f(iii), a POSITA would have found it obvious to incorporate *Smith*’s teachings for processing inaudible sounds into *DiCenso641*’s system. *Kyriakakis*, ¶134.

In addition to disclosing up converting and/or down converting inaudible sounds (see §§VIII.A.1.f(iii) and VIII.A.10.a), *Smith* also explains that “inaudible sounds can be replaced with other sounds, such as a warning, voice identification or

⁸ *Wiernicki* is used to demonstrate a POSITA’s knowledge; it is not part of the unpatentability ground.

other identification.” *Smith*, [0027]. *DiCenso641* also discloses that the user interface “allows user 120 to create a personalized or customized auditory experience by setting his/her preferences ... for associated sound types to indicate which sounds to amplify, cancel, **add or insert**, or attenuate, respectively. Other functions may be used to enhance a sound by ... replacing an undesired sound with a more pleasant sound (using a combination of cancellation and addition/insertion, for example).” *DiCenso641*, [0028]. *DiCenso641* also notes that user preferences may include “one **or more** modifications to the associated sound.” *Id.*, [0033].

When incorporating *Smith*’s teachings for processing inaudible sounds in *DiCenso641*’s system, a POSITA would also have found it obvious to further modify *DiCenso641*’s system to present a user 120 the option to provide an alert, such as a warning, voice identification or other identification—as taught by *Smith*—when sounds are detected outside the audible range. *Kyriakakis*, ¶136. In other words, a POSITA would have found it obvious to further modify the *DiCenso641-Smith* combination such that, when a sound is detected with, for example, a frequency greater than 20 kHz, in addition to down converting the sound to within the audible range, DSP 310 is configured to provide an alert responsive to the inaudible sound being detected (as taught by *Smith*). *Kyriakakis*, ¶136. A POSITA would also have understood that such an alert would amount to an audible notification of the presence of such an inaudible sound within the signals captured by the one or more

microphones or transducers of earpieces 134. *Kyriakakis*, ¶136; *see also* '736Pat., 15:64-16:2 (“According to an embodiment, if audio in the hazardous range has been detected, then one or more users are notified, at step 325. The notification may take the form of a visual notification, an audible notification, and/or any other suitable form of notification.”).

A POSITA would have also found the modification obvious because it would have amounted to applying a known technique (*Smith*'s teaching regarding processing inaudible sounds, including providing a warning or other identification for inaudible sounds) to a known device (the *DiCenso641-Smith* combination that processes inaudible sounds) ready for improvement to yield predictable results (further modifying the *DiCenso641-Smith* combination to provide a warning or other identification regarding inaudible sounds in addition to up converting and/or down converting such sounds). *Kyriakakis*, ¶137. A POSITA would have also had a reasonable expectation of success in doing so as it would have merely involved programming additional digital signal processing operations already taught and performed by *Smith* to be performed by *DiCenso641*'s DSP 310. *Kyriakakis*, ¶138.

Accordingly, the *DiCenso641-Smith* combination teaches if an inaudible sound is detected that corresponds to a frequency for which user preferences indicate that an alert should be provided (“if one or more of the isolated one or more sounds includes the frequency outside of the predetermined threshold”), DSP 310 provides

an alert to user 102 via speaker(s) of earpieces 134 (“notifying a user, via a notification, that one or more of the isolated one or more sounds includes the frequency outside of the predetermined threshold”). *Kyriakakis*, ¶139.

6. Claim 8

DiCenso641-Smith teaches this claim.⁹ *Kyriakakis*, ¶¶140-148.

DiCenso641 discloses other functions may be used to enhance a sound, including “providing equalization” of the sound. *DiCenso641*, [0028]; *see also id.*, Abstract (“A microprocessor processes ambient sounds and generates modified audio signals using ... **equalization** based on user preferences associated with particular types of sounds.”), [0007] (“Modifying the signal may include ... **equalizing the component signal**”), [0044] (“Each sound type or group may be modified or manipulated ... [by] changing various qualities of a sound, **such as equalization**, pitch, etc.”), claim 10 (“wherein modifying the signal ... comprises ... **equalizing the signal**”).

⁹ *See Brown v. 3M*, 265 F.3d 1349, 1351 (Fed. Cir. 2001) (“When a claim covers several structures or compositions, either generically or as alternatives, the claim is deemed anticipated if any of the structures or compositions within the scope of the claim is known in the prior art.”).

Accordingly, the *DiCenso641-Smith* combination teaches providing equalization of the signal captured by one or more microphones 312 (“equalizing the sensed noise”). *Kyriakakis*, ¶142.

DiCenso641 also discloses wearable device 130 including context sensors “to determine accurately the user’s location and/or head position and orientation. This allows the system to reproduce voices and sounds in the correct spatial position as they occur within the ambient auditory environment to not confuse the user.” *DiCenso641*, [0026]. “As an example, if a voice comes from the left of the user and he turns his head 45 degrees toward his left, the voice is placed in the correct location of the stereo panorama to not confuse the user’s perception.” *Id.*; *see also id.*, [0034] (disclosing “virtually locat[ing] the sound(s) within the auditory environment of the user using stereo or multiple speaker arrangements”), [0045]. A POSITA would have understood reproducing sounds captured by one or more microphones 312 in the correct spatial position within a stereo panorama, as described in *DiCenso641*, comprises panning the sounds. *Kyriakakis*, ¶144.

Notably, while the ’736 patent refers to panning as “separating like frequencies” (’906Pat., 9:2-4, 16:12-13), this is neither consistent with the ordinary meaning of the term “panning” in the art nor sufficient to constitute lexicography. *Kyriakakis*, ¶¶145-146 (discussing *Rossing*, *Kirkeby*, *Eppolito*, and *Avendano*). Nevertheless, to the extent that PO argues and the Board finds that “panning” as used

in claim 8 refers to “separating like frequencies,” *DiCenso641*’s disclosure of filters meets this limitation because a POSITA would have understood filtering includes the separation of frequencies. *DiCenso641*, [0028]; *Kyriakakis*, ¶147 (discussing *Ramo* and *Rossing*).¹⁰

Accordingly, the *DiCenso641-Smith* combination also teaches reproducing in the correct spatial position within a stereo panorama sounds captured by one or more microphones 312 (“panning the sensed noise”). *Kyriakakis*, ¶148.

7. Claim 9

DiCenso641-Smith teaches this claim. *Kyriakakis*, ¶¶149-153.

Claim 9 does not limit where the in-ear device is in the claimed system or how it relates to the components recited in claim 1. The ’736 patent also contemplates that “various in-ear systems may be integrated into the present invention,” including “an in-ear monitor” and that “the output of such an in-ear monitor can be autonomously adjusted after sensing audio output.” ’736*Pat.*, 8:51-65. Accordingly, a POSITA would have understood the plain and ordinary meaning of this claim to encompass as if claim 1 were written as “... at least one output device including an in-ear device, wherein an audio output of the in-ear device auto-adjusts based on

¹⁰ *Rossing*, *Kirkeby*, *Eppolito*, *Avendano*, and *Ramo* are used to demonstrate a POSITA’s knowledge; they are not part of the unpatentability ground.

signal energy sensed within a cluster or surrounding clusters, the at least one output device including:” *Kyriakakis*, ¶150.

DiCenso641 discloses earpieces 134 comprising “in-the-ear devices that partially or substantially completely seal the ear canal of user 120 to provide passive attenuation of ambient sounds.” *DiCenso641*, [0022]; *see also id.*, [0023] (“In one embodiment, wearable device 130 includes in-the-ear or intra-aural earpieces 134”). *DiCenso641* also discloses that the user interface “allows user 120 to create a personalized or customized auditory experience by setting his/her preferences ... for associated sound types to indicate which sounds to amplify, cancel, add or insert, or attenuate, respectively.” *Id.*, [0028]. For example, *DiCenso641* discloses that “DSP 310 receives user preferences 322 corresponding to each of the plurality of types of sounds and modifies the signal for each type of sound in the ambient auditory environment based on the corresponding user preference.” *Id.*, [0042]. *DiCenso641* further discloses that “[t]he modified signal is output to amp(s) 314 and speaker(s) 316 to generate the auditory environment for the user.” *Id.* A POSITA would thus have understood *DiCenso641* to disclose automatically adjusting the signal output via speaker(s) 316 based on the signals captured by one or more microphones 312. *Kyriakakis*, ¶152.

Accordingly, the *DiCenso641-Smith* combination teaches each of earpieces 134 comprising an in-the-ear device (“an in-ear device”) and that the signal output

via the speakers 316 of earpieces 134 is automatically adjusted based on the signals captured by one or more microphones 312 (“wherein an audio output of the in-ear device auto-adjusts based on signal energy sensed within a cluster”). *Kyriakakis*, ¶153.

8. Claim 10

DiCenso641-Smith teaches this claim. *Kyriakakis*, ¶¶154-157.

For the reasons discussed in §VIII.A.1.e, *DiCenso641* teaches the wearable device 130—which can be implemented as earpieces 134—having a microprocessor-based DSP 310, and that, when implementing the functionality described with respect to DSP 310, code or instructions executable by DSP 310 would be stored in a computer readable storage medium. As discussed in §VIII.A.1.f(iii), the *DiCenso641-Smith* combination teaches *DiCenso641*’s DSP 310 determining that a sound includes a frequency outside of the audible range and converting such sounds outside of the audible range to the audible range for enhanced hearing. A POSITA would have understood DSP 310’s operation in the *DiCenso641-Smith* combination to be automatic inasmuch as the DSP would execute relevant code without requiring further human intervention. *Kyriakakis*, ¶156.

Accordingly, the *DiCenso641-Smith* combination teaches determining whether sound(s) include a frequency outside of the audible range (*e.g.*, greater than 20 kHz) and, if so, converting such sound(s) outside of the audible range to the

audible range for enhanced hearing (“altering the one or more of the isolated one or more sounds so that the frequency does not fall outside of the predetermined threshold”) automatically based on code or instructions stored in a computer readable storage medium and executed by DSP 310 (“is performed automatically”). *Kyriakakis*, ¶157.

9. Claim 25

DiCenso641-Smith teaches this claim. *Kyriakakis*, ¶¶158-160. As discussed in §VIII.A.1.d(ii), *DiCenso641* discloses earpieces 134 sending an unprocessed audio stream and receiving back a modified audio stream from mobile device 320, and a POSITA would have understood each of *DiCenso641*’s earpieces 134 to include a wireless transceiver to wirelessly communicate with mobile device 320. *Kyriakakis*, ¶159.

Accordingly, the *DiCenso641-Smith* combination teaches a pair of earpieces 134 including a first earpiece having integrated Bluetooth or Wi-Fi technology that includes a wireless transceiver (“a transmission medium comprising a wireless transceiver”) for sending an unprocessed audio stream and receiving back a modified audio stream (“configured to wirelessly transmit and receive data”) from mobile device 320 (“from the data source”). *Kyriakakis*, ¶160.

10. Claim 27

a. 27[a]

DiCenso641-Smith teaches this feature. *Kyriakakis*, ¶¶161-163.

As discussed in §VIII.A.1.f(iii), *Smith* discloses determining that a sound includes a frequency outside of the audible range and converting such sounds to the audible range. For example, *Smith* discloses that “infrasound can be up converted in frequency and ultrasound can be down converted in frequency to facilitate processing and/or human hearing.” *Smith*, [0026]. Also, for the reasons discussed in §VIII.A.1.f(iii), it would have been obvious to a POSITA to modify *DiCenso641* based on *Smith* to incorporate *Smith*’s teachings for processing inaudible sounds via *DiCenso641*’s DSP 310. *Kyriakakis*, ¶162. As also discussed in §VIII.A.1.f(iii), a POSITA would also have understood that, when implementing *Smith*’s teaching of identifying and processing inaudible sounds, *DiCenso641*’s DSP 310 would first separate (or isolate) sounds identified within signals captured by the microphones 312 before further processing and modifying the sounds. *Kyriakakis*, ¶162.

Accordingly, the *DiCenso641-Smith* combination teaches DSP 310 determining whether isolated sound(s) detected by earpiece(s) 134 include a frequency outside of the audible range (*e.g.*, greater than 20 kHz) (“if one or more of the isolated one or more sounds includes the frequency outside of the predetermined threshold”) and, if so, converting such sound(s) outside of the audible

range to the audible range (“altering the one or more of the isolated one or more sounds so that the frequency does not fall outside of the predetermined threshold”). *Kyriakakis*, ¶163.

b. 27[b]

DiCenso641-Smith teaches this feature. *Kyriakakis*, ¶¶164-166.

DiCenso641 discloses that, after modifying sounds by applying user preferences to associated sounds within the ambient auditory environment, “[t]he modified sounds are then provided to one or more speakers associated with or integrated with the wearable device.” *DiCenso641*, [0034]; *see also id.*, [0042] (“The modified signal is output to amp(s) 314 and speaker(s) 316 to generate the auditory environment for the user.”); §VIII.A.1.d(iii) (describing each earpiece 134 having a speaker 316 for outputting a modified signal to generate an auditory environment for a user).

Accordingly, the *DiCenso641-Smith* combination teaches *DiCenso641*’s DSP 310 separating the sounds from one another in order to individually modify or manipulate such sounds and then outputting the modified sounds (“outputting the isolated one or more sounds”) to the speakers 316 on earpieces 134 (“on the at least one output device”) to generate the auditory environment for the user. *Kyriakakis*, ¶166.

11. Claim 11

a. 11[pre]

To the extent the preamble is limiting, *DiCenso641* teaches this feature. *Kyriakakis*, ¶¶167-169. For example, *DiCenso641* discloses “a system or **method** for generating a user controllable auditory environment for a user that may be personalized or customized in response to user preferences for particular types or groups of sounds.” *DiCenso641*, [0019]; *see also id.*, [0028], [0034], [0042].

Accordingly, *DiCenso641* teaches a method for generating a user controllable auditory environment that includes modifying sounds in the ambient auditory environment (“a method of managing sensed noise”). *Kyriakakis*, ¶169.

b. 11[a] through 11[e][iii]

Independent claim 11 simply recites a method for providing the physical components of the system recited in claim 1. *See, e.g., '736Pat.*, claim 11 (the method comprising “providing at least one data source,” “providing at least one cluster of at least one computing device,” etc.). Accordingly, the *DiCenso641-Smith* combination which teaches each component of the system of claim 1 also teaches providing such components for the same reasons discussed with respect to claim 1 in §VIII.A.1.b through §VIII.A.1.f(iii).. The same also applies to claims depending from claim 11.

12. Claims 13-17, 19-20, 26, and 28

DiCenso641-Smith teaches claims 13-17, 19-20, 26 and 28 for the same reasons as discussed with respect to claims 4-10, 25 and 27, according to the table below.

Claim	Section(s)
13	VIII.A.2 (claim 4)
14	VIII.A.3 (claim 5)
15	VIII.A.4 (claim 6)
16	VIII.A.5 (claim 7)
17	VIII.A.6 (claim 8)
19	VIII.A.6 (claim 8)
20	VIII.A.8 (claim 10)
26	VIII.A.9 (claim 25)
28	VIII.A.10.a & VIII.A.10.b (claim 27)

13. Claim 18

DiCenso641-Smith teaches this claim. *Kyriakakis*, ¶¶186-188.

DiCenso641 discloses “DSP 310 receives user preferences 322 corresponding to each of the plurality of types of sounds and modifies the signal for each type of sound in the ambient auditory environment based on the corresponding user

preference.” *DiCenso641*, [0042]. For example, *DiCenso641* discloses modifying the signal by “**changing various qualities of a sound, such as equalization, pitch, etc.**” *Id.*, [0044]. A POSITA would also have understood varying the pitch of a sound to amount to the application of an audio effect to the sound. *Kyriakakis*, ¶187 (discussing *Lindahl*); *see also Lindahl*, [0067] (“In the presently depicted embodiment, **audio processing logic 32 may apply various audio effects 138** based on the received image characteristics. **Such audio effects may include variations in one or more characteristics of an audio signal. For example, effects 138 applied to audio may include variation in pitch**”)¹¹; *Kyriakakis*, ¶187.

Accordingly, the *DiCenso641-Smith* combination teaches modifying select sounds within an ambient environment by changing the pitch of the sound signal (“adding one or more audio effects to the sensed noise”). *Kyriakakis*, ¶188.

B. Ground 1B: *DiCenso641*, *Smith*, and *Holland* Render Obvious Claims 2 and 12

1. Claim 2

a. 2[a]

DiCenso641-Smith teaches this feature. *Kyriakakis*, ¶¶194-196.

¹¹ *Lindahl* is used to demonstrate a POSITA’s knowledge; it is not part of the unpatentability ground.

DiCenso641 discloses that “user interface 324 is implemented by a second microprocessor 326 having associated memory 328 embedded in a mobile device 320, such as a smartphone, tablet computer, wrist watch, or arm band, for example.” *DiCenso641*, [0039]. *DiCenso641* explains that “changes made by user 120 using the user interface are communicated to the wearable device 130 to control corresponding processing of input signals to create auditory output signals that implement the user preferences.” *Id.*, [0028].

Accordingly, the *DiCenso641-Smith* combination teaches mobile device 320 implementing a user interface 324 (“an interfacing mechanism”) via which a user may control the processing of input signals to create auditory output signals. *Kyriakakis*, ¶196.

b. 2[b]

DiCenso641-Smith-Holland teaches this feature. *Kyriakakis*, ¶¶197-206.

DiCenso641 discloses mobile device 320 communicates with earpieces 134 via wired or wireless communication technology. *See DiCenso641*, [0023] (“User preferences are then communicated to the DSP associated with earpieces 134 **through wired or wireless technology**, such as Wi-Fi, Bluetooth, or similar technology, for example.”), [0039] (“User preferences 322 may be communicated **via a wired or wireless communications link 360** to DSP 310. Various types of wired or wireless communications technology or protocols may be used depending

on the particular application or implementation.”). *DiCenso641*, however, does not focus on the implementation details relating to how the mobile device 320 implements both wired and wireless communication in mobile device 320. Thus, a POSITA would have been motivated to look for additional information regarding how to implement *DiCenso641*’s functionality of implementing both wired and wireless communication. *Kyriakakis*, ¶199. In so looking, a POSITA would have readily identified *Holland*.

Holland is generally directed to a “a system for delivering content associated with a media presentation to devices that are auxiliary to the devices that play and display the media presentation.” *Holland*, [0039]; *see also id.*, Abstract. *Holland* discloses a “media player 110, display device 120, and speakers 130 [that] are integrated on a single device such as a computer, a laptop, an enhanced television, or an enhanced cell phone” that functions as a “media player device” or a “companion content device.” *See id.*, [0040].

Holland discloses sending signals between such devices “wirelessly or through a wired connection.” *Id.*, [0043] (“Some embodiments allow both wired and wireless signals”). *Holland* also provides implementation details for facilitating wired or wireless communication between devices, including mobile phones. *See Holland*, [0156] (“The electronic system 2000 may be a ... phone, PDA, or any other sort of electronic device.”). For example, *Holland* explains that the mobile phone

includes a network adapter to couple the mobile phone to a network. *See id.*, [0162] (“Finally, as shown in FIG. 20, bus 2005 also couples electronic system 2000 to a network 2065 through a network adapter (not shown). In this manner, the electronic can be a part of a network of computers”).

A POSITA would have appreciated that *Holland* describes essentially the same functionality of communicating data between electronic devices as *DiCenso641*. *Kyriakakis*, ¶204. A POSITA would have further recognized that *Holland* provides additional details regarding how to implement this functionality by using a network adapter to implement both wired and wireless communication. *Kyriakakis*, ¶204.

A POSITA would have found the combination obvious because it would have amounted to the mere application of a known technique (including a network adapter in a mobile device as *Holland* teaches) to improve a similar device (the *DiCenso641-Smith* combination’s mobile device 320 that uses wired or wireless communication to connect to other devices) in the same way (providing components supporting wired or wireless communication between devices as *Holland* teaches). *Kyriakakis*, ¶205.

Accordingly, the *DiCenso641-Smith-Holland* combination teaches mobile phone 320 having a network adapter (“a network adapter”) to couple mobile phone 320 to a network to communicate with other devices (“configured to transmit and

receive the data”) via a wired or wireless communications link (“through both wired and wireless communication”). *Kyriakakis*, ¶206.

c. 2[c]

DiCenso641-Smith-Holland teaches this feature. *Kyriakakis*, ¶¶207-209.

DiCenso641 explains that user preferences 322 are captured by user interface 324. *DiCenso641*, [0039]; *see also id.*, FIGs. 5, 6 (depicting example user interfaces having controls for specifying user preferences associated with particular types or groups of sounds). *DiCenso641* also discloses that, through the user interface, “the user can raise or lower the volume of specific sound sources as well as completely cancel or enhance other auditory events.” *Id.*, [0048]. For example, *DiCenso641* explains that mobile device 320 “may include a touch pad or screen to capture user gestures. For example, the user draws a character “V” (for voices), then swipes down (lowering this sound category).” *Id.*, [0056]; *Kyriakakis*, ¶208.

Accordingly, the *DiCenso641-Smith-Holland* combination teaches mobile device 320 implementing a user interface 324 having a touchpad or screen to capture user gesture (“at least one input mechanism”) via which a user can raise or lower the volume of specific sound sources. *Kyriakakis*, ¶209.

d. 2[d]

DiCenso641-Smith-Holland teaches this feature. *Kyriakakis*, ¶¶210-212.

As discussed in §VIII.B.1.c, *DiCenso641* discloses that by manipulating the user interface (e.g., swiping on a touchpad), the user can raise or lower the volume of specific sound sources.

Accordingly, the *DiCenso641-Smith-Holland* combination teaches mobile device 320 implementing a user interface 324 via which a user can raise or lower the volume of specific sound sources (“manipulate the interfacing mechanism”). *Kyriakakis*, ¶212.

e. 2[e]

DiCenso641-Smith-Holland teaches this feature. *Kyriakakis*, ¶¶213-214. For example, as discussed in §VIII.B.1.c, *DiCenso641* discloses that, through the user interface, the user can raise or lower the volume of specific sound sources as well as completely cancel or enhance other auditory events. And as discussed in §VIII.A.1.d(iii), *DiCenso641* describes each earpiece 134 having a speaker 316 for outputting a modified signal to generate an auditory environment for a user.

Accordingly, the *DiCenso641-Smith-Holland* combination teaches modifying the signal output via speaker(s) 316 of earpieces 134 (“vary the output of the at least one output device”) based on user input captured by user interface 324 to raise or lower the volume of specific sounds. *Kyriakakis*, ¶214.

2. Claim 12

DiCenso641-Smith-Holland teaches claim 12 for the same reasons discussed with respect to claim 2 in §VIII.B.1.a through §VIII.B.1.e. *Kyriakakis*, ¶215.

C. Ground 1C: *DiCenso641*, *Smith*, and *Warren* Render Obvious Claim 3

1. Claim 3

DiCenso641-Smith-Warren teaches this claim. *Kyriakakis*, ¶¶216-221.

DiCenso641 discloses that the earpieces 134 “each contain an associated speaker and one or more microphones or transducers, which may include an ambient microphone to detect ambient sounds within the ambient auditory environment.” *DiCenso641*, [0022]. *DiCenso641* does not, however, provide additional implementation details for the types of microphones or transducers included in the wearable device (the headphones or earpieces). A POSITA would have thus searched for references to supply such implementation details and would have readily found *Warren*. *Kyriakakis*, ¶217.

Warren is directed generally to a personal listening device “to be fitted in the ear, on the ear, near the ear, or behind the ear” that “may be virtually any personal listening device or system such as a hearing aid 8, an earphone 10, a headphone (not shown), a wireless headset 12, an insert earphone (not shown), and the like.” *Warren*, [0026]. *Warren* explains that such devices may include any of a number of types of

microphones, such as “a silicon (MEMS) condenser microphone, an electret microphone, an omni-directional microphone, a directional microphone, a dynamic microphone, or a monitor microphone.” *Id.*, [0029].

A POSITA would have been motivated to modify *DiCenso641*’s earpieces 134 based on the teachings of *Warren* to include an omni-directional microphone and would have had a reasonable expectation of success in doing so. *Kyriakakis*, ¶219. A POSITA would have appreciated that *Warren* and *DiCenso641* are similarly directed to a personal listening device. *Kyriakakis*, ¶219. For example, *DiCenso641* generally relates to “systems and methods for a user controllable auditory environment using wearable devices, such as headphones, speakers, or in-ear devices” (*DiCenso641*, Abstract), and *Warren* describes the components of a personal listening device that may comprise any of a hearing aid, an earphone, a headphone, a wireless headset, an insert earphone, or the like (*Warren*, [0026]). For that reason, *Warren* provides implementation details suitable for *DiCenso641*’s wearable device 130 or, more specifically, earpieces 134. *Kyriakakis*, ¶219. A POSITA would have considered applying *Warren*’s teaching to *DiCenso641* to amount to merely combining prior art elements (*Warren*’s omni-directional microphone and *DiCenso641*’s earpieces 134) according to known methods (*Warren* teaches including an omni-directional microphone within any of a hearing aid, an

earphone, a headphone, a wireless headset, an insert earphone, or the like) to yield predictable results. *Kyriakakis*, ¶219.

Moreover, for the reasons discussed in §VIII.A.2, a POSITA would also have understood that a omni-directional microphone comprises an omni-directional transducer. *Kyriakakis*, ¶220.

Accordingly, the *DiCenso641-Smith-Warren* combination teaches the “one or more microphones or transducers” of *DiCenso641*’s earpieces 134 (“the sound sensing mechanism”) including an omni-directional microphone (“an omnidirectional transducer”). *Kyriakakis*, ¶221.

D. Ground 1D: *DiCenso641*, *Smith*, and *DiCenso645* Render Obvious Claims 21-24

1. Claim 21

a. 21[a]

DiCenso641-Smith teaches this feature. *Kyriakakis*, ¶¶222-224.

As discussed in §VIII.A.1.c, a POSITA would have understood *DiCenso641* to disclose a pair of earpieces 134 including at least a first earpiece having a speaker, one or more microphones or transducers, and a DSP, and a second earpiece having at least a speaker and one or more microphones or transducers. *Kyriakakis*, ¶223.

Accordingly, the *DiCenso641-Smith* combination teaches a pair of earpieces 134 including a second earpiece having at least a speaker and one or more microphones or transducers (“at least one output device”). *Kyriakakis*, ¶224.

(i) 21[a][i]

DiCenso641-Smith teaches this feature. *Kyriakakis*, ¶¶225-231.

As discussed in §VIII.D.1.a, *DiCenso641* discloses a second earpiece 134 (“output device”) having at least a speaker and one or more microphones or transducers.

Smith discloses a system and method for providing both hearing enhancement and hearing protection. *See Smith*, Abstract. *Smith* discloses a structure for an earpiece used in such a system that is similar to *DiCenso641*’s earpiece inasmuch as it includes “a microphone 102, electronics 103, a connector 104, and a speaker 105.” *Id.*, [0020]. *Smith* also explains that “the microphone 102, the electronics 103, the connector 104, and/or the speaker 105, **as well as a battery**, can all be disposed within the fully occluding earpiece 101. Thus, the situational hearing enhancement and protection device can be autonomous or fully self-contained.” *Id.*, [0034]; *see also id.*, [0059] (“As a further example, a battery can be located either within the shell 111 or outside of the shell 111.”). *Smith* also discloses that its “earpiece does not have to be an occluding earpiece.” *Id.*, [0123].

A POSITA would have understood that *DiCenso641*'s earpieces 134 would each need a power source to power and operate the various components contained within the earpieces 134. *Kyriakakis*, ¶229; *see also DiCenso641*, [0032] (disclosing "active or powered reproduction of the ambient environment to the loudspeakers of the wearable device"). A POSITA would thus have been motivated to look at techniques for providing a power source for *DiCenso641*'s earpieces, and would have readily identified *Smith*'s teaching of disposing a power source (e.g., a battery) within the housing of the earpieces. *Kyriakakis*, ¶229. A POSITA would have been motivated to incorporate a battery within *DiCenso641*'s earpieces because, as taught by *Smith*, this would permit *DiCenso641*'s earpieces 134 to "be autonomous or fully self-contained." *Smith*, [0034]; *Kyriakakis*, ¶229. A POSITA would have thus found the combination to be obvious because it would have amounted to the mere application of a known technique (including a battery within an earpiece as taught by *Smith*) in a similar device (*DiCenso641*'s earpieces 134) to obtain predictable results (to power the components of earpieces 134). *Kyriakakis*, ¶229.

A POSITA would also have had a reasonable expectation of success in incorporating *Smith*'s teaching into *DiCenso641*. *Kyriakakis*, ¶230. *DiCenso641* and *Smith* both disclose earpiece(s) that include at least one microphone and a speaker. *See DiCenso641*, [0022]; *Smith*, [0020]. *DiCenso641* and *Smith* both also describe modifying select sounds within the ambient environment captured by the

microphones and providing the modified sounds via the earpiece speakers. *See DiCenso641*, [0042] (“DSP 310 ... modifies the signal for each type of sound in the ambient auditory environment.... The modified signal is output to amp(s) 314 and speaker(s) 316 to generate the auditory environment for the user.”); *Smith*, [0020] (“The electronics 103 can process the signal and provide a processed signal to the speaker 105 ... to provide sound to the user's eardrum.”), [0112]. Modifying *DiCenso641*'s earpieces 134 to include *Smith*'s battery would have been straightforward and well within a POSITA's skill, as *Smith* confirms by incorporating a battery in earpieces similar to *DiCenso641*'s. *Kyriakakis*, ¶230.

Accordingly, the *DiCenso641-Smith* combination teaches a second earpiece 134 including a battery (“a power source”) for powering and operating at least the speaker and the one or more microphones or transducers of the earpieces 134 (“for operating the output device”). *Kyriakakis*, ¶231.

(ii) 21[a][ii]

DiCenso641-Smith teaches this feature. *Kyriakakis*, ¶¶232-234.

As discussed in §VIII.D.1.a, *DiCenso641* discloses a second earpiece 134 having a speaker. With respect to figure 3, which illustrates a representative embodiment of wearable device 130, *DiCenso641* explains that “[s]ystem 300 includes a microprocessor or digital signal processor (DSP) 310 in communication with one or more microphones 312, one or more amplifiers 314 and one or more

speakers 316.” *DiCenso641*, [0038]; *see also id.*, [0022] (describing figures 2-6 as illustrating and describing in greater detail the DSP of wearable device 130); *Kyriakakis*, ¶233. *DiCenso641* discloses that system 300 “generates a customized or personalized user controllable auditory environment based on sounds from the ambient auditory environment by receiving a signal representing the sounds in the ambient auditory environment of the user from one or more microphones 312.” *DiCenso641*, [0042]. *DiCenso641* explains that signals captured by one or more microphones 312 are processed and modified based on user preferences, and “[t]he modified signal is output to amp(s) 314 and speaker(s) 316 to generate the auditory environment for the user.” *Id.*

Accordingly, the *DiCenso641-Smith* combination teaches a second earpiece 134 having a speaker 316 (“a speaker”) for outputting a modified signal (“for outputting sound”) to generate an auditory environment for a user. *Kyriakakis*, ¶234.

(iii) 21[a][iii]

DiCenso641-Smith teaches this feature. *Kyriakakis*, ¶¶235-237.

For the reasons discussed in §VIII.A.1.d(ii), *DiCenso641* teaches earpieces 134 each sending an unprocessed audio stream captured by the microphones on the respective earpiece 134 to mobile device 320 and receiving back a modified audio stream from mobile device 320 for outputting on the speaker(s) of the respective earpiece 134. A POSITA would thus have understood each of *DiCenso641*’s

earpieces 134 to include a wireless transceiver to wirelessly communicate with mobile device 320. *Kyriakakis*, ¶236.

Accordingly, the *DiCenso641-Smith* combination teaches a second earpiece 134 including integrated Bluetooth or Wi-Fi technology (“a communication mechanism”) for sending an unprocessed audio stream and receiving back a modified audio stream (“for receiving electronic information”) from mobile device 320 (“from the data source”). *Kyriakakis*, ¶237.

(iv) 21[a][iv]

DiCenso641-Smith-DiCenso645 teaches this feature. *Kyriakakis*, ¶¶238-243.

DiCenso645 is generally directed to “a method for providing audio enhancement to a user of a listening device” that “includes, in response to detecting the voice trigger, pausing or attenuating the first audio stream and reproducing a second audio stream associated with ambient sound.” *DiCenso645*, [0007]. *DiCenso645* explains that “the listening device 100 may include a pair of headphones, such as the over-the-ear headphones However, any type of wired or wireless headphones, including ... in-ear headphones, may be used” *Id.*, [0024].

DiCenso645 discloses a “do-not-disturb mode 705” in which “the listening device 100 does not enter the conversation mode 105 in response to voice triggers. Thus, when someone uses a voice trigger, the listening device 100 continues to play the audio stream and the optional noise-cancellation function remains enabled.” *Id.*,

[0051]. *DiCenso645* explains that “the listening device 100 may include one or more visual indicators and/or auditory indicators that indicate to others that the user does not want to be disturbed.” *Id.*, [0052]. For example, “the listening device 100 may display text (e.g., ‘Do Not Disturb!’) using various display technologies, such as an organic light-emitting diode (OLED) display, when the do-not-disturb mode 705 is enabled.” *Id.*

A POSITA would have been motivated to modify *DiCenso641*’s earpieces 134 in view of *DiCenso645* to include a display (such as an OLED display) that displays text to indicate when a user does not want to be disturbed. *Kyriakakis*, ¶241. More particularly, similar to *DiCenso645*, *DiCenso641* discloses that wearable device 130 (comprising earpieces 134) may operate in a transparent mode in which “the system does not alter the auditory field or environment experienced by user 120 relative to the current ambient auditory environment” or “a default mode that attenuates all sounds or amplifies all sounds from the ambient environment, or attenuates or amplifies particular frequencies of ambient sounds similar to operation of more conventional noise cancelling headphones or hearing aids, respectively.” *DiCenso641*, [0023]. *DiCenso641* also discloses a “focus mode” (e.g., for use when the user is in the office), in which “the system blocks any office noises as well as the people voices and conversations happening around him.” Thus, a POSITA would have recognized that *DiCenso645*’s teaching of providing a display to visually

indicate that the user does not want to be disturbed would have advanced, or at a minimum been consistent with, *DiCenso641*'s goal of allowing the user to focus without being disturbed by other people's voices. *Kyriakakis*, ¶241.

A POSITA would have found it obvious to further modify the *DiCenso641-Smith* combination to incorporate a display (such as an OLED display) in earpieces 134 as taught by *DiCenso645* because it would have amounted to use of a known technique (*DiCenso645*'s teaching of using a display to show a message to others that the user does not want to be disturbed) to improve similar devices (the *DiCenso641-Smith* combination's earpieces which may be used in a focus mode when the user does not want to be distracted) in the same way (the *DiCensor641-Smith-DiCenso645* combination in which the earpieces include a display to show a message when the user does not want to be disturbed/distracted). *Kyriakakis*, ¶242. A POSITA would have had an expectation of success because *DiCenso645* already implements a display in in-ear headphones similar to *DiCenso641*'s earpieces. *Kyriakakis*, ¶242.

Accordingly, the *DiCenso641-Smith-DiCenso645* combination teaches a display ("a display") on at least a second earpiece 134 for displaying text to indicate to others that the user does not want to be disturbed. *Kyriakakis*, ¶243.

2. Claim 22

DiCenso641-Smith-DiCenso645 teaches this claim. *Kyriakakis*, ¶¶244-246.

For the reasons discussed in §§VIII.D.1.a(i) and VIII.D.1.a(iv), a POSITA would have been motivated to modify *DiCenso641*'s earpieces to include a battery as taught by *Smith* and a display as taught by *DiCenso645*. Notably, neither the claim nor the '736 patent further specify what is meant by a power source and a display having "varied outputs." Nevertheless, as POSITA would have understood that a power source, such as a battery, and a display, such as an OLED display, can vary their outputs as needed. *Kyriakakis*, ¶245. For example, *DiCenso645* describes the OLED display displaying text while do-not-disturb mode 705 is enabled, suggesting that the OLED display does not display such text when do-not-disturb mode 705 is **not** enabled, irrespective of the output of a battery used to power such components. Additionally, a POSITA would have understood that the amount of power provided by the battery to the components of the earpiece would vary depending on the operation of the earpiece. *Kyriakakis*, ¶245. For example, when the transceiver is "active" and transmitting/receiving data the battery would provide more power to the transceiver than when the transceiver is "idle." *Kyriakakis*, ¶245.

Accordingly, the *DiCenso641-Smith-DiCenso645* combination teaches a display adjusting based on a mode of earpieces 134 irrespective of a battery used to power such components ("wherein the power source and the display are varied outputs"). *Kyriakakis*, ¶246.

3. Claim 23

DiCenso641-Smith-DiCenso645 teaches claim 23 for the same reasons discussed with respect to claim 21 in §VIII.D.1.a through §VIII.D.1.a(iv).

4. Claim 24

DiCenso641-Smith-DiCenso645 teaches claim 23 for the same reasons discussed with respect to claim 22 in §VIII.D.2.

E. Ground 1E: *DiCenso641*, *Smith*, and *Goldstein873* Render Obvious Claim 32

1. Claim 32

a. 32[pre], 32[a], and 32[b]]

DiCenso641 teaches 32[pre], 32[a], and 32[b]for the reasons discussed in §§VIII.A.1.a, VIII.A.1.b, and VIII.A.1.c, respectively.

b. 32[c]

As discussed in §VIII.A.1.c, *DiCenso641* teaches at least one computing device.

(i) 32[c][i]

DiCenso641 teaches this feature. *Kyriakakis*, ¶¶256-258.

While the term “noise sensing mechanism” does not appear in the specification of the ’736 patent, a POSITA would have understood that “a noise sensing mechanism configured to sense a noise” as used in claim 32, and “a sound sensing mechanism, configured to sense a noise” as used in claim 1 have sufficiently

congruent scope such that they both encompass a microphone. *Kyriakakis*, ¶257. More particularly, a POSITA would have understood the '736 patent uses the terms “audio,” “sound” and “noise” interchangeably such that a mechanism for sensing noise is congruent with a mechanism for sensing audio or sound. *Kyriakakis*, ¶257; *see e.g.*, '736Pat., 13:59-61 (“At step 305, audio/noise is sensed by one or more audio sensing devices. According to an embodiment, the one or more sensing devices are microphones.”). Indeed, claim 1 of the '736 patent further equates sound and noise by reciting “a **sound** sensing mechanism, configured to sense a **noise**.” *Kyriakakis*, ¶257.

Accordingly, *DiCenso641* teaches this feature for the same reasons discussed in §VIII.A.1.d(i).

(ii) 32[c][ii]

DiCenso641 teaches this feature for the reasons discussed in §VIII.A.1.d(ii).

(iii) 32[c][iii]

DiCenso641 teaches this feature for the reasons discussed in §VIII.A.1.d(iii).

c. 32[d]

DiCenso641 teaches this feature for the reasons discussed in §VIII.A.1.e.

d. 32[e]

DiCenso641-Smith teaches this feature for the reasons discussed in §VIII.A.1.f.

(i) 32[e][i]

DiCenso641 teaches this feature. *Kyriakakis*, ¶¶263-267.

This element is substantially identical to element 1[e][i] in claim 1 (*see* §VIII.A.1.f(i)), except that this element recites “frequencies” instead of “sounds.” A POSITA would have understood that “frequencies” as used in claim 32 and “sounds” as used in claim 1 have sufficiently congruent scope such that “frequencies” encompasses “sounds.” *Kyriakakis*, ¶264.

More particularly, a POSITA would have known that different sounds are characterized by the frequency(ies) of the waves that form the sound. *Kyriakakis*, ¶265. Thus, for example, a POSITA would have known that the sound waves comprising a car horn would have different frequency(ies) from the sound waves comprising a person speaking. *Kyriakakis*, ¶265. A POSITA would have also known that identifying sounds and/or separating sounds in an ambient environment entails identifying and/or separating the sounds based on their frequencies. *Kyriakakis*, ¶265; *see, e.g., Snow*, 1:14-17 (“One known method of audio signal processing is to process the audio signal in the frequency spectrum by separating the audio signal into multiple audio signals that fall within spaced audio frequency bands.”).¹²

¹² *Snow* is used to demonstrate a POSITA’s knowledge; it is not part of the unpatentability ground.

Consistent with this understanding, the '736 patent discloses that different sounds are characterized by the frequency(ies) that comprise them. *Kyriakakis*, ¶266; *see, e.g., '736Pat.*, 13:56-58 (“sounds are associated with different frequencies and/or are associated with one or more instruments”), 13:63-64 (“one ore more instruments and/or frequencies are identified and isolated from the senses audio”), 16:13-14 (“like frequencies in the sensed audio are separated”), 16:39-40 (“the present system senses and analyzes audio frequencies”). Thus, a POSITA would have understood “one or more frequencies” as recited here and in subsequent elements of claim 32 encompasses “one or more sounds” as recited in corresponding elements of claim 1. *Kyriakakis*, ¶266.

Accordingly, the *DiCenso641-Smith* combination teaches this feature for the reasons discussed in §VIII.A.1.f(i).

(ii) 32[e][ii]

DiCenso641 teaches this feature for the reasons discussed in §§VIII.A.1.f(ii) andVIII.E.1.d(i).

(iii) 32[e][iii]

DiCenso641-Smith teaches this feature for the reasons discussed in §§VIII.A.1.f(iii) andVIII.E.1.d(i).

(iv) 32[e][iv]

DiCenso641-Smith-Goldstein873 teaches this feature. *Kyriakakis*, ¶¶270-279.

Smith discloses that its system “can **alert** the user to otherwise **inaudible sounds**. Such sounds can be inaudible due to their **frequency content** and/or amplitude.” *Smith*, [0027]. *Smith* also discloses that “inaudible sounds can be replaced with other sounds, such as a **warning**, voice identification or **other identification**.” *Id.* As discussed in §VIII.A.1.f(iii), a POSITA would have found it obvious to implement *Smith*’s teachings for processing/replacing inaudible sounds via *DiCenso641*’s DSP 310 to enable such sounds to be heard by the user, or to otherwise alert a user to their presence. *Kyriakakis*, ¶271.

Goldstein873 is similar to *DiCenso641* inasmuch as it is generally directed to “a method and device for personalized hearing” (*Goldstein873*, [0007]), and discloses “an earpiece and method of operating an earpiece that monitors and safely adjusts audio delivered to a user’s ear” (*id.*, [0002]). Similar to *DiCenso641*, *Goldstein873* describes its earpiece as including “an Ambient Sound Microphone (ASM) to capture ambient sound, an Ear Canal Receiver (ECR) to deliver audio to an ear canal, an ear canal microphone (ECM) to measure a sound pressure level within the ear canal, and a processor to produce the audio from at least in part the ambient sound.” *Id.*, [0007]. *Goldstein873* discloses that “earpiece 100 can continually monitor the environment for warning sounds” (*id.*, [0066]), and also can “send a warning message to nearby people (e.g., list of contacts) that are within a vicinity of the user, thereby allowing them to receive the warning” (*id.*, [0067]).

A POSITA would have found it obvious to further modify the *DiCenso641-Smith* combination based on *Goldstein873*'s teachings so that the alert/warning generated by the *DiCenso641-Smith* system—when processing, for example, an ultrasonic sound that is otherwise inaudible to the user—is also transmitted to nearby people so that they, too, can be made aware of the alert/warning as taught by *Goldstein873*. *Kyriakakis*, ¶273. A POSITA would have recognized that *Goldstein873*'s teachings are compatible with the *DiCenso641-Smith* combination because *DiCenso641* discloses that its wearable device 130 can wirelessly connect with “other similar wearable devices.” *DiCenso641*, [0025]; *Kyriakakis*, ¶273. Thus, a POSITA would have understood *DiCenso641*'s disclosure to encompass wearable device 130 communicating with other similar wearable devices worn by other people, and to be well-suited for implementing *Goldstein873*'s teaching of transmitting warnings/alerts to people nearby. *Kyriakakis*, ¶273.

A POSITA would have understood *DiCenso641*'s reference to “similar wearable devices” to encompass devices similar to *DiCenso641*'s wearable device 130 having a DSP. *Kyriakakis*, ¶274. A POSITA would also have understood that a device that includes a DSP comprises a “computing device.” *Kyriakakis*, ¶¶274-276 (discussing *Computer Dictionary* and *Oshana*).

A POSITA would have found the combination obvious because it would have amounted to mere application of a known technique (*Goldstein873*'s teaching of an

earpiece sending a warning message to nearby people) to improve similar devices (*DiCenso641-Smith* combination's similar earpieces that can connect to other similar wearable devices worn by other people) in the same way. *Kyriakakis*, ¶277. A POSITA would have also found the combination obvious because it would have amounted to applying a known technique (*Goldstein873*'s teaching of an earpiece sending a warning message to nearby people) to a known device (*DiCenso641-Smith* combination's similar earpieces that can connect to other similar wearable devices worn by other people) ready for improvement to yield predictable results (the *DeCenso641-Smith-Goldstein873* combination having earpieces that send a warning to similar wearable devices worn by people nearby). *Kyriakakis*, ¶278.

Accordingly, the *DiCenso641-Smith-Goldstein873* combination teaches if an inaudible sound is detected that corresponds to a frequency for which user preferences indicate that an alert should be provided (“if one or more of the isolated one or more frequencies includes the frequency outside of the predetermined threshold”), DSP 310 of earpieces 134 transmitting the alert to at least one device similar to *DiCenso641*'s wearable device 130 having a DSP that is worn by another person nearby (“transmitting an alert to another computing device regarding the frequency of the one or more of the isolated one or more frequencies being outside of the predetermined threshold”). *Kyriakakis*, ¶279.

F. Ground 2A: *DiCenso641*, *Goldstein873*, and *Smith* Render Obvious Claims 1, 4-11, 13-20 and 25-28

To the extent PO argues and the Board finds that *DiCenso641* does not disclose earpieces 134 including a wireless transceiver and/or a memory storing computer readable instructions accessible to the DSP 310, Petitioners submit that claims 1, 4-11, 13-20, and 25-28 nevertheless would have been obvious in view of the combination of *DiCenso641*, *Goldstein873*, and *Smith. Kyriakakis*, ¶¶280-290.

By the earliest alleged priority date, it was known to include a transceiver in earpieces to implement wireless communication with external devices. *Kyriakakis*, ¶281. *Goldstein873* is exemplary, and it is analogous to the '736 patent, as it is within the same field of endeavor and reasonably pertinent to one or more problems addressed by the '736 patent. *Kyriakakis*, ¶281. *Goldstein873* is generally directed to an earpiece for “continually monitor[ing] the environment for warning sounds” *Goldstein873*, [0066]. As illustrated in figure 2, *Goldstein873*’s earpiece 100 includes “**a transceiver 204 that can support singly or in combination any number of wireless access technologies** including without limitation Bluetooth™, Wireless Fidelity (WiFi), Worldwide Interoperability for Microwave Access (WiMAX), and/or other short or long range communication protocols.” *Id.*, [0028].

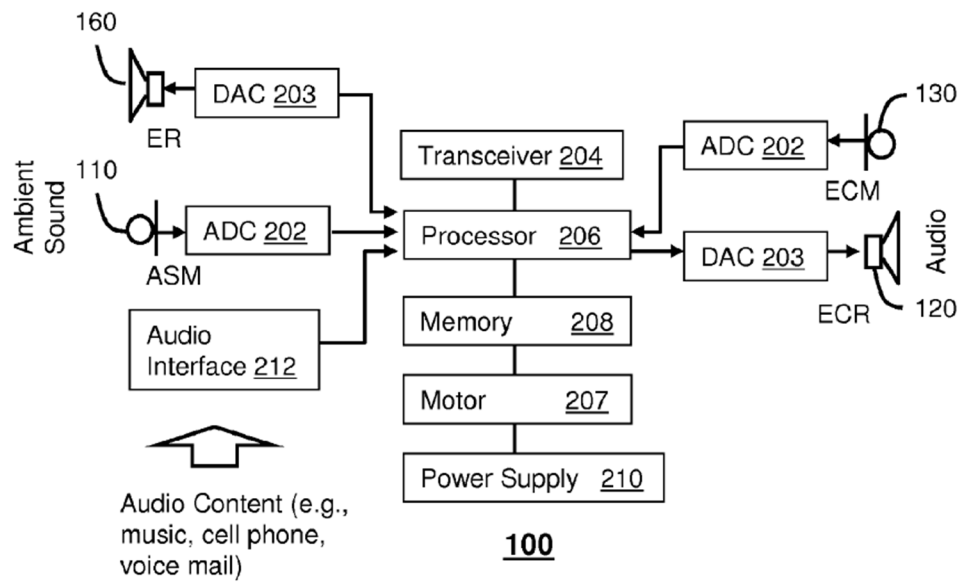
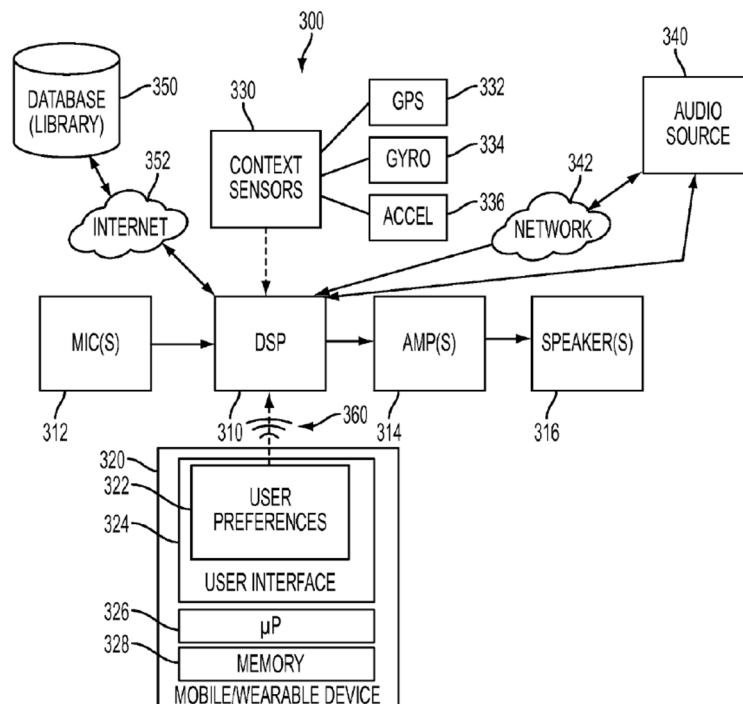


FIG. 2

Goldstein873, FIG. 2

Goldstein873 explains that “[t]he transceiver 204 can also provide support for dynamic downloading over-the-air to the earpiece 100.” *Id.*

As discussed in §§VIII.A.1.d(ii) and VIII.D.1.a(iii), *DiCenso641* discloses earpieces 134 wirelessly communicating with mobile device 320. *Kyriakakis*, ¶283. *DiCenso641* also discloses (and depicts in FIG. 3 (reproduced below)) a wireless link 360 communicating between mobile device 320 and DSP 310. *DiCenso641*, [0039].



DiCenso641, FIG. 3

Thus, to the extent the Board finds that *DiCenso641* does not already disclose the earpieces 134 each having a wireless transceiver, a POSITA would have been motivated to modify *DiCenso641*'s earpieces 134 to incorporate a transceiver in each to effectuate wireless communication with mobile device 320 as taught by *Goldstein873*. *Kyriakakis*, ¶284. A POSITA would have found the combination obvious because it would have amounted to an application of a known technique (including a wireless transceiver in a headphone or earbud as *Goldstein873* teaches) to improve a similar device (*DiCenso641*'s headphones/earbuds that use a wireless link) in the same way (providing components supporting wireless communication between devices as *Goldstein873* teaches). *Kyriakakis*, ¶284.

Accordingly, the *DiCenso641-Goldstein873* combination teaches earpieces 134 including a first earpiece having a wireless transceiver to implement wireless communication (“an electronic bus”) for sending an unprocessed audio stream and receiving back a modified audio stream (“which is configured to transmit and receive data”) from mobile device 320 (“from the data source”). *Kyriakakis*, ¶285. The *DiCenso641-Goldstein873* combination also teaches earpieces 134 including a second earpiece having a wireless transceiver to implement communication (“communication mechanism) for receiving a modified audio stream (“for receiving electronic information”) from mobile device 320 (“from the data source”).

While as discussed in §§VIII.A.1.e and VIII.A.1.f, *DiCenso641* teaches earpieces 134 having a microprocessor-based DSP 310 and computer readable storage medium storing code executable by a processor to perform the indicated function, it does not provide additional implementation details for the storage medium that stores the code executed by the DSP 310. A POSITA would have thus searched for references to supply such implementation details and would have readily found *Goldstein873*. *Kyriakakis*, ¶286.

Goldstein873 discloses that its earpiece includes a processor 206 which can be implemented as a DSP, and also includes memory 208 “for controlling operations of the earpiece device 100.” *Goldstein873*, [0027]. Thus, when implementing *DiCenso641*’s earpieces, a POSITA would have found it obvious to incorporate a

DSP and a memory storing code executable by the DSP on the same earpiece as taught by *Goldstein873*. *Kyriakakis*, ¶287. A POSITA would have found the combination obvious because it would have amounted to mere use of a known technique (*Goldstein873*'s teaching to incorporate a DSP and memory on the same earpiece) to improve similar devices (*DiCenso641* which has an earpiece similar to *Goldstein873*'s and also discloses a computer readable storage medium to store code) in the same way. *Kyriakakis*, ¶288. A POSITA would have also found the combination obvious because it would have amounted to applying a known technique (*Goldstein873*'s teaching to incorporate a DSP and memory on the same earpiece) to a known device (*Goldstein873*'s earpiece that also has a DSP) ready for improvement to yield predictable results (*DiCenso641*'s earpiece having a DSP and associated memory on the same earpiece as taught by *Goldstein873*). *Kyriakakis*, ¶289.

Aside from the features discussed in this section, the analysis of how the *DiCenso641-Goldstein873-Smith* combination renders claims 1, 4-11, 13-20, and 25-28 obvious is otherwise the same as discussed in §§VIII.A.1-VIII.A.13. *Kyriakakis*, ¶290.

**G. Ground 2B: *DiCenso641, Goldstein873, Smith, and Holland*
Render Obvious Claims 2 and 12**

DiCenso641-Goldstein873-Smith- Holland render claims 2,12 obvious for the same reasons discussed in §§VIII.B and VIII.F.

**H. Ground 2C: *DiCenso641, Goldstein873, Smith, and Warren*
Render Obvious Claim 3**

DiCenso641-Goldstein873-Smith-Warren render claim 3 obvious for the same reasons discussed in §VIII.C and VIII.F.

**I. Ground 2D: *DiCenso641, Goldstein873, Smith, and DiCenso645*
Render Obvious Claims 21-24**

DiCenso641-Goldstein873-Smith-DiCenso645 render claims 21-24 obvious for the same reasons discussed in §VIII.D and VIII.F.

**J. Ground 2E: *DiCenso641, Smith, and Goldstein873* Render
Obvious Claim 32**

DiCenso641-Smith-Goldstein873 render claim 32 obvious for the same reasons discussed in §§VIII.E and VIII.F.

IX. SECONDARY CONSIDERATIONS

There is no evidence in the prosecution history or elsewhere supporting secondary considerations arguments, or evidence of nexus of such alleged evidence to the claims. To the extent PO asserts the existence of any secondary considerations in its responses, Petitioners reserve the right to address any such evidence. *Kyriakakis*, ¶295.

X. MANDATORY NOTICES UNDER 37 C.F.R. § 42.8

A. Real Parties-in-Interest

Petitioners identify themselves as the real parties-in-interest.

B. Related Matters

To the best of Petitioners' knowledge, the '736 patent has only been involved in the following district court litigation:

- *Zophonos Inc. v. Samsung Electronics Co., Ltd. et al.*, 2:25-cv-00752 (E.D. Tex.), filed July 30, 2025.

To the best of Petitioners' knowledge, the '736 patent has not been challenged in any other *inter partes* review or post-grant review prior to this proceeding.

Petitioners are concurrently filing a petition challenging claims of U.S. Patent No. 10,656,906 (IPR2026-00083), which is also asserted in the district court litigation. U.S. Patent No. 11,900,016 is also asserted in the district court litigation.

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D. Service Information

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E. Power of Attorney

A power of attorney is filed herewith according to 37 C.F.R. §42.10(b).

XI. FEES

Petitioners concurrently electronically submit the required fees for this Petition. The Board is authorized to charge Arnold & Porter Kaye Scholer LLP's deposit account, No. 50-2387, for any fee deficiency.

Date: November 3, 2025

Respectfully submitted,

/Ali R. Sharifahmadian/

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CERTIFICATE OF COMPLIANCE

The undersigned hereby certifies that the foregoing Petition for *Inter Partes* Review contains 13,834 words, excluding those portions identified in 37 C.F.R. § 42.24(a), as measured by the word-processing system used to prepare this paper.

/Ali R. Sharifahmadian/
Ali R. Sharifahmadian (Reg. No. 48,202)
Counsel for Petitioners

CERTIFICATE OF SERVICE

I certify that on November 3, 2025, I caused a true and correct copy of the foregoing Petition for *Inter Partes* Review of U.S. Patent No. 11,204,736 and supporting exhibits to be served via overnight delivery on the correspondence address of record indicated on Patent's Office Patent Center system for U.S. Patent No. 11,204,736:

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