

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE INC.
Petitioner,

v.

INGENIOSPEC, LLC.
Patent Owner.

Patent No. 11,921,355

Inter Partes Review No. IPR2026-00331

**PETITION FOR *INTER PARTES* REVIEW
UNDER 35 U.S.C. §§ 311-319 AND 37 C.F.R. § 42.100 *et seq.***

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I. INTRODUCTION

Petitioner Apple Inc. (“Petitioner” or “Apple”) petitions for *inter partes* review of claims 1-54, 57-72, 75-82, 85-92, and 95-100 of U.S. Patent No. 11,921,355 (“the ’355 Patent” (EX1001)). The challenged claims—issued just over two years ago—do not present any patentable improvement over the prior art, as set forth in this Petition and in the supporting Declaration of Dr. Chris Kyriakakis. (EX1003.)

Accordingly, Petitioner requests that the Board institute *inter partes* review of the ’355 patent and cancel the claims at the conclusion of the instituted proceeding.

II. SUMMARY OF THE ’355 PATENT

A. Background of the ’355 Patent

The ’355 patent relates to wearable audio devices with electrical components that produce audio output customized to hearing characteristics of a user. (EX1001, 3:37-47; EX1003, ¶29.) For example, the electrical components can support signal capturing, processing, and display; and can be used to provide audio output and/or audio pick-up. (EX1001, 3:48-60; EX1003, ¶29.)

B. Priority Date

The application that became the ’355 patent (Appl. No. 18/144,557) was filed on May 8, 2023, and claims priority to numerous provisional and non-provisional applications. (EX1001.)

For the purposes of this Petition only, a priority date of July 28, 2004, is assumed. (EX1003, ¶30.) This is the filing date of the earliest application (Provisional Appl. No. 60/592,045) to which the '355 patent claims priority.

C. Prosecution History of the '355 Patent

The prosecution of the '355 patent—allowed in just eight months with one hundred claims—was defective in multiple respects. The application was misclassified as an optical system, the Examiner's search was limited to select embodiments, and the Examiner repeatedly included typographical errors in search terms. (EX1002.) These flaws improperly narrowed the examination and hindered the discovery of prior art, including the references discussed herein, that demonstrate the claims' obviousness.

The patent also benefited from a defective request under the since-discontinued After Final Consideration Pilot 2.0 (AFCP 2.0) program. Through AFCP 2.0, the applicant secured accelerated allowance after a Nov. 24, 2023 Final Rejection without filing an RCE. (EX1002, 1013, 1084, 1443–1451.)

As required for AFCP 2.0 requests, the applicant certified that its amendments did not broaden any independent claim in any aspect. (EX1002, 1013.) That certification was false. The response amended only independent claim 64, and broadened it by removing a six-line limitation requiring a sensor “configured to sense data indicative of whether the head-worn personal electronic

apparatus is being worn by the user.” (EX1002, 1051–1079.) Although the Examiner was required to verify AFCP 2.0 compliance before considering the amendments, the Examiner failed to do so, resulting in improper, accelerated allowance without an RCE. (EX1002, 1013, 1084, 1443–1451.)

Accordingly, instituting the Petition to review the challenged patent is a necessary and appropriate use of Board resources in view of these significant prosecution defects.

D. Level of Ordinary Skill

Based on the disclosure of the '355 patent and an assumed priority date of July 28, 2004, a person of ordinary skill in the art (“POSITA”) would have had a Bachelor of Science degree and a Master’s degree in Electrical Engineering, Computer Engineering, Physics, or an equivalent field, as well as one to two years of academic or industry experience in mobile devices, wireless communications, or audio electronics, or comparable industry experience. (EX1003, ¶24.)

III. CLAIM CONSTRUCTION

In the co-pending district court litigation, Petitioner proposed the following claim constructions relevant to the '355 patent:

Term / Claims	Petitioner's Proposed Construction in Co-Pending Litigation
“head-worn personal electronic apparatus” / “head-worn wearable electronic device” / “head-worn electronic personal audio apparatus”/ “head-worn electronic device” / Preamble (’355 patent) ’355 patent, claims 1-3, 5-19, 21-54, 57-70, 72, 75-82, 85-92, 95-100	“electronic eyewear or headwear”
“[a/the] speaker[s] ... proximate to an ear of a user” / “the first speaker . . . proximate to a first ear of the user” / “the second speaker ... proximate to a second ear of the user” ’355 patent, claims 1, 17, 65, 77, 87	“[a/the] speaker[s] . . . near an ear of the user” / “the first speaker . . . near a first ear of the user” / “the second speaker . . . near a second ear of the user”

(EX1012.)

In this proceeding, Petitioner does not propose any express construction for any claim term. The Board construes the claim terms “only to the extent necessary to resolve the controversy” at hand: here, the invalidity of the claims under 35 U.S.C. § 103. *Realtime Data LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019) (internal citation omitted). The Board should not construe any of the claim terms because, as set forth in the Petition, the claims are invalid under § 103 under any

reasonable interpretation and thus no claim construction is necessary to resolve any issue before the Board. (EX1003, ¶33.) The grounds described herein are consistent with Petitioner’s litigation constructions and with no express construction. (EX1003, ¶35.) Thus, the claims are unpatentable regardless of whether the Board applies Petitioner’s litigation constructions or declines to construe the claims. (EX1003, ¶35.)

IV. PRECISE REASONS FOR RELIEF REQUESTED

Pursuant to 35 U.S.C. §§ 311-319 and 37 C.F.R. § 42.100 *et seq.* (including § 42.104(b)), Petitioner requests cancellation of claims 1-54, 57-72, 75-82, 85-92, and 95-100 of the ’355 Patent based on the following references and the accompanying Declaration of Dr. Chris Kyriakakis. (EX1003.) All claims are unpatentable, *e.g.*, as obvious, in view of the prior art, at least as set forth herein.

Prior Art Reference	Abbreviation
U.S. Patent No. 7,620,433	Bodley (EX1005)
U.S. Patent No. 7,046,230	Zadesky (EX1006)
U.S. Patent No. 6,671,379	Nemirovski (EX1007)
U.S. Patent No. 7,599,508	Lynch (EX1008)
U.S. Patent No. 7,010,332	Irvin (EX1009)
U.S. Patent No. 5,721,783	Anderson (EX1010)

The statutory grounds for the challenge of each claim are set forth below.

Throughout the Petition, all statutory citations are pre-AIA based on the earliest possible priority date of July 28, 2004.

Ground	35 U.S.C. §	Claim(s)	Prior Art References
1	103	1, 2, 17, 18, 51, 52, 54, 58, 59	Anderson, Lynch
2	103	3-5, 19-21	Anderson, Lynch, Bodley
3	103	6, 22-24	Anderson, Lynch, Bodley, Zadesky
4	103	7-12, 29-40, 53, 57, 60	Anderson, Lynch, Nemirovski
5	103	13, 14, 41-50	Anderson, Lynch, Irvin
6	103	15, 16, 77-82, 85, 86	Anderson, Lynch, Nemirovski, Irvin
7	103	25-28	Anderson, Lynch, Bodley, Irvin
8	103	61-64	Anderson, Lynch, Nemirovski, Bodley, Zadesky
9	103	65-72, 75, 76, 87-92, 95-100	Anderson, Lynch, Nemirovski, Bodley, Irvin

Below, Petitioner discusses why the challenged claims are unpatentable, including by specifying how and where the prior art satisfies each limitation of

each challenged claim, as required by 37 C.F.R. § 42.104(b)(4).¹ Petitioner's showing establishes a reasonable likelihood that it will prevail on each ground of invalidity as to each challenged claim.

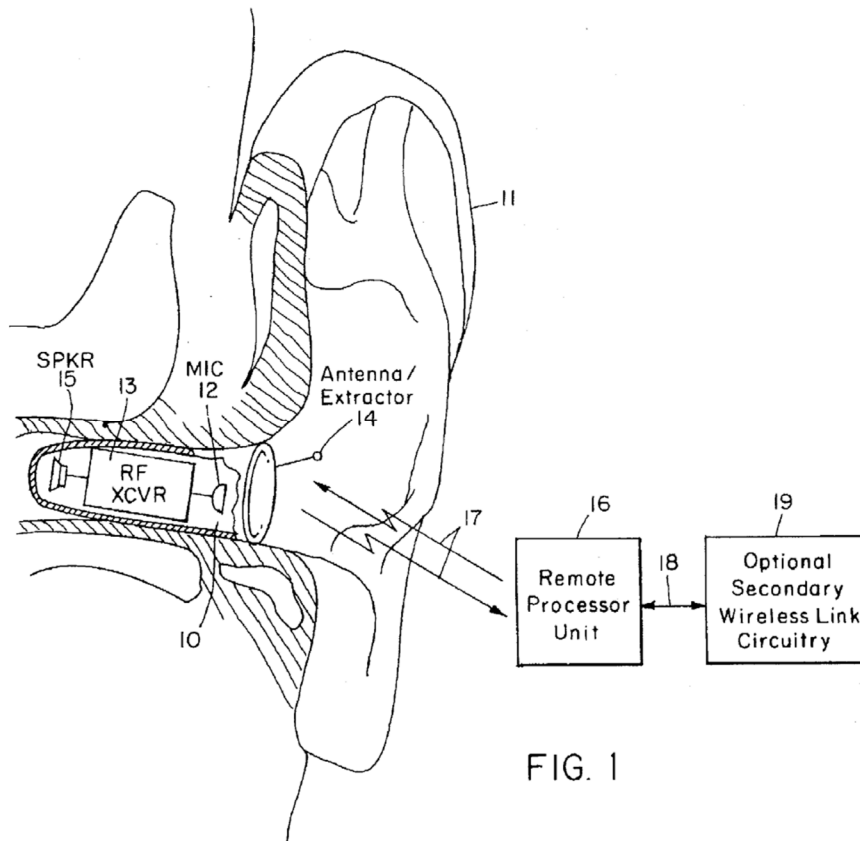
V. GROUND 1: CLAIMS 1, 2, 17, 18, 51, 52, 54, 58, AND 59 ARE RENDERED OBVIOUS BY ANDERSON IN VIEW OF LYNCH

A. Summary of Anderson

Anderson is a U.S. Patent that was filed on June 7, 1995 and issued on February 24, 1998. (EX1010.) Anderson is thus prior art to the '355 patent under at least 35 U.S.C. §§102(a), (b), and (e). Anderson was not cited during prosecution.

Anderson discloses a hearing aid that includes an earpiece and a remote processor unit (RPU) that receives signals from and transmits signals to the earpiece. (EX1010, 1:7-10; EX1003, ¶37.) FIG. 1 illustrates:

¹ Petitioner also shows how each claim preamble is satisfied, but does not concede that any preamble is limiting for any ground in the Petition.



(EX1004, FIG. 1; EX1003, ¶37.)

The earpiece includes a microphone, RF transceiver, and speaker, and the RPU may be worn or carried by the user and can interface with a telephone network. (EX1010, 3:58-60, 4:1-12, 5:61-6:5; EX1003, ¶38.)

Anderson discloses “many variations of the system shown in FIG. 1.” (EX1010, 4:15-18; EX1003, ¶39.) In some embodiments, the earpiece is worn in the user’s ear canal, such as shown for earpiece 10 in FIG. 1; or may utilize a behind-the-ear (“BTE”) unit. (EX1010, 3:53-58; EX1003, ¶39.) In some embodiments, such as shown in FIG. 2, the earpiece belongs to a head-worn headset 21:

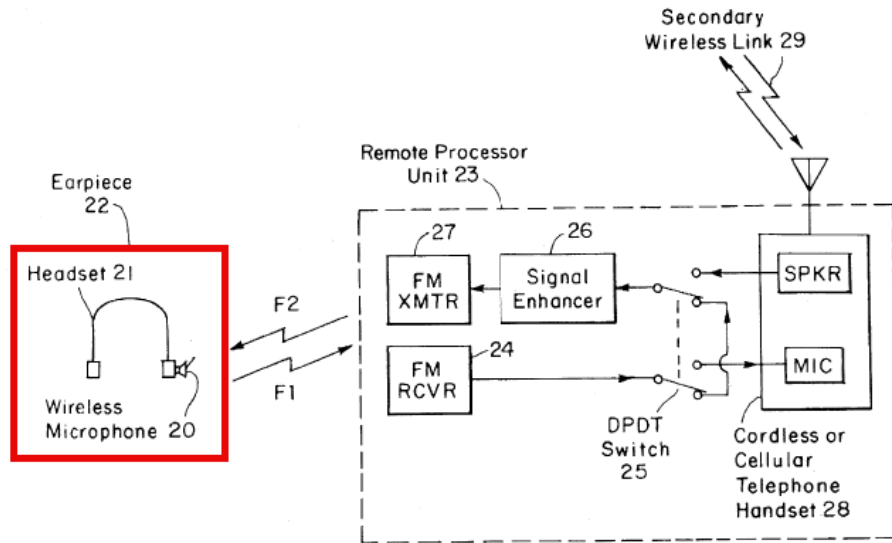


FIG. 2

(EX1010, 4:15-39, FIG. 2 (annotated); EX1003, ¶39.)

The headset earpiece 22 shown in FIG. 2 is “functionally similar” to the in-ear earpiece 10 shown in FIG. 1. (EX1010, 4:33-35; EX1003, ¶40.) The headset earpiece 22 can be made using commercial off-the-shelf components, such as a Radio Shack model 12-103 headset receiver:



(EX1014, 46; EX1010, 4:26-39; EX1003, ¶40.)

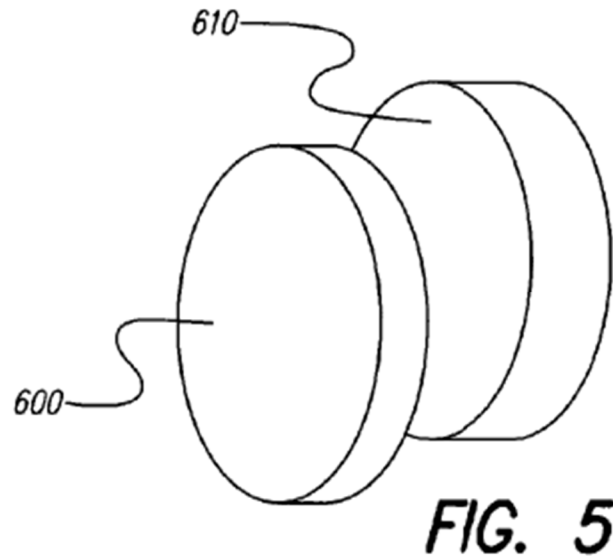
During operation of the hearing aid, audio signals from the environment are picked up by the microphone of the earpiece and transmitted over a two-way wireless link to the RPU. (EX1010, 1:55-59; EX1003, ¶41.) The RPU then enhances the audio signals, *e.g.*, by adjusting the signals to accommodate for a user's hearing impairment, and subsequently transmits the enhanced signals over the two-way wireless link to the earpiece. (EX1010, 1:61-63, 27:4-17; EX1003, ¶41.) The system may also support mobile telephone functionality and noise cancellation. (EX1010, 2:60-65, 23:19-26, 24:45-25:14, FIG. 2; EX1003, ¶41.)

Anderson is analogous art to the '355 patent because it is directed to the same field of endeavor: wearable devices with electrical components, including those that provide audio output. (EX1001, Abstract; 3:37-47; EX1010, Abstract, 1:5-2:39; EX1003, ¶42.) For example, Anderson relates to wearable hearing aid systems in which audio signals are presented to a user—analogous to the wearable audio devices of the '355 patent. (*See* EX1001, 3:36-64; EX1010, 1:5-2:39; EX1003, ¶42.) Similarly, by disclosing systems in which “audio signals are enhanced according to the user's needs,” Anderson is reasonably pertinent to a problem faced by the '355 patent inventor—using wearable devices to provide users with “enhanced hearing.” (EX1001, 3:37-47; EX1010, 1:55-63; EX1003, ¶42.)

B. Summary of Lynch

Lynch is a U.S. Patent that was filed on April 14, 2004 and issued on October 6, 2009. (EX1008.) Lynch is thus prior art to the '355 patent under at least 35 U.S.C. §§102(a) and (e). Lynch was not cited during prosecution.

Lynch discloses a wireless assistive listening device cap (“ALD Cap”) for a hearing aid device. (EX1008, 1:61-2:23; EX1003, ¶44.) The ALD Cap includes electronics that supplement or replace hearing aid components and is compatible with various hearing aid types, including head-mounted devices with or without BTE units. (EX1008, 1:61-2:23, 3:1-4; EX1003, ¶44.) The ALD Cap improves the comfort, ergonomics, and aesthetics of the hearing aid by fastening electronic components of the hearing aid to the top of the user’s head. (EX1008, 1:17-57, 2:20-23; EX1003, ¶44.) The ALD Cap is attached on top of head-mounted components of a hearing aid system, *e.g.*, via a magnet; and can communicate wirelessly with those components. (EX1008, 2:63-66, 3:5-12, 3:34-44; EX1003, ¶44.) FIG. 5 illustrates an ALD Cap 600 connected to an external component 610 of a hearing aid system:



(EX1008, 4:37-41, FIG. 5; EX1003, ¶44.)

Lynch is analogous art to the '355 patent because it is directed to the same field of endeavor: wearable devices with electrical components, including devices that provide audio output. (EX1001, Abstract; 3:37-47; EX1008, Abstract, 1:10-2:23; EX1003, ¶45.) For example, Lynch relates to head-wearable hearing aid systems in which audio signals are presented to a user—analogue to the head-wearable audio devices of the '355 patent. (See EX1001, 3:36-64; EX1008, 1:61-2:23; EX1003, ¶45.) Similarly, by disclosing wearable systems that “provide[] access to assistive listening technology,” Lynch is reasonably pertinent to a problem faced by the '355 patent inventor—using wearable devices to provide users with “enhanced hearing.” (EX1001, 3:37-47; EX1008, 2:20-23; EX1003, ¶45.)

C. Motivation to Combine Anderson and Lynch with Reasonable Expectation of Success

A POSITA would have been motivated to combine the teachings of Anderson and Lynch. (EX1003, ¶46.) In Anderson’s hearing aid, the earpiece wirelessly communicates with an RPU worn or carried by the user (e.g., in a pocket), enabling reduced size and power consumption in the earpiece. (EX1010, 1:51-2:4, 4:4-7; EX1003, ¶46.) Anderson acknowledges the RPU may be small and “easily misplaced,” and addresses this problem by entering a limited stand-alone mode while the RPU is located. (EX1010, 21:31-22:2; EX1003, ¶46.)

This solution is suboptimal because remote processing and communication features are unavailable, and only default parameters are used. (EX1010, 21:57-62; EX1003, ¶47.) A POSITA would have sought to reduce the risk of misplacing the RPU without sacrificing its size or wireless advantages. (EX1003, ¶47.) Lynch provides such a solution by mounting hearing aid electronics on the user’s head via an ALD Cap, thereby minimizing separation between components and improving comfort, ergonomics, and aesthetics. (EX1008, 1:61-2:23; EX1003, ¶47.)

Lynch expressly contemplates use with head-worn hearing aids and emphasizes providing assistive listening functionality without undesirable ear-worn components. (EX1008, 1:61-2:23; EX1003, ¶48.) Further, Anderson broadly discloses that the RPU may be “carried on” the user without specifying

location, making head mounting an obvious option among a finite set of locations. (EX1010, 6:1-3; EX1003, ¶48.) Using Lynch’s ALD Cap to mount the RPU would preserve Anderson’s advantages, including wireless operation and “complete freedom of movement” while the hearing aid is worn. (EX1010, 2:32-35; EX1003, ¶48.)

The POSITA would have had a reasonable expectation of success. (EX1003, ¶49.) Lynch’s ALD Cap is designed to integrate with various hearing aids, including head-mounted hearing aids that do not use BTE components—the same type of hearing aid (*e.g.*, featuring headset 21) disclosed in Anderson. (EX1008, 2:15-23; EX1003, ¶49.) Anderson further teaches that many system variations and RPU implementations are possible using “well known” components. (EX1010, 12:48-49; EX1003, ¶49.) Additionally, Anderson’s RPU may be small and have a “wide variety of form factors,” suggesting that it could be flexibly and easily repositioned. (EX1010, 20:48-52, 21:31-34; EX1003, ¶49.) These disclosures indicate that adapting Anderson’s RPU in view of Lynch would have been a predictable modification. (EX1003, ¶49.)

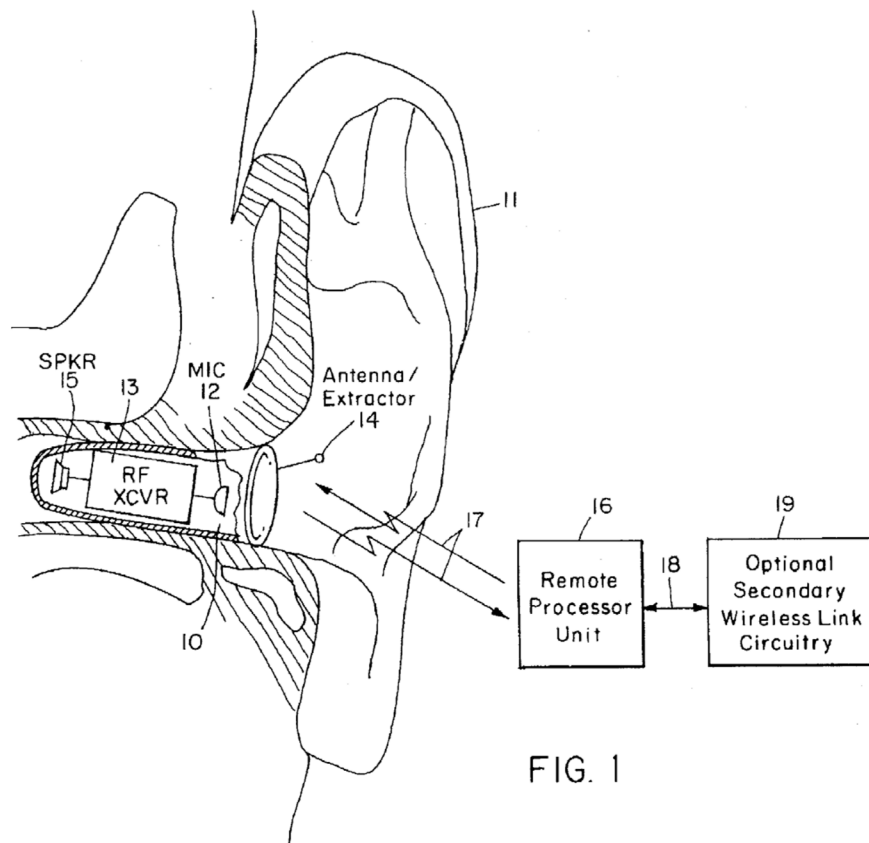
D. Claim 1

1. [Preamble]²

Anderson in view of Lynch teaches the claimed head-worn personal

² See the claims appendix for a full recitation of each claim.

electronic apparatus. (EX1003, ¶50.) Anderson discloses an electronic hearing aid that includes an earpiece 10 with a microphone and speaker, and an RPU that communicates with the earpiece. (EX1010, 1:7-10, FIG. 1, FIG. 2; EX1003, ¶50.) The RPU receives audio signals and generates customized audio output signals that are “enhanced according to the user’s needs,” such as by enhancing the signals to compensate for hearing loss; the customized signals are then wirelessly transmitted from the RPU to the earpiece, which presents them to the user via the speaker. (EX1010, 1:61-62, 22:62-23:14, 27:4-17; EX1003, ¶50.) FIG. 1 illustrates:



(EX1010, FIG. 1; EX1003, ¶50.)

Anderson in view of Lynch teaches that the apparatus is head-worn, *i.e.*,

electronic headwear worn on the user's head, in at least two embodiments.

(EX1003, ¶51.) First, Anderson discloses that with respect to FIG. 1, the earpiece 10 can utilize a BTE unit instead of a completely-in-the-canal (“CIC”) housing.

(EX1010, 3:53-58; EX1003, ¶51.) In combination with Lynch, which teaches using an ALD Cap to supplement or replace electronic components of the BTE unit, this apparatus is head-worn—*e.g.*, because the ALD Cap attaches to the top of the user's head for support. (EX1008, 1:61-2:14; EX1003, ¶51.)

Second, Anderson teaches that the earpiece may be “form[ed]” from a headset 21, as shown in FIG. 2:

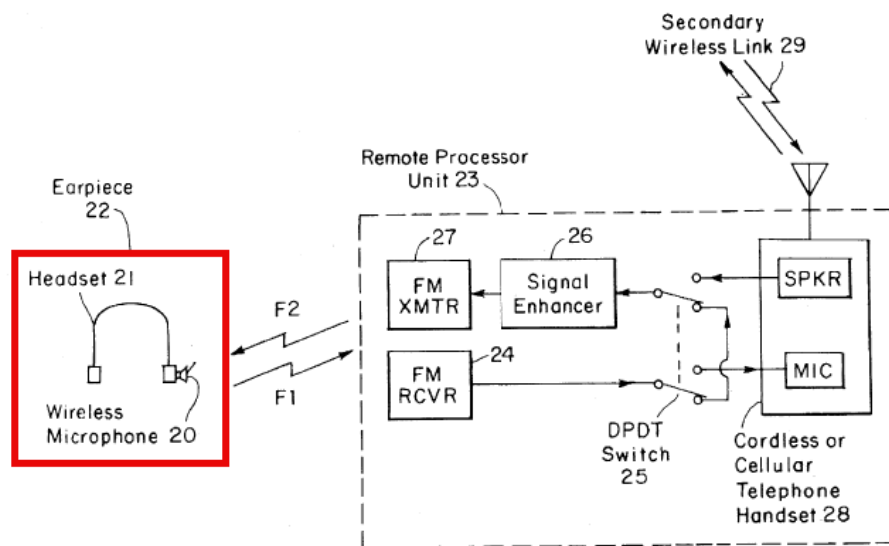


FIG. 2

(EX1010, 4:15-39, 5:52-54, FIG. 2 (annotated); EX1003, ¶52.)

The POSITA would have understood headset 21 and its earpiece 22 to be head-worn at least because FIG. 2 illustrates headset 21 (and thus earpiece 22) as

including a headband that rests on the user's head for support; and because headset 21 can be a "Radio Shack (R) model 12-103" stereo headset, which similarly includes a headband, as shown below:



(EX1014, 46; EX1010, 4:26-39, FIG. 2; EX1003, ¶53.)

Anderson illustrates headset 21 and earpiece 22 within the context of a “limited-feature embodiment,” shown in FIG. 2. (EX1010, 4:15-29; EX1003, ¶54.) However, the POSITA would have understood headset 21 and earpiece 22 to be combinable with the “full-featured” embodiment of FIG. 1. (EX1010, 3:53-58; EX1003, ¶54.) This is because Anderson characterizes FIG. 1 and FIG. 2 as showing two preferred embodiments of the same invention; explains that the headset earpiece shown in FIG. 2 is “functionally similar” to the in-ear earpiece 10 of FIG. 1; and further explains that “many other earpiece housing types” can be used in place of the CIC earpiece housing shown in FIG. 1. (EX1010, 3:52-58, 4:15-35; EX1003, ¶54.) The POSITA would have understood from these

disclosures that the FIG. 1 system could be flexibly implemented using various housings for the earpiece, including headset 21. (EX1003, ¶54.)

The POSITA would have been motivated to use the headset instead of the CIC housing to realize advantages in cost, simplicity, and commercial availability described by Anderson. (EX1003, ¶55.) Even using headset 21 in a full-featured application, it would provide certain advantages over the in-ear embodiment. (EX1003, ¶55.) Unlike some CIC housings, the headset did not need to be customized to fit in a user's ear canal. (EX1010, 4:15-5:60; EX1014, 46; EX1003, ¶55.) Additionally, there would have been comfort benefits: as Lynch discloses, many users do not like supporting objects with their ears, a problem addressed by replacing a CIC housing with a headset. (EX1008, 1:17-21; EX1003, ¶55.) And using a larger headset rather than a small in-ear device would make it easier and less expensive to include the processing and communication capabilities of the full-featured application, and would reduce the likelihood of misplacing the device. (EX1010, 2:36-39 (relaxing earpiece size constraints leads to a "cost-effective design"), 21:31-34; EX1003, ¶55.) Anderson provides specific guidance for adapting the headset using "techniques [that] are well known in the art," and notes that schematics and service manuals for the headset were readily available, demonstrating that the POSITA would have had a reasonable expectation of success in making the combination. (EX1010, 4:26-5:60; EX1003, ¶55.)

Because the POSITA would have combined headset 21 and its earpiece 22 with the full-featured FIG. 1 embodiment, throughout this Petition, unless otherwise noted, references to the earpiece 10 shown for FIG. 1 should be understood to apply equally to earpiece 22 and headset 21. (EX1003, ¶56.)

a. Combination of Anderson and Lynch

In the combination of Anderson and Lynch, described above in Section C, the RPU is mounted to the user's head via an ALD Cap as taught by Lynch. (EX1003, ¶57.) Lynch's ALD Cap includes electronic components that supplement or replace the components of a hearing aid device, which the POSITA would have understood to include Anderson's RPU component. (EX1008, 2:56-3:4; EX1003, ¶57.) Lynch teaches that comfort, ergonomics, and aesthetics are improved by mounting these components on the user's head. (EX1008, 1:17-57, 2:20-23; EX1003, ¶57.) The ALD Cap communicates wirelessly with the hearing aid device, analogous to how Anderson's RPU communicates wirelessly with the earpiece. (EX1008, Abstract, 3:62-4:18; EX1010, FIG. 1, FIG. 2; EX1003, ¶57.)

The ALD Cap can be mounted to the user's head via magnets, adhesives, or other fixation means. (EX1008, 3:5-12; EX1003, ¶58.) For hearing aids that include a BTE unit, such as some embodiments of Anderson, Lynch's ALD Cap is placed on top of a cochlear implant headpiece that "attach[es] to the head, not the ear." (EX1008, 2:5-8; EX1003, ¶58.)

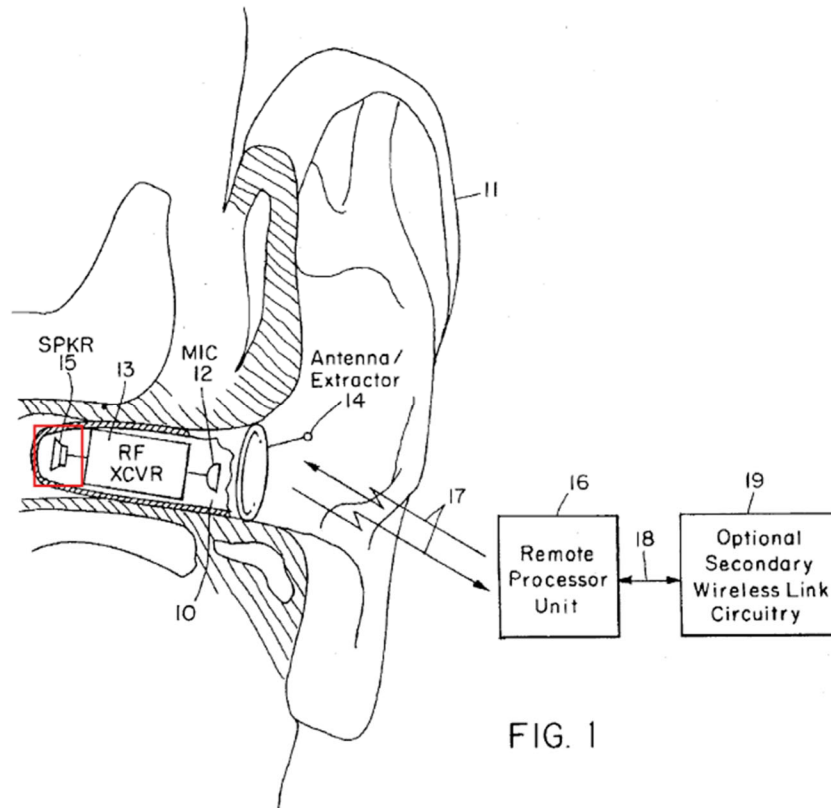
And for hearing aids that are head-mounted and do not use BTE (behind-the-ear) components, such as embodiments of Anderson that include headset 21, Lynch's ALD Cap can be placed on top of the hearing aid's head-mounted external components. (EX1008, 2:56-66; EX1003, ¶59.) The POSITA would have understood such components to include headset 21, which is both external and head-mounted. (EX1003, ¶59.)

Thus, in the combination of Anderson and Lynch, Anderson's RPU would be worn on the user's head—either via Lynch's ALD Cap mounted on top of headset 21, or (for devices with BTE units) on a cochlear implant headpiece attached to the head. (EX1003, ¶60.) The POSITA would have been motivated to make the combination, with a reasonable expectation of success, for the reasons described in Section C above. (EX1003, ¶60.)

The POSITA would have understood the electronic hearing aid apparatus of the combination to be both personal (because it is worn by a single user) and head-worn (because it is supported by the top of the user's head, *e.g.*, via headset 21), thus meeting the claimed apparatus. (EX1010, 1:7-10, 3:52-58, 4:26-39, FIG. 2; EX1014, 46; EX1003, ¶61.) The POSITA would further understand the claimed apparatus to include the RPU as described above. (EX1003, ¶61.)

2. [A]

Anderson's earpiece includes a speaker, as illustrated in FIG. 1:



(EX1010, 3:60, FIG. 1 (annotated); EX1003, ¶62.)

As discussed above, in embodiments, a BTE unit can be used in place of an in-ear housing for a hearing aid; as the POSITA would have understood, BTE units of such systems are worn near (and thus proximate to) the ear and include external electronic components such as speaker 15. (EX1010, 3:53-58; EX1008, 1:22-27, FIG. 1; EX1003, ¶63.)

Additionally, in embodiments, Anderson's earpiece belongs to head-worn headset 21, as shown in FIG. 2:

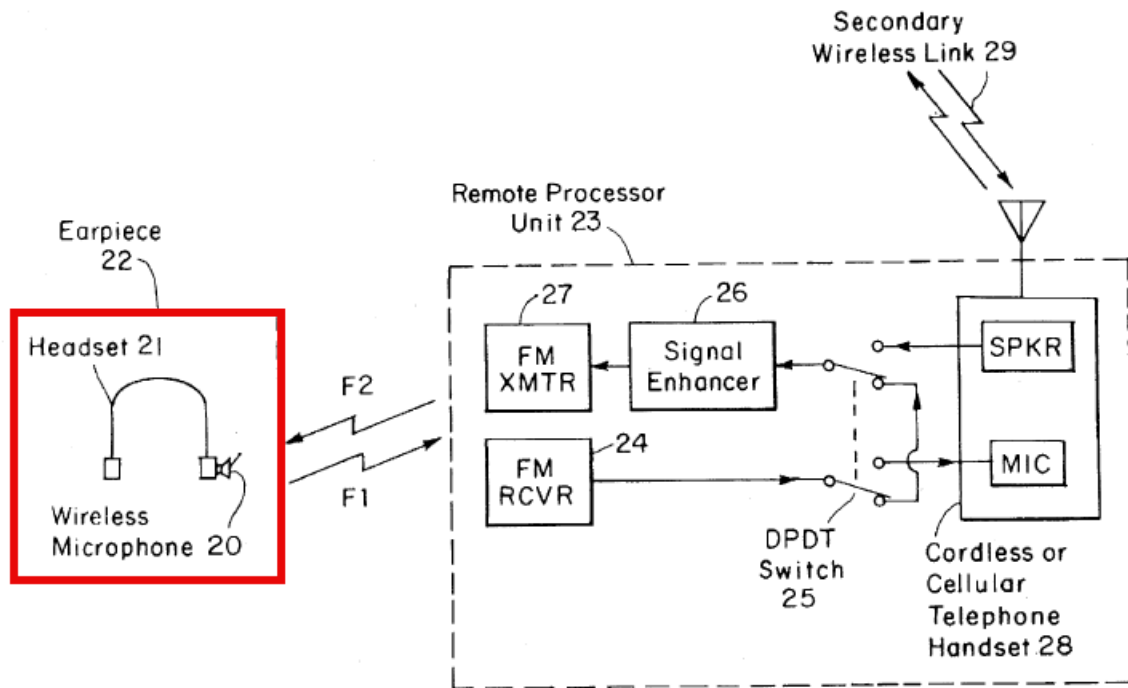


FIG. 2

(EX1010, 4:15-39, FIG. 2 (annotated); EX1003, ¶64.)

In these headset embodiments, headset 21 can be a “Radio Shack (R) model 12-103” stereo headset, shown below:



(EX1014, 46; EX1010, 4:26-39; EX1003, ¶65.)

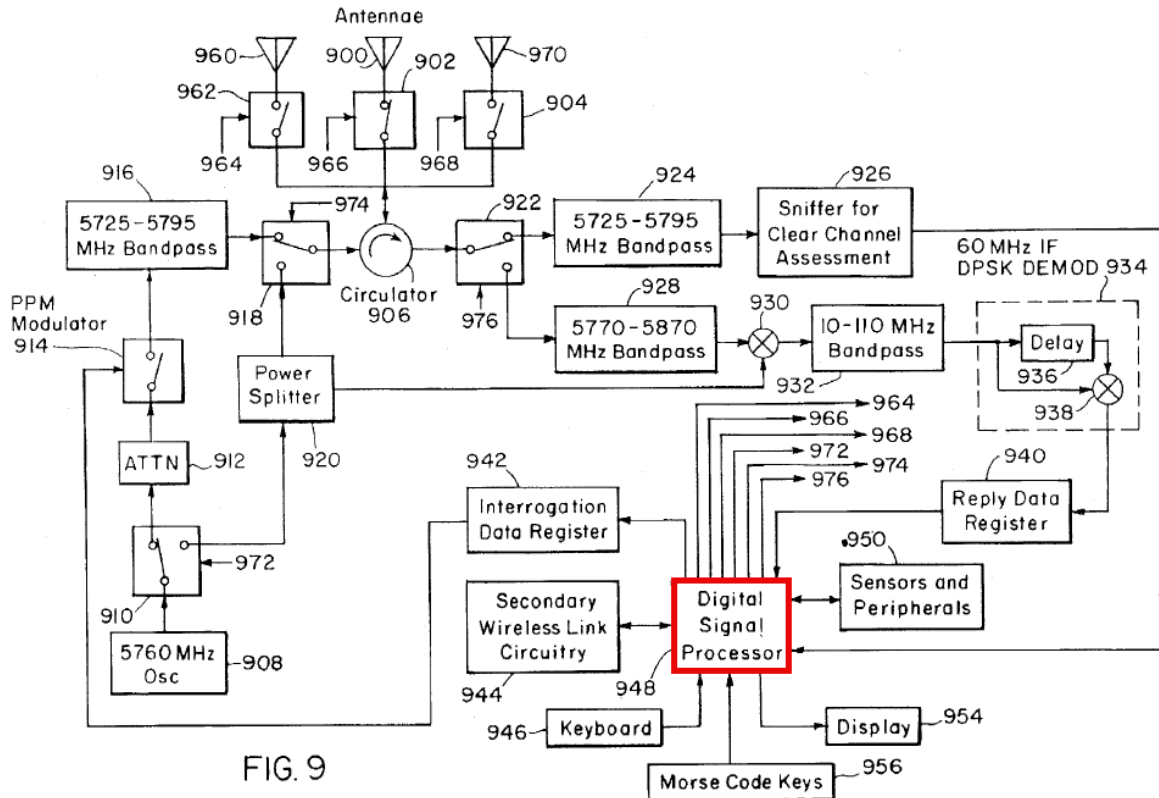
The POSITA would have understood from these disclosures that Anderson's headset 21 can include a speaker for each ear, as shown above, with each speaker positioned near (and thus proximate to) its respective ear when the headset is worn. (EX1003, ¶66.)

3. [B]

Anderson discloses a two-way wireless communication link 17 between the earpiece and the RPU. (EX1010, 4:1-4, FIG. 1; EX1003, ¶67.) Environmental audio signals are picked up by the earpiece's microphone 12 and transmitted wirelessly over the link 17 to the RPU. (EX1010, 1:51-63, 22:62-23:5; EX1003, ¶67.) In the RPU, these audio output signals are "enhanced according to the user's needs" and transmitted back to the earpiece, for presentation to the user via the earpiece's speaker 15. (EX1010, 1:55-63, 23:8-14; EX1003, ¶67.) The POSITA would thus understand Anderson's RPU to include a wireless receiver to wirelessly receive, via communication link 17 from the earpiece, the audio output signals that are later customized and output via the speaker. (EX1003, ¶67.) As one example, the RPU can include an FM receiver tuned to the earpiece's transmission frequency. (EX1010, 4:44-49; EX1003, ¶67.)

4. [C]

Anderson's RPU comprises electronic circuitry that includes a digital signal processor (DSP) 948, as shown in FIG. 9:



(EX1010, 12:48-53, FIG. 9 (annotated); EX1003, ¶68.)

DSP 948 itself includes “several integrated circuits,” such as additional DSPs and supporting memory devices. (EX1010, 12:48-53, FIG. 9; EX1003, ¶69.)

5. [D]

Anderson discloses a hearing test performed by the earpiece and RPU for a user of the hearing aid. (EX1010, 27:4-9; EX1003, ¶70.) The RPU’s DSP 948 generates tones of varying frequencies and amplitudes, which are presented to the user via the earpiece. (EX1010, 27:9-13; EX1003, ¶70.) Based on the user’s response to the tones, the hearing test determines “appropriate gain vs. frequency parameters” for a program stored in the DSP 948. (EX1010, 27:13-17; EX1003,

¶70.) The parameters are used by DSP 948 to “perform[] signal enhancement to compensate for the user’s hearing loss.” (EX1010, 27:13-17; EX1003, ¶70.) This is consistent with the ’355 patent, which describes a “calibration” process that generates a “frequency hearing profile”, so that “amplification across frequencies is tailored to the hearing needs of the user.” (EX1001, 69:20-42; EX1003, ¶70.)

The POSITA would have understood Anderson’s gain vs. frequency parameters to be hearing characteristics associated with the user, *i.e.*, via the hearing test; and that the parameters are stored in the RPU’s electronic circuitry (*e.g.*, in a memory device of DSP 948) for access by DSP 948, *i.e.*, for the stored program to perform the signal enhancement. (EX1010, 27:13-17; EX1003, ¶71.)

6. [E]

As described for [B], the RPU receives audio output signals from the earpiece, enhances the signals, and sends the customized audio output signals back to the earpiece for presentation. (EX1010, 1:51-63; EX1003, ¶72.) As described for [D], the RPU enhances the signals by applying the stored gain vs. frequency parameters to “compensate for the user’s hearing loss.” (EX1010, 27:13-17; EX1003, ¶72.)

7. [F]

As described for [B], the customized audio signals are transmitted from the RPU to the earpiece, where they are output to the user by the earpiece speaker 15.

(EX1010, 1:55-63, 22:62-23:14; EX1003, ¶73.)

8. [G]

See element [F]. (EX1003, ¶74.) The customized audio signals received by the earpiece are “converted by a speaker 15 to sounds that can only be heard by the user 11.” (EX1010, 23:8-14; EX1003, ¶74.)

E. Claim 2

1. [Preamble]

See claim 1. (EX1003, ¶75.)

2. [A]

See claim 1[B]. (EX1003, ¶75.) The audio output signals are received by the RPU from the user’s earpiece via wireless link 17. (EX1010, 22:62-23:5; EX1003, ¶75.) The earpiece is a mobile communication device at least because it is a device that “communicates wirelessly” with the RPU to send and receive signals; the earpiece can also communicate wirelessly with a telephone system, such as a cell phone. (EX1010, Abstract, 2:20-44; EX1003, ¶76.) The earpiece is mobile, and associated with the user, because it is worn by the user and “allows complete freedom of movement”. (EX1010, 1:6-18; EX1003, ¶76.)

F. Claim 17

1. [Preamble]

See claim 1[Preamble]. (EX1003, ¶77.)

2. [A]

See claim 1[A]. (EX1003, ¶78.)

3. [B]

See claim 1[B], [D], and [E]. (EX1003, ¶79.) The customized audio output signals are wirelessly transmitted to the earpiece from the RPU via the two-way wireless link 17. (EX1010, 23:8-14; EX1003, ¶79.) The POSITA would have understood these wirelessly transmitted signals to be received by a wireless receiver of the earpiece, *i.e.*, the earpiece's RF transceiver 13. (EX1010, 3:58-60, 11:19-23, FIG. 4; EX1003, ¶79.)

4. [C]

Anderson's earpiece includes electronic circuitry that includes custom application-specific integrated circuit (ASIC) 845, which controls "all earpiece functions," as shown in FIG. 8:

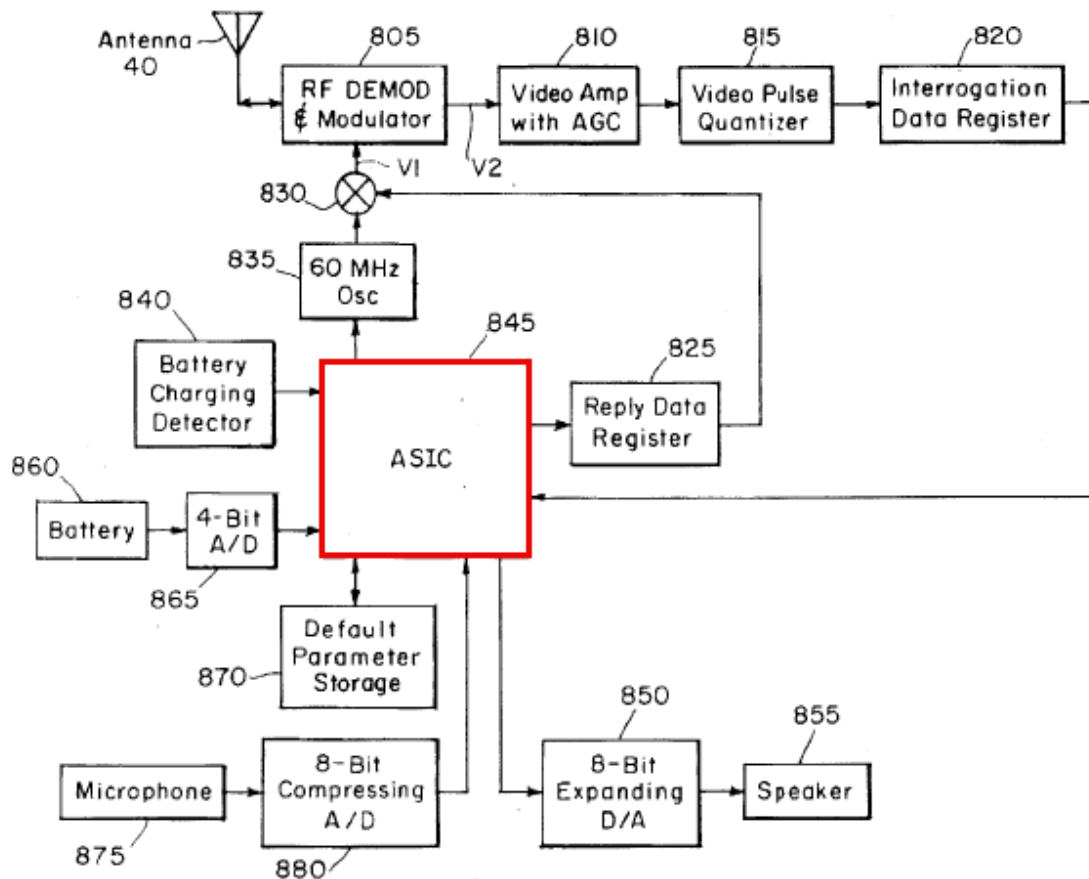


FIG. 8

(EX1010, 12:38-41, FIG. 8 (annotated); EX1003, ¶80.)

Under control of the ASIC 845, as described for claim 1[B] and [F], the earpiece receives the customized audio signals and outputs the signals to the user via speaker 15. (EX1003, ¶81.)

5. [D]

See claim 1[G]. (EX1003, ¶82.)

G. Claim 18**1. [Preamble]**

See claim 17. (EX1003, ¶83.)

2. [A]

See claim 2[A]. (EX1003, ¶84.)

H. Claim 51**1. [Preamble]**

See claim 17. (EX1003, ¶85.)

2. [A]

Anderson’s hearing aid “provides useful unsolicited information,” such as “a verbal warning that an earpiece or RPU battery voltage is low.” (EX1010, 24:15-23; EX1003, ¶86.) The POSITA would have understood such verbal warnings to be audio alerts, *e.g.*, alerts regarding battery status, that are sent from the RPU to the earpiece and “ultimately received as audio signals by the user,” *i.e.*, via the earpiece’s speaker. (EX1010, 24:20-23, 26:2-5; EX1003, ¶86.)

I. Claim 52**1. [Preamble]**

See claim 51. (EX1003, ¶87.)

2. [A]

Anderson’s audio alerts, as described for claim 51[A] (*e.g.*, verbal warnings

about the earpiece or RPU battery), are provided to a user only “if desired,” *i.e.*, dependent on a user preference for such alerts. (EX1010, 24:15-23; EX1003, ¶88.) The POSITA would have understood a user preference setting, *e.g.*, an RPU “parameter setting[,]” to indicate the user’s preference for audio alerts. (EX1010, 20:52-55; EX1003, ¶88.)

J. Claim 54

1. [Preamble]

See claim 17. (EX1003, ¶89.)

2. [A]

In Anderson, “speech signals ... are picked up by the earpiece wireless microphone 20” for communication to the RPU. (EX1010, 5:3-6:25; EX1003, ¶90.) The wireless microphone 20 is “mounted on” the headset 21 to “form” the earpiece 22, as shown in FIG. 2:

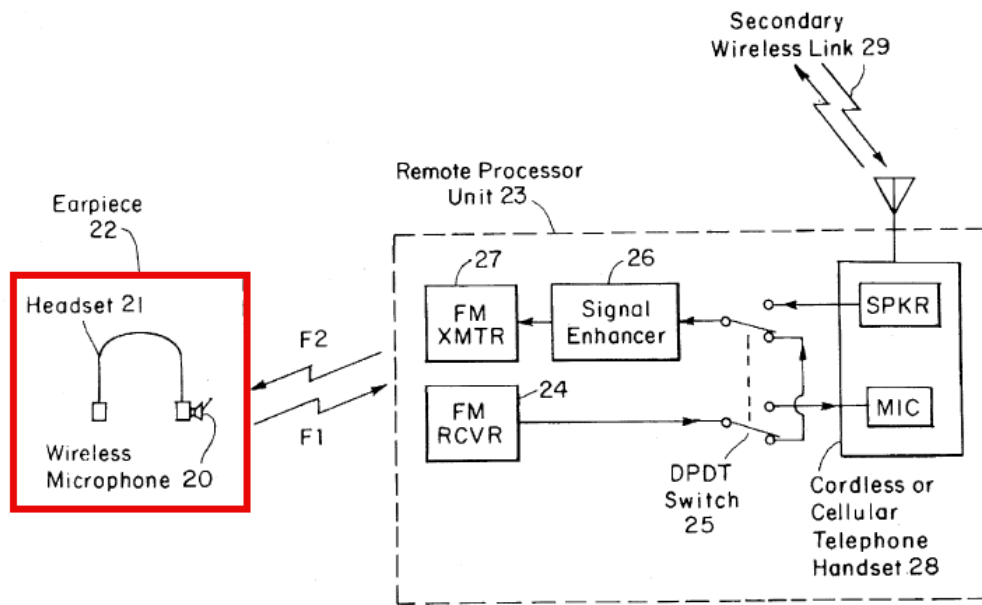


FIG. 2

(EX1010, 4:35-39, FIG. 2 (annotated); EX1003, ¶90.)

The earpiece apparatus is shown in FIG. 2 to include the headset 21; and is head-worn as described for claim 1, Preamble. (EX1010, FIG. 2; EX1003, ¶91.)

The wireless microphone 20 is at least partially internal to this head-worn apparatus, in order to connect to the headset's 1.5V battery, and to connect to the A/D converter 880 as shown in FIG. 8 (illustrating the earpiece):

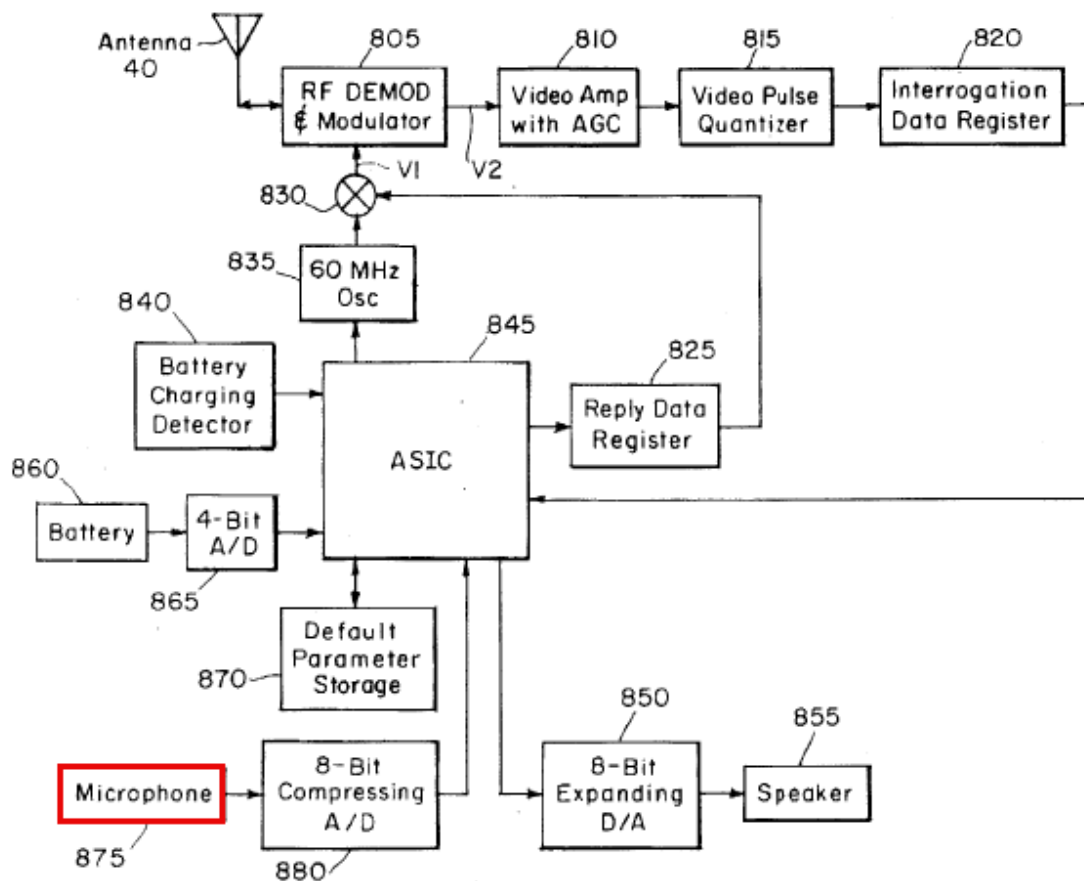


FIG. 8

(EX1010, 3:40-41, 5:52-54, 16:28-32, FIG. 8; EX1014, 46; EX1003, ¶91.)

Reference to FIG. 8's disclosures is appropriate in the combination, which implements Anderson's full-featured application (FIG. 8) in its headset-based device (FIG. 2). (EX1003, ¶92.)

3. [B]

Anderson discloses using a voice recognition program to execute voice commands, such as for telephone dialing and hearing aid parameter control. (EX1010, 25:15-34; EX1003, ¶93.) The user's verbal commands are received as

audio signals by the earpiece (*i.e.*, by the earpiece's microphone) and transmitted to the RPU. (EX1010, 25:29-30; EX1003, ¶93.) The RPU executes a voice recognition process (*e.g.*, by DSP 948) to identify voice commands from the audio signals, causing the RPU to initiate actions such as executing telephone calls. (EX1010, 25:41; EX1003, ¶93.)

K. Claim 58

1. [Preamble]

See claim 17. (EX1003, ¶94.)

2. [A]

Anderson's RPU can include a "peripheral device" to provide music (*e.g.*, from a compact disc) or other information to the user. (EX1010, 24:45-47, 25:52-59; EX1003, ¶95.) The RPU combines the customized audio signals described for claim 1[B] with "other" audio information, which the POSITA would have understood to include the music; and transmits this customized audio output to the earpiece via wireless link 17 for receipt by the earpiece's wireless receiver as described for claim 17[B]. (EX1010, 23:5-14; EX1003, ¶95.)

L. Claim 59

1. [Preamble]

See claim 17. (EX1003, ¶96.)

2. [A]

As described for claim 1[D], Anderson's RPU "performs signal enhancement to compensate for the user's hearing loss" based on gain vs. frequency parameters that are determined based on a hearing test. (EX1010, 27:4-17; EX1003, ¶97.) The POSITA would have understood such a gain parameter to characterize an amplitude of a signal; and thus would have understood Anderson's disclosure of using gain vs. frequency parameters to enhance the audio signals to include raising (amplifying) or lowering (attenuating) the amplitude of different frequency bands, based on their corresponding gain parameters, in accordance with the results of the user's hearing test. (EX1023, 314; EX1010, 27:4-17; EX1003, ¶97.)

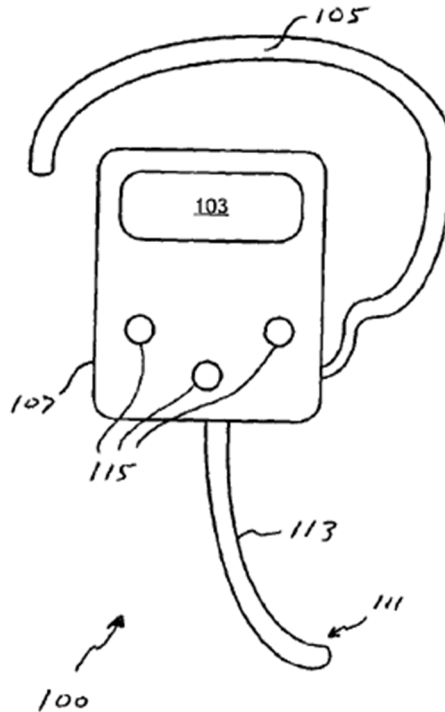
VI. GROUND 2: CLAIMS 3-5 AND 19-21 ARE RENDERED OBVIOUS BY ANDERSON IN VIEW OF LYNCH AND BODLEY

A. Summary of Bodley

Bodley is a U.S. Patent that was filed on January 15, 2003, published on July 15, 2004, and issued on November 17, 2009. (EX1005.) Bodley is thus prior art to the '355 patent under at least 35 U.S.C. §§102(a) and (e). Bodley was not cited during prosecution.

Bodley discloses a headset for wireless communication that includes an earpiece, a microphone, a speaker, and an integral display. (EX1005, 1:47-57, 2:38-50; EX1003, ¶99.) Bodley's headset attaches to the user using "any of a

variety of means,” including a headband for head support. (EX1005, 2:38-40; EX1003, ¶99.) FIG. 1 illustrates an ear-worn embodiment:



(EX1005, FIG. 1; EX1003, ¶99.)

The headset preferably connects to a “communications system” “that enables both voice and hearing data transfer,” such as a cell phone. (EX1005, 2:28-37; EX1003, ¶100.) The body of the headset houses electronic components, and includes a touch-sensitive display for presenting information (such as battery level) and receiving touch input (such as for entering phone numbers or operating the cell phone). (EX1005, 2:44-46, 2:65-67, 3:5-43; EX1003, ¶100.)

Bodley is analogous art to the '355 patent because it is directed to the same field of endeavor: wearable devices with electrical components, including those

that provide audio output. (EX1001, Abstract; 3:37-47; EX1005, Abstract, 1:47-67, 2:28-50; EX1003, ¶101.) For example, Bodley relates to wearable headsets in which audio signals are presented to a user—analogous to the wearable audio devices of the '355 patent. (See EX1001, 3:36-64; EX1005, 2:28-50; EX1003, ¶101.) Similarly, by disclosing devices with electrical components to configure audio operation (*e.g.*, headset volume, voice dialing, ring mode), Bodley is reasonably pertinent to a problem faced by the '355 patent inventor—using wearable devices with electrical components to “facilitate audio support.” (EX1001, 3:37-47; EX1005, 1:47-67; EX1003, ¶101.)

B. Motivation to Combine with Reasonable Expectation of Success

The POSITA would have been motivated to combine the teachings of Bodley with those of Anderson and Lynch. (EX1003, ¶102.) Anderson discloses that the RPU includes pushbuttons (*e.g.*, a keyboard) for data entry and parameter control, and may also support voice input for functions such as dialing telephone numbers. (EX1010, 2:51-55, 20:52-21:30, 25:15-29, FIG. 7; EX1003, ¶102.) However, a POSITA would have recognized drawbacks to both approaches; pushbuttons and keyboards rely on moving parts prone to failure and require force and fine motor control, which may be difficult for users with impairments, particularly given the device’s small size. (EX1003, ¶102.) Voice control likewise is limited, as Anderson discloses only “limited-vocabulary” commands. (EX1010,

25:22-34; EX1003, ¶102.) It also requires the user to speak, making it unsuitable for covert operation, noisy environments, or users with speech impairments. (EX1010, 1:10-18, 20:48-60; EX1003, ¶102.)

A POSITA would have been motivated to address these usability issues by combining Anderson and Lynch with Bodley’s touch input teachings for wearable audio devices. (EX1003, ¶103.) For example, integrating Bodley’s touch-sensitive sensor into the earpiece, as taught by Bodley, would eliminate moving parts, improving reliability and durability—particularly for hearing aid devices used daily in varied environments. (EX1005, FIG. 1; EX1003, ¶103.) Touch controls also enable low-force input and are suitable for noisy or covert operation. (EX1003, ¶103.)

The POSITA would have had a reasonable expectation of success in making the combination. (EX1003, ¶104.) Anderson, Lynch, and Bodley disclose structurally and functionally similar head-worn audio devices that use analogous and well-understood components (*e.g.*, microphones, speakers, wireless transceivers, and control circuitry), making their teachings readily combinable. (EX1010, FIG. 1, FIG. 2; EX1008, 1:61-2:23, 3:62-4:4, FIG. 4; EX1005, 1:47-67, 2:38-50, 3:44-4:3, FIG. 1, FIG. 9; EX1003, ¶104.) Because Anderson already provides user controls (*e.g.*, dialing) for the earpiece, using Bodley’s known touch interface to perform similar functions would have been straightforward, applying

known components and techniques to yield predictable results. (EX1003, ¶104.)

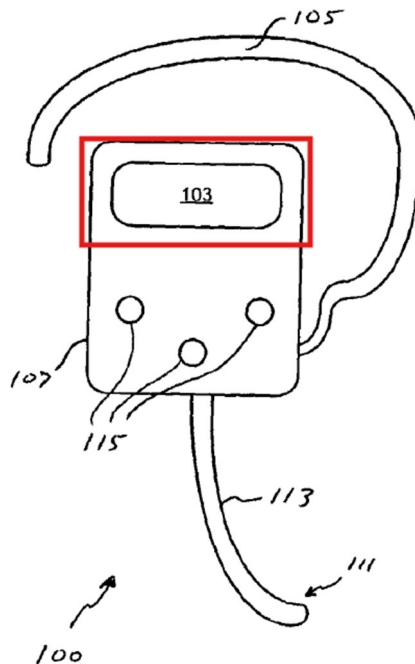
C. Claim 3

1. [Preamble]

See claim 1. (EX1003, ¶105.)

2. [A]

Bodley discloses a headset 100 that includes a “touch-sensitive” display panel 103 for data input, as shown in FIG. 1:



(EX1005, FIG. 1 (annotated), 2:40-41, 2:65-67, 3:20-21; EX1003, ¶106.)

The POSITA would have incorporated Bodley’s touch-sensor teachings into the Anderson/Lynch headset, such that the head-worn earpiece includes a touch-sensitive surface for controlling the hearing aid. (EX1003, ¶108.) Although Bodley describes the touch sensor as part of a display, a POSITA would have

understood that the touch-sensitive surface could be implemented with or without a display, while retaining the same advantages. (EX1003, ¶108.)

3. [B]

In the combination of Bodley with Anderson and Lynch, the POSITA would have understood the touch-sensitive surface to provide at least the input functionality of Anderson's pushbuttons and/or voice control. (EX1003, ¶109.) For example, the touch-sensitive surface would be used to control parameter settings such as volume, or to perform operations such as telephone dialing, as disclosed by Anderson, thereby altering operation of the hearing aid apparatus. (EX1010, 20:52-55, 25:15-29; EX1003, ¶109.) These operations are consistent with behavior of the touch display in Bodley, *i.e.*, adjusting headset volume or dialing a telephone. (EX1005, 3:15-20; EX1003, ¶109.)

D. Claim 4

1. [Preamble]

See claim 3. (EX1003, ¶110.)

2. [A]

Anderson includes "cellular telephone capabilities," including telephone dialing functions and communication with a cellular telephone system. (EX1010, 23:14-35; EX1003, ¶111.) The POSITA would have understood such cellular telephone capabilities to include supporting voice calls to the user, which is a basic

telephone function. (EX1003, ¶111.)

3. [B]

As described for claim 3[B], the touch-sensitive surface of the combination would perform operations such as telephone dialing, as taught by Anderson and by Bodley. (EX1003, ¶112.) Anderson discloses that its telephone operations include “communicat[ing] with a conventional handset or speakerphone in the usual fashion,” which the POSITA would have understood to include accepting or declining voice calls. (EX1010, 24:50-55; EX1003, ¶112.)

E. Claim 5

1. [Preamble]

See claim 3. (EX1003, ¶113.)

2. [A]

As described for claim 3[B], in the combination, the touch-sensitive surface controls parameter settings including volume, thus controlling the customized audio output provided to the user (*i.e.*, via the earpiece speaker from the RPU as described for claim 1[B]). (EX1010, 20:52-55, 25:15-29; EX1003, ¶114.)

F. Claim 19

1. [Preamble]

See claim 17. (EX1003, ¶115.)

2. [A]

See claim 3[A]. (EX1003, ¶116.)

3. [B]

See claim 3[B]. (EX1003, ¶117.)

G. Claim 20

1. [Preamble]

See claim 19. (EX1003, ¶118.)

2. [A]

See claim 4[A]. (EX1003, ¶119.)

3. [B]

See claim 4[B]. (EX1003, ¶120.)

H. Claim 21

1. [Preamble]

See claim 19. (EX1003, ¶121.)

2. [A]

See claim 5[A]. (EX1003, ¶122.)

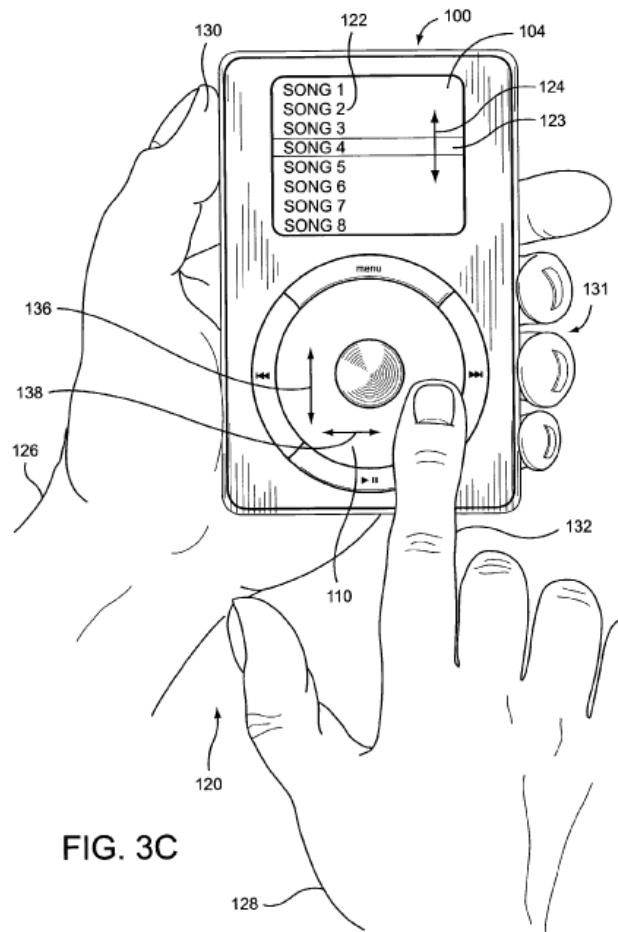
VII. GROUND 3: CLAIMS 6 AND 22-24 ARE RENDERED OBVIOUS BY ANDERSON IN VIEW OF LYNCH, BODLEY, AND ZADESKY

A. Summary of Zadesky

Zadesky is a U.S. Patent that was filed on July 1, 2002, published on April 24, 2003, and issued on May 16, 2006. (EX1006.) Zadesky is thus prior art to the

'355 patent under at least 35 U.S.C. §§102(a), (b), and (e). Zadesky was not cited during prosecution.

Zadesky describes that a portable audio device can include a touch-sensitive surface (touchpad) for receiving user touch input. (EX1006, 1:47-3:22; EX1003, ¶124.) The touchpad can control the media player based on a sliding input from the user, as shown in FIG. 3C:



(EX1006, FIG. 3C; EX1003, ¶124.)

Zadesky is analogous art to the '355 patent because it is directed to the same

field of endeavor: portable devices with electrical components, including those that provide audio output. (EX1001, Abstract; 3:37-47; EX1006, 3:36-4:3; EX1003, ¶125.) For example, Zadesky discloses a handheld media player in which audio is presented to a user—analogue to the audio devices of the '355 patent. (*See* EX1001, 3:36-64; EX1006, 3:38-46, 4:60-5:26; EX1003, ¶125.) Similarly, by disclosing that such handheld devices include electrical components (*e.g.*, touchpads) for providing audio control functions (*e.g.*, volume), Zadesky is reasonably pertinent to a problem faced by the '355 patent inventor—using wearable devices with electrical components to “facilitate audio support.” (EX1001, 3:37-47; EX1006, 10:34-51; EX1003, ¶125.)

B. Motivation to Combine with Reasonable Expectation of Success

The POSITA would have been motivated to combine the teachings of Anderson, Lynch, and Bodley with Zadesky with a reasonable expectation of success. (EX1003, ¶126.) As discussed above, the combined Anderson-Lynch-Bodley system includes a headset with a touch-sensitive surface for controlling earpiece functions. (EX1003, ¶126.) However, those references do not detail how a user interacts with the touch surface, motivating a POSITA to look to Zadesky to supply these details. (EX1003, ¶126.) Zadesky teaches touchpad input techniques that “facilitate user interaction” with audio devices, and provide “numerous” advantages such as ease and speed of use, accessibility, and ergonomics.

(EX1006, 3:26-37, 4:37-40, 5:61-6:8, 13:36-60; EX1003, ¶126.)

Zadesky further discloses using sliding input on a touch surface to control functions such as volume. (EX1006, 10:40-51; EX1003, ¶127.) The POSITA would have incorporated such sliding input to achieve faster, more intuitive, and ergonomic control—particularly beneficial in wearable devices, such as in Anderson, Lynch, and Bodley, where the user may be unable to see the interface (*e.g.*, if worn on the user’s head). (EX1003, ¶127.)

Zadesky also emphasizes applicability to a wide range of portable audio devices, compatibility with “widely varied” types of touchpads, and implementation using common components (*e.g.*, processors and memory), consistent with Anderson, Lynch, and Bodley. (EX1006, 5:27-45, 6:4-8, 13:61-14:20; EX1003, ¶128.) Thus, combining Zadesky would have required only modifying the existing touch surface to recognize sliding input, as taught by Zadesky—a straightforward and predictable change supporting a reasonable expectation of success. (EX1003, ¶128.)

C. Claim 6

1. [Preamble]

See claim 3. (EX1003, ¶129.)

2. [A]

Zadesky’s portable media player device includes a touchpad 110 configured

to “receive input from a finger moving across the surface of the touch pad 110” and control the media player accordingly, *e.g.*, by scrolling through a list of media files on the player, or “vary[ing] a characteristic of the media player,” such as changing the volume. (EX1006, 5:61-6:8, 10:40-51; EX1003, ¶130.) The POSITA would have understood Zadesky’s “finger moving across the surface” to disclose a sliding action. (EX1003, ¶130.)

The POSITA would have combined the touchpad input teachings of Zadesky with the touch surface of the Anderson-Lynch-Bodley system by configuring the touch surface to use sliding user input (as in Zadesky) to control the system’s operations, such as telephone dialing, or controlling volume or other parameter settings. (EX1010, 20:52-55, 25:15-29; EX1003, ¶131.)

D. Claim 22

1. [Preamble]

See claim 19. (EX1003, ¶132.)

2. [A]

See claim 22[A]. (EX1003, ¶133.) Zadesky teaches distinguishing a direction of the user input with respect to the touch-sensitive surface; for example, the “direction that the finger moves may be arranged to control the direction of scrolling,” *i.e.*, by moving “vertically up when the finger is moved in a first direction and vertically down when the finger is moved in a second direction.”

(EX1006, 6:38-59; EX1003, ¶133.)

E. Claim 23

1. [Preamble]

See claim 19. (EX1003, ¶134.)

2. [A]

See claim 6[A]. (EX1003, ¶135.)

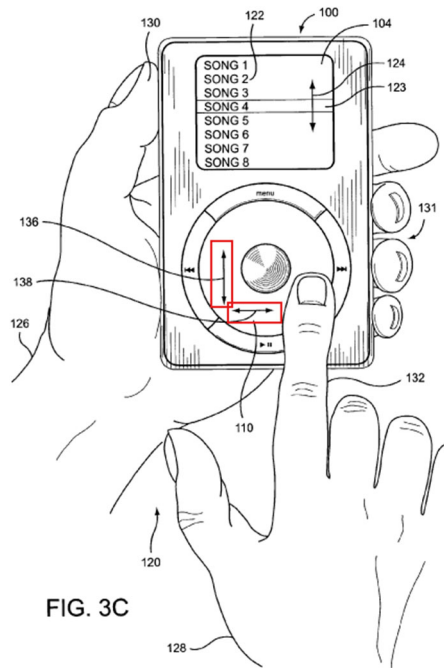
F. Claim 24

1. [Preamble]

See claim 19. (EX1003, ¶136.)

2. [A]

See claim 22[A]. Additionally, in Zadesky, as shown in FIG. 3C below, a user can “slide his or her finger 132 substantially tangentially from all sides of the touch pad,” such that the touchpad is “actuated *forwards and backwards* as shown by arrows 136 and side to side by arrows 138.” (EX1006, 9:17-21 (emphasis added); EX1003, ¶137.)



(EX1006, FIG. 3C (annotated); EX1003, ¶137.)

VIII. GROUND 4: CLAIMS 7-12, 29-40, 53, 57, AND 60 ARE RENDERED OBVIOUS BY ANDERSON IN VIEW OF LYNCH AND NEMIROVSKI

A. Summary of Nemirovski

Nemirovski is a U.S. Patent that was filed on July 31, 2001, published on October 3, 2002, and issued on December 30, 2003. (EX1007.) Nemirovski is thus prior art to the '355 patent under at least 35 U.S.C. §§102(a), (b), and (e). Nemirovski was not cited during prosecution.

Nemirovski discloses an earset with multiple microphones for use in a communication system. FIG. 5 illustrates an embodiment:

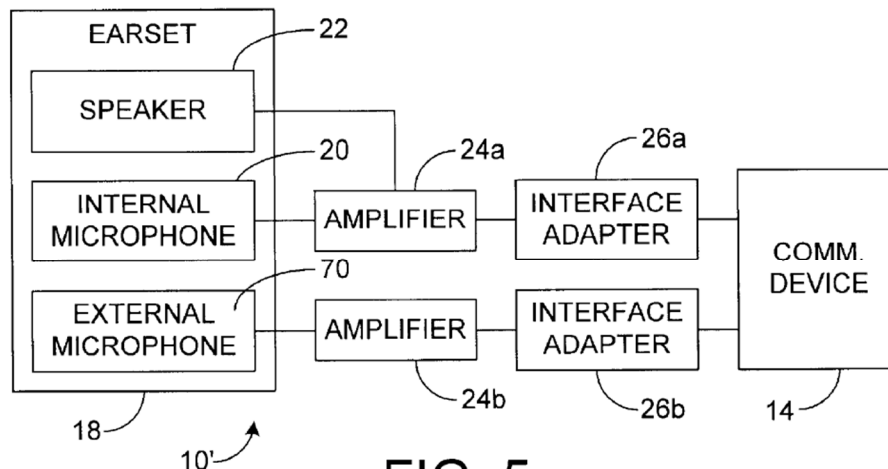


FIG. 5

(EX1007, FIG. 5; EX1003, ¶139.)

Nemirovski's earset can be "retained ... by a headset assembly," by which the POSITA would have understood the earset to be headwear (*i.e.*, worn supported by the top of the user's head via the headset assembly). (EX1007, 6:19-22; EX1003, ¶140.)

The earset includes an internal microphone, an external microphone, and a speaker. (EX1007, 9:46-50, FIG. 5; EX1003, ¶141.) The microphones detect sound and generate electrical signals that may be amplified and transmitted to a communication device, which can present audio to the user via the speaker. (EX1007, 4:34-47; EX1003, ¶141.)

The internal microphone is oriented toward the ear canal to capture user-generated sounds (*e.g.*, speech), while the external microphone captures ambient sounds. (EX1007, 5:45-50, 6:58-64, 9:22-26, 9:54-60; EX1003, ¶142.) These

signals can be used to distinguish user speech from external noise and to cancel externally generated noise. (EX1007, 9:19-31, 19:8-13; EX1003, ¶142.)

Nemirovski is analogous art to the '355 patent because it is directed to the same field of endeavor: wearable devices with electrical components, including those that provide audio output. (EX1001, Abstract; 3:37-47; EX1007, Abstract, 2:10-45; EX1003, ¶143.) For example, Nemirovski discloses a head-worn earset with a microphone and speaker—analogous to the head-worn audio devices of the '355 patent. (*See* EX1001, 3:36-64; EX1007, 2:10-25; EX1003, ¶143.) Similarly, by disclosing that such earsets include electrical components operable to detect speech and produce a corrected microphone signal for the user, Nemirovski is reasonably pertinent to a problem faced by the '355 patent inventor— using wearable devices to provide users with “enhanced hearing.” (EX1001, 3:37-47; EX1007, 2:10-47; EX1003, ¶143.)

B. Motivation to Combine with Reasonable Expectation of Success

The POSITA would have been motivated to combine Anderson and Lynch with Nemirovski with a reasonable expectation of success. (EX1003, ¶144.) Anderson discloses a hearing aid earpiece compatible with multiple microphones, including a body-worn microphone used to detect background noise and adjust parameters such as volume amplification. (EX1010, 7:10-13, 22:27-33, 23:26-31; EX1003, ¶144.)

The POSITA would have sought this combination to address shortcomings in Anderson. (EX1003, ¶145.) First, Anderson acknowledges drawbacks of body-worn microphones, including susceptibility to wind and clothing noise, failure to track head movement, and incompatibility with stand-alone operation. (EX1010, 22:20-27; EX1003, ¶145.) Anderson suggests relocating the body-worn microphone to the earpiece to address these issues, but does not describe how to do so while preserving background-noise detection. (EX1010, 22:20-27; EX1003, ¶145.)

Second, Anderson's earpiece includes a microphone for voice and cellular functionality, including speech detection for cell phone dialing and communication, but environmental noise can degrade speech signals. (EX1010, 23:14-35, 24:45-25:14, 25:15-50, 26:57-61, FIG. 1, FIG. 9; EX1003, ¶146.) Although Anderson acknowledges this environmental noise problem, its proposed solutions (bone conduction and multiple earpieces) have drawbacks. (EX1010, 26:55-57; EX1003, ¶147.) For example, as the POSITA would have recognized, bone conduction provides "suboptimal sound transmission" to the ear; and requiring multiple earpieces instead of one can greatly increase expense, and may be unsuitable for some applications (*e.g.*, while driving). (EX1010, 26:54-65; EX1017, 2; EX1003, ¶147.) Anderson invites its combination with other systems, by suggesting that distinguishing environmental noise can be performed "using any

of a number of techniques and circuits well known in the art”. (EX1010, 23:65-24:1; EX1003, ¶147.)

Accordingly, the POSITA would have been motivated to combine Anderson with Nemirovski to address these problems. (EX1003, ¶148.) Nemirovski provides a solution by disclosing an earpiece with internal and external microphones for detecting user speech and environmental noise, along with techniques for separating and canceling noise. (EX1007, 5:45-50, 6:58-64, 9:19-31, 9:54-60, 19:8-13; EX1003, ¶148.) The POSITA would have been motivated to apply this microphone arrangement to Anderson to realize the benefits described in Nemirovski, such as improved signal processing, and enabling the user to engage in other activities while speaking, without the drawbacks of bone conduction or multiple earpieces. (EX1007, 3:6-44, 10:8-11:6; EX1003, ¶148.) This is consistent with Nemirovski, which explains that multiple-earpiece solutions such as in Anderson are “discouraged” in some circumstances (such as while driving). (EX1007, 7:38-41; EX1003, ¶148.)

Although Anderson notes differences between hearing aids and telephone handsets, a POSITA would still have combined Nemirovski because Anderson includes analogous voice and cellular functionality and would benefit from Nemirovski’s noise-reduction techniques. (EX1010, 2:7-16; EX1003, ¶149.)

The POSITA would have had a reasonable expectation of success in

combining the teachings of Anderson, Lynch, and Nemirovski. (EX1003, ¶150.)

For example, Anderson, Lynch, and Nemirovski each disclose analogous head-worn devices that support audio output in use with a communication system.

(EX1010, 1:6-10, 6:19-22; EX1008, 1:61-2:23, 4:37-51; EX1007, 3:6-9; EX1003,

¶150.) The devices share various analogous and familiar components used in conventional ways, such as microphones for detecting speech, speakers for

presenting audio signals, and amplifier circuits for signal processing. (EX1010,

3:58-60, FIG. 1, FIG. 8; EX1008, 4:37-51; EX1007, 9:45-50, FIG. 5; EX1003,

¶150.) And Nemirovski provides implementation detail, such as specific signal processing methods for detecting speech, to guide its combination with systems

such as Anderson and Lynch. (EX1007, 10:27-11:6; EX1003, ¶150.)

Accordingly, the combination would have applied known techniques and

components to yield predictable results. (EX1003, ¶150.)

C. Claim 7

1. [Preamble]

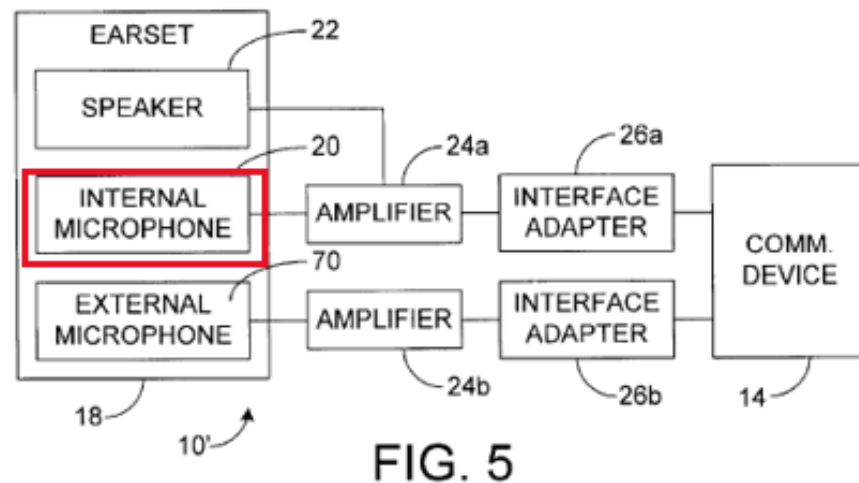
See claim 1. (EX1003, ¶151.)

2. [A]

The POSITA would have incorporated Nemirovski's microphone teachings into the Anderson/Lynch head-worn apparatus, such that the earpiece includes analogous microphones to improve speech detection and noise cancellation.

(EX1003, ¶152.)

In Nemirovski, internal microphone 20 of an earpiece detects “sounds emanating or coming out of the ear (or air pressure changes occurring within the ear) to accurately and reliably detect the speech of the user.” (EX1007, 3:6-23; EX1003, ¶153.) FIG. 5 illustrates:



(EX1007, 9:46-50, FIG. 5 (annotated); EX1003, ¶153.)

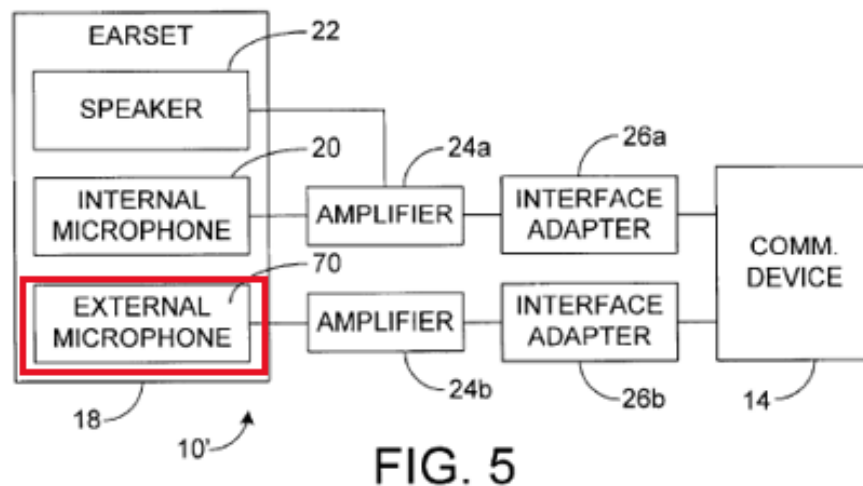
Nemirovski’s use of the microphone is consistent with Anderson’s disclosure of speech detection for voice commands and mobile telephone functionality, including communication with a cellular phone system. (EX1010, 23:19-26, 24:45-25:50, FIG. 1, FIG. 2; EX1003, ¶154.)

The internal microphone 20 is disposed on an interior portion of a housing of the earset, and is “*directed towards the ear canal of the user* and detects sounds emanating or coming out of the ear (or air pressure changes occurring within the

ear) to accurately and reliably *detect the speech of the user.*” (EX1007, 3:15-18 (emphasis added), 6:36-37; 9:46-50, FIG. 5; EX1003, ¶155.) The POSITA would have understood Nemirovski’s internal microphone 20, as combined with the apparatus of Anderson and Lynch, to be at least partially in the apparatus and directed toward the user when the apparatus is worn, so as to pick up audio input from the user. (EX1003, ¶155.)

3. [B]

Nemirovski’s earset 18 includes an external microphone 70 that “points away from the person wearing the earset.” (EX1007, 9:46-58, FIG. 5; EX1003, ¶156.) FIG. 5 illustrates:



(EX1007, 9:46-50, FIG. 5 (annotated); EX1003, ¶156.)

The external microphone detects air pressure changes outside of the ear that result from “externally generated noise (other people’s speech, environmental

noise, etc.)”—that is, ambient sound from the environment in the vicinity of the wearer. (EX1007, 9:53-58; EX1003, ¶157.) The POSITA thus would have understood the externally generated noise picked up by Nemirovski’s external microphone 70, as combined with the apparatus of Anderson and Lynch, to include this ambient audio input. (EX1003, ¶157.)

D. Claim 8

1. [Preamble]

See claim 7. (EX1003, ¶158.)

2. [A]

In Anderson, an external microphone (such as a body-worn microphone) can be used to “measure background noise for the purpose of automatically setting hearing aid parameters.” (EX1010, 7:10-13; EX1003, ¶159.) The POSITA would have understood such measuring background noise to include determining an ambient sound level (*i.e.*, by measuring a level of ambient background sounds). (EX1003, ¶159.) And in Nemirovski, external microphone 70 of an earpiece can be used to detect “environmental noise”. (EX1007, 9:45-10:7, FIG. 5; EX1003, ¶159.) Accordingly, a POSITA would have incorporated Nemirovski’s external microphone into the Anderson/Lynch earpiece and used it to determine ambient sound levels as in Anderson. (EX1003, ¶159.) The POSITA would have been motivated to make this combination for the reasons described in Section VIII.B.

(EX1003, ¶159.)

3. [B]

As described above, Anderson discloses that the ambient sound level is measured “for the purpose of automatically setting hearing aid parameters.”

(EX1010, 7:10-13; EX1003, ¶160.) Such hearing aid parameters can include the amplification level and the earpiece volume. (EX1010, 22:27-33, 23:26-31; EX1003, ¶160.) The POSITA would have understood setting the earpiece’s volume and amplification level, as described in Anderson, to include modifying the audio output to the speaker of the earpiece. (EX1003, ¶160.)

E. Claim 9

1. [Preamble]

See claim 7. (EX1003, ¶161.)

2. [A]

As described for claim 8[B], Anderson discloses measuring the ambient sound level, from an ambient sound input provided by a microphone; and using the ambient sound level to set the volume and amplification level of an audio output signal provided by the earpiece’s speaker. (EX1010, 7:10-13, 22:27-33, 23:26-31; EX1003, ¶162.) The POSITA would have understood the output signal to include ambient audio, at least because Anderson’s earpiece provides “audio signals from the ambient environment,” as required for hearing aid applications. (EX1010, 2:7-

16; EX1003, ¶162.)

3. [B]

See element [A]. (EX1003, ¶163.)

F. Claim 10

1. [Preamble]

See claim 7. (EX1003, ¶164.)

2. [A]

See claim 8[A]. (EX1003, ¶165.) In the combination described, Nemirovski's external microphone 70 detects "environmental noise" (an ambient sound input); and a level of that ambient noise is measured "for the purpose of automatically setting hearing aid parameters" as in Anderson. (EX1007, 9:45-10:7, FIG. 5; EX1010, 7:10-13; EX1003, ¶165.)

3. [B]

As described for claim 8[B], Anderson discloses measuring the ambient noise level, from an ambient sound input provided by a microphone as in Nemirovski; and using the ambient noise level to set the volume and amplification level of an audio output signal provided by the earpiece's speaker. (EX1010, 2:7-16, 7:10-13, 22:27-33, 23:26-31; EX1003, ¶166.) Anderson discloses that setting the output signal's volume level includes setting the "nominal and maximum allowable earpiece volume." (EX1010, 22:31-33; EX1003, ¶166.) The POSITA

would thus understand the audio output signal (*e.g.*, the signal's nominal and maximum volume) to be dependent on the ambient noise level. (EX1003, ¶166.)

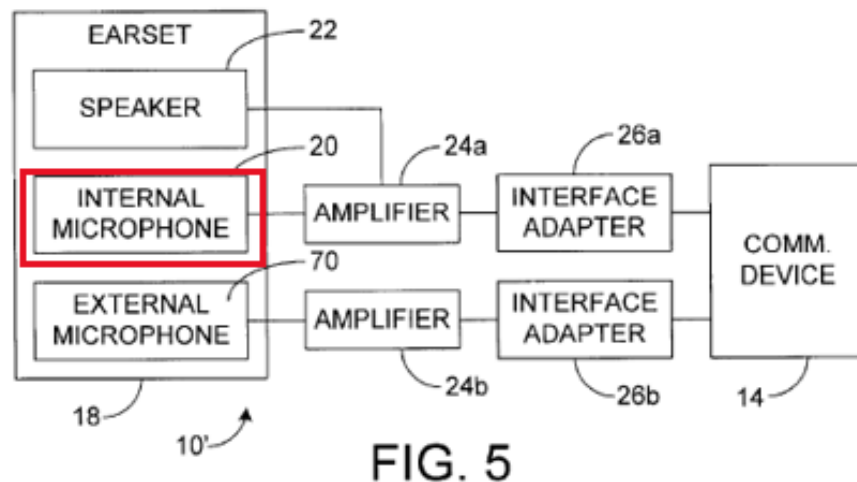
G. Claim 11

1. [Preamble]

See claim 1. (EX1003, ¶167.)

2. [A]

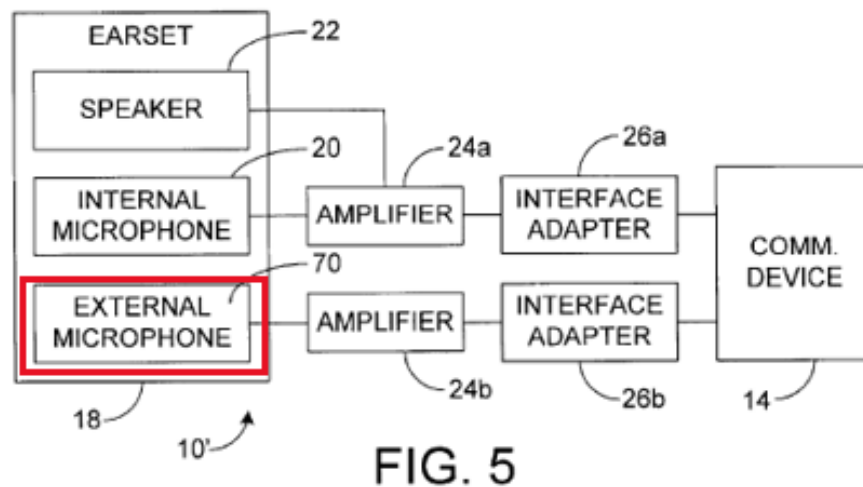
See claim 7[A]. (EX1003, ¶168.) Nemirovski teaches a first (internal) microphone 20 of the apparatus, as shown in FIG. 5:



(EX1007, 9:46-50, FIG. 5 (annotated); EX1003, ¶168.)

3. [B]

See claim 7[A]. (EX1003, ¶169.) Nemirovski teaches a second (external) microphone 70 of the apparatus, as shown in FIG. 5:



(EX1007, 9:46-50, FIG. 5 (annotated); EX1003, ¶169.)

4. [C]

See claim 7[A]. (EX1003, ¶170.)

5. [D]

See claim 7[B]. (EX1003, ¶171.)

6. [E]

Nemirovski teaches that a processing circuit can use the unique signals generated by the internal microphone 20 and the external microphone 70 “to distinguish between user produced speech and externally produced sounds.” (EX1007, 10:8-26; EX1003, ¶172.) The system can then “cancel externally generated noise from the detections of the internal microphone 20” to produce a “relatively noise-free speech signal.” (EX1007, 10:8-26; EX1003, ¶172.) The POSITA thus would have understood that in the combination of Anderson and

Lynch with Nemirovski, a processing circuit (e.g., Anderson’s RPU) processes the audio input from the first (internal) microphone in order to remove audio input that is associated with the environment, (*i.e.*, environmental noise picked up by the second (external) microphone). (EX1003, ¶172.)

H. Claim 12

1. [Preamble]

See claim 1. (EX1003, ¶173.)

2. [A]

See claim 11[A] and claim 11[B]. (EX1003, ¶174.)

3. [B]

See claim 11[C]. (EX1003, ¶175.)

4. [C]

See claim 11[D]. (EX1003, ¶176.)

5. [D]

See claim 10[A]. (EX1003, ¶177.)

6. [E]

Nemirovski’s earpiece can “cancel externally generated noise from the detections of the internal microphone 20” to produce a “relatively noise-free speech signal.” (EX1007, 10:8-26, 10:48-58; EX1003, ¶178.) In the below linear system, the internal and external microphone audio signals (Y_I and Y_E , respectively) each include a sound component S (user speech) and a noise

component N (ambient noise such as from passing vehicles and machinery) picked up by the microphones:

$$F_{MI} * S + F_{MI} * N = Y_I \quad (\text{Eq. 1})$$

$$F_{ME} * S + F_{ME} * N = Y_E \quad (\text{Eq. 2})$$

(EX1007, 10:28-47; EX1003, ¶178.)

The terms F_{MI} and F_{ME} represent the impulse responses of the internal and external microphones, respectively. (EX1007, 10:30-34; EX1003, ¶179.) The linear system is solved for the speech component S and the ambient noise component N, such that the noise component can be canceled from the microphone signals, thus isolating the speech component. (EX1007, 10:20-26; EX1003, ¶179.) The resulting modified signal is dependent on the ambient noise level because the ambient noise (N) is specifically targeted for cancellation. (EX1003, ¶179.)

I. Claim 29

1. [Preamble]

See claim 17. (EX1003, ¶180.)

2. [A]

See claim 7[A]. (EX1003, ¶181.)

3. [B]

See claim 7[B]. (EX1003, ¶182.)

J. Claim 30**1. [Preamble]**

See claim 29. (EX1003, ¶183.)

2. [A]

See claim 8[A]. (EX1003, ¶184.)

3. [B]

See claim 8[B]. (EX1003, ¶185.)

K. Claim 31**1. [Preamble]**

See claim 29. (EX1003, ¶186.)

2. [A]

See claim 9[A]. (EX1003, ¶187.)

3. [B]

See claim 9[B]. (EX1003, ¶188.)

L. Claim 32**1. [Preamble]**

See claim 31. (EX1003, ¶189.)

2. [A]

See claim 10[A]. (EX1003, ¶190.)

3. [B]

See claim 10[B]. (EX1003, ¶191.)

M. Claim 33**1. [Preamble]**

See claim 17. (EX1003, ¶192.)

2. [A]

See claim 7[A]. (EX1003, ¶193.) Nemirovski's internal microphone 20 is internal to the apparatus and "directed towards the ear canal of the user," so as to "detect[] sounds emanating or coming out of the ear (or air pressure changes occurring within the ear) to accurately and reliably detect the speech of the user." (EX1007, 3:15-18; EX1003, ¶193.)

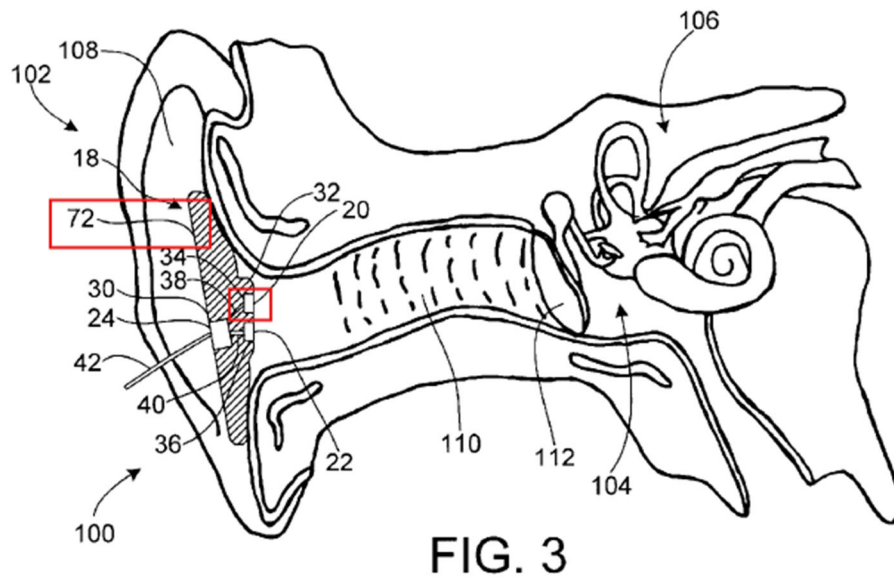
3. [B]

See claim 7[B]. (EX1003, ¶194.) Nemirovski's external microphone 70 is "disposed in a recess" of the housing of the apparatus. (EX1007, 9:35-37; EX1003, ¶194.) The external microphone 70 detects air pressure changes outside of the ear that result from "externally generated noise (other people's speech, environmental noise, etc.)." (EX1007, 9:53-58; EX1003, ¶194.) The POSITA would thus understand Nemirovski's external microphone to be at least partially in the apparatus and configured to pick up ambient sound input associated with the environment in the vicinity of the apparatus. (EX1003, ¶194.)

4. [C]

Nemirovski's external microphone 70 is disposed on an "exterior portion 72

of the housing 30” of the apparatus, while the internal microphone 20 is disposed on an “interior portion 32 of the housing 30” that is configured to be inserted into the ear (e.g., into the concha or ear canal). (EX1007, 6:36-49, 9:33-35; EX1003, ¶195.) FIG. 3 illustrates:



(EX1007, FIG. 3 (annotated); EX1003, ¶195.)

FIG. 3, illustrating the user’s ear, shows that exterior portion 72 (and thus external microphone 70) is disposed further than interior portion 32 (and internal microphone 20) from the user’s mouth. (EX1003, ¶196.) As the POSITA would have understood, this placement is a consequence of the microphones’ different purposes: the internal microphone is closer to the mouth, to better detect speech while remaining insulated from external sounds; conversely, the external microphone is further from the mouth, to better detect such external sounds.

(EX1007, 6:30-35, 9:19-31; EX1003, ¶196.)

N. Claim 34

1. [Preamble]

See claim 17. (EX1003, ¶197.)

2. [A]

See claim 11[A]. (EX1003, ¶198.)

3. [B]

See claim 11[B]. (EX1003, ¶199.)

4. [C]

See claim 11[C]. (EX1003, ¶200.)

5. [D]

See claim 11[D]. (EX1003, ¶201.)

6. [E]

See claim 11[E]. (EX1003, ¶202.)

O. Claim 35

1. [Preamble]

See claim 34. (EX1003, ¶203.)

2. [A]

Nemirovski’s internal microphone 20 “detects sounds emanating or coming out of the ear (or air pressure changes occurring within the ear) to accurately and reliably detect the speech of the user,” which the POSITA would have understood

to include a voice input. (EX1007, 3:15-18; EX1003, ¶204.)

3. [B]

Nemirovski's external microphone 70 detects air pressure changes outside of the ear that result from "externally generated noise (other people's speech, environmental noise, etc.)," which the POSITA would have understood to include ambient noise. (EX1007, 9:53-58; EX1003, ¶205.)

P. Claim 36

1. [Preamble]

See claim 34. (EX1003, ¶206.)

2. [A]

See claim 7[A]. (EX1003, ¶207.)

3. [B]

See claim 7[B]. (EX1003, ¶208.) Nemirovski's external microphone 70 can be "disposed in a recess" of the housing of the apparatus and "points away" from the wearer. (EX1007, 9:35-53; EX1003, ¶208.)

Q. Claim 37

1. [Preamble]

See claim 36. (EX1003, ¶209.)

2. [A]

See claim 35[A]. (EX1003, ¶210.)

3. [B]

See claim 35[B]. (EX1003, ¶211.)

R. Claim 38

1. [Preamble]

See claim 17. (EX1003, ¶212.)

2. [A]

See claim 7[A]. (EX1003, ¶213.)

3. [B]

See claim 7[B]. (EX1003, ¶214.)

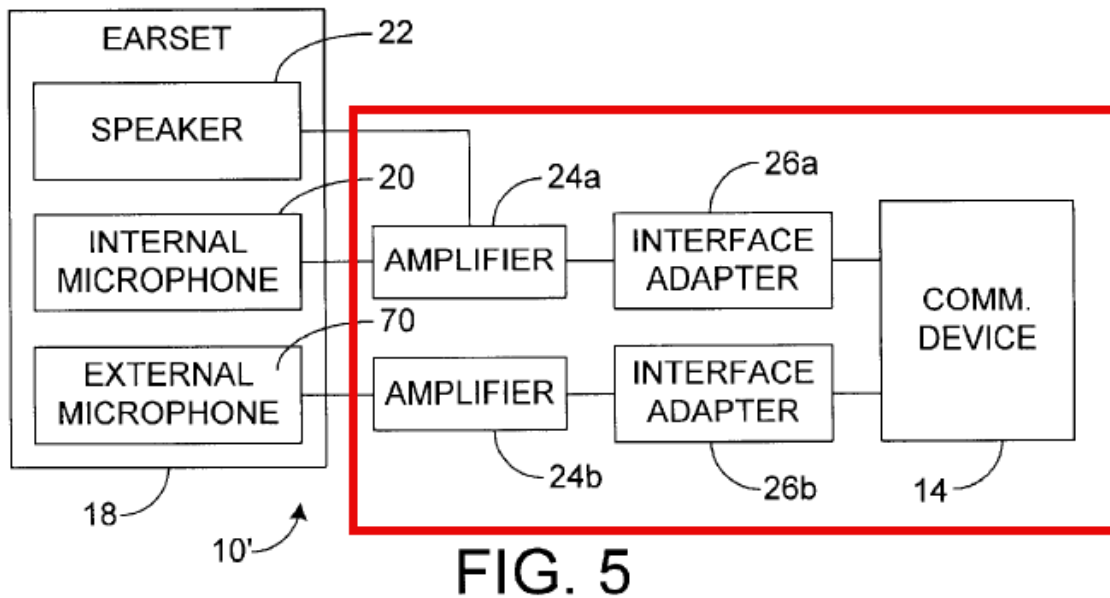
4. [C]

See claim 8[A]. (EX1003, ¶215.) Nemirovski's external microphone detects "environmental noise"; and Anderson teaches that the microphone "measure[s] background noise for the purpose of automatically setting hearing aid parameters," which the POSITA would have understood to include determining an environmental sound level (*i.e.*, a background noise level) from the microphone's environmental audio input. (EX1007, 9:45-10:7, FIG. 5; EX1010, 7:10-13; EX1003, ¶215.)

5. [D]

In Nemirovski, signals from the first and second microphones are amplified and processed (*i.e.*, by amplifiers 24a and 24b respectively, interface adapters 26a and 26b respectively, and communication device 14) such that the environmental

noise component is canceled from the audio signal detected by the first microphone 20. (EX1007, 9:45-10:13, FIG. 5; EX1003, ¶216.) FIG. 5 illustrates:



(EX1007, FIG. 5 (annotated); EX1003, ¶216.)

This amplification of the first microphone's audio signal is dependent on the environmental sound level (*i.e.*, noise component N) as described for claim 12[E]; that is, the noise component N is canceled from the microphone audio signal to isolate the speech component of the signal. (EX1007, 10:20-47; EX1003, ¶217.)

S. Claim 39

1. [Preamble]

See claim 17. (EX1003, ¶218.)

2. [A]

See claim 7[A] and [B]. (EX1003, ¶219.)

3. [B]

See claim 38[A]. (EX1003, ¶220.)

4. [C]

See claim 38[B]. (EX1003, ¶221.)

5. [D]

See claim 38[C]. (EX1003, ¶222.)

6. [E]

See claim 39[D]. (EX1003, ¶223.)

T. Claim 40**1. [Preamble]**

See claim 17. (EX1003, ¶224.)

2. [A]

See claim 7[A]. (EX1003, ¶225.)

3. [B]

See claim 7[B]. (EX1003, ¶226.)

4. [C]

See claim 12[E]. (EX1003, ¶227.)

U. Claim 53**1. [Preamble]**

See claim 17. (EX1003, ¶228.)

2. [A]

Nemirovski discloses that in the head-worn apparatus, an interior portion 32 of the housing 30 positions the speaker 22 in the concha 122 of the user's ear, or within the ear canal. (EX1007, 6:39-49; EX1003, ¶229.)

V. Claim 57

1. [Preamble]

See claim 17. (EX1003, ¶230.)

2. [A]

The apparatus includes an internal microphone 20 and an external microphone 70 as described for claim 7. (EX1007, 9:19-21; EX1003, ¶231.) The POSITA would have understood this array of microphones, as well as each of the individual microphones, to be configured for directional audio pickup based on their placement. (EX1003, ¶231.) Nemirovski teaches that the internal microphone is directed toward the ear canal to detect user-generated sounds while being shielded from external noise, whereas the external microphone is oriented away from the user to detect environmental sounds. (EX1007, 9:19-35; EX1003, ¶231.) Although the microphones themselves may be omnidirectional, the microphones are *configured* for directional audio pickup by their positions relative to the ear and the apparatus. (EX1007, 3:34-35, 7:13-14, 9:43-44; EX1003, ¶231.). For example, the internal microphone is “shielded from environmental noise” by

the housing and the user's head, which directionally blocks external sound, while the external microphone directionally detects ambient sound outside the ear "[a]s a result" of its outward orientation. (EX1007, 7:8-14, 9:51-55; EX1003, ¶231.)

W. Claim 60

1. [Preamble]

See claim 59. (EX1003, ¶232.)

2. [A]

See claim 7[A]. (EX1003, ¶233.)

3. [B]

See claim 7[B]. (EX1003, ¶234.)

4. [C]

Anderson discloses performing background noise cancellation on the audio output presented to the user, *e.g.*, by creating sound waves in opposition to noise from the environment, so as to cancel the noise from the audio presented to the user. (EX1010, 2:60-65, 23:36-24:4; EX1003, ¶235.) As described for claim 8[A], in the combination of Anderson and Lynch with Nemirovski, Nemirovski's external microphone (rather than Anderson's body-worn microphone) would advantageously detect the environmental audio input. (EX1007, 9:45-10:7, FIG. 5; EX1010, 7:10-13, 22:20-27; EX1003, ¶235.)

IX. GROUND 5: CLAIMS 13, 14, AND 41-50 ARE RENDERED OBVIOUS BY ANDERSON IN VIEW OF LYNCH AND IRVIN

A. Summary of Irvin

Irvin is a U.S. patent that was filed on Feb. 21, 2000, and issued on March 7, 2006. (EX1009.) Irvin is thus prior art to the '355 patent under at least 35 U.S.C. §§102(a) and (e).

Irvin discloses wireless headsets with “automatic on/off capabilities to maximize battery life,” such as headset 100 shown in FIG. 1:

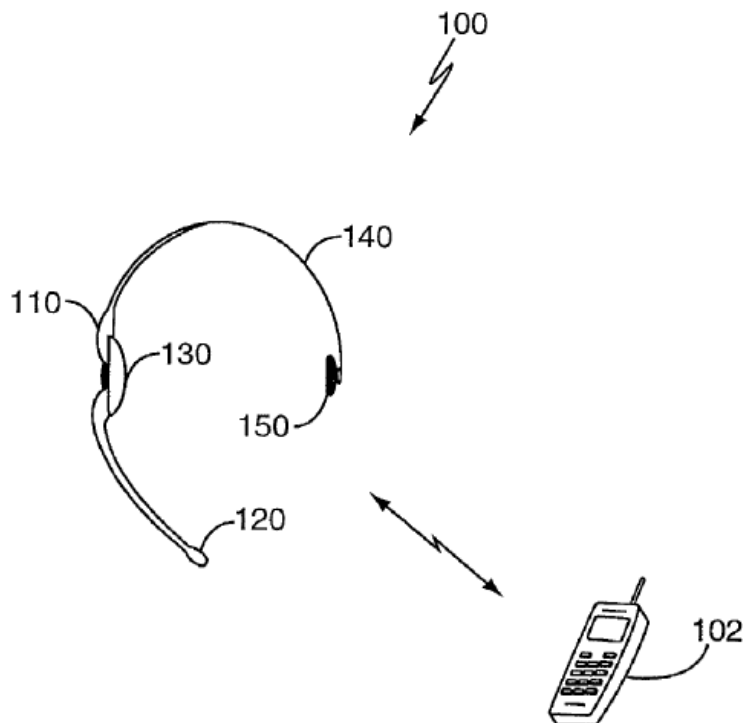


FIG. 1

(EX1009, Abstract, 1:13-51, FIG. 1; EX1003, ¶237.)

Irvin's headset is head-worn: it is "secur[ed] ... to the user's head," *e.g.*, via a retaining member, and automatically transitions between inactive, sleep, and active states depending on whether it is being worn. (EX1009, Abstract, 2:16-51, 3:35-39, 8:11-50, 9:40-43; EX1003, ¶238.) A communications circuit 230 provides wireless and audio interfaces that are selectively enabled or disabled by a power control circuit 210 depending on the device state. (EX1009, 3:28-4:10, 8:11-9:39, FIG. 2A; EX1003, ¶238.) FIG. 2A illustrates:

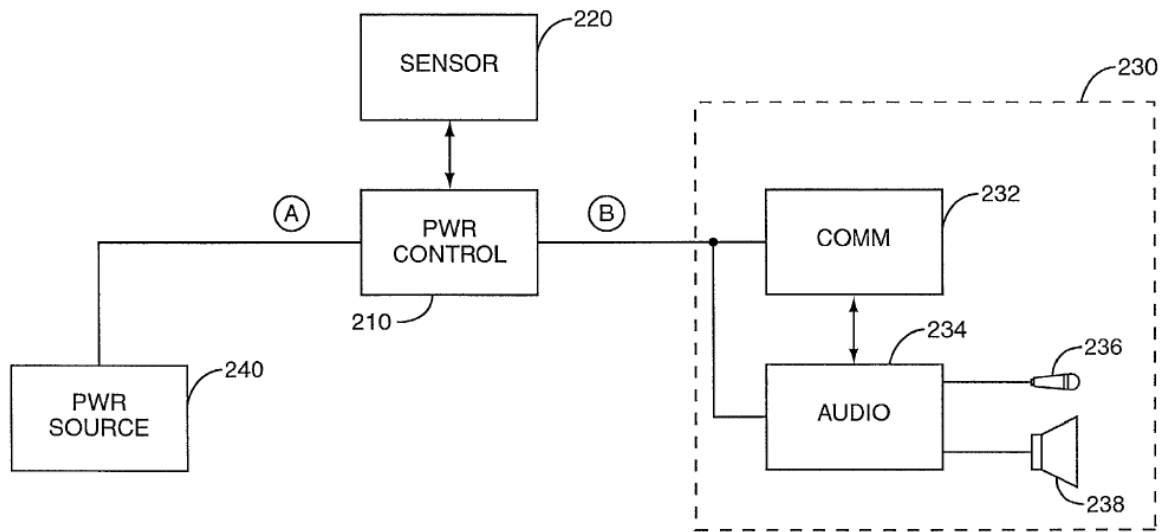


FIG. 2A

(EX1009, FIG. 2A; EX1003, ¶238.)

Transitions between the states are controlled by a sensor 220 (*e.g.*, a contact sensor or proximity sensor), which detects when the user is wearing the headset.

(EX1009, Abstract, 2:16-51, 5:1-6:67, 8:11-50; EX1003, ¶¶239-241.) FIGs. 4C and 4D illustrate sensor 220 embodiments:

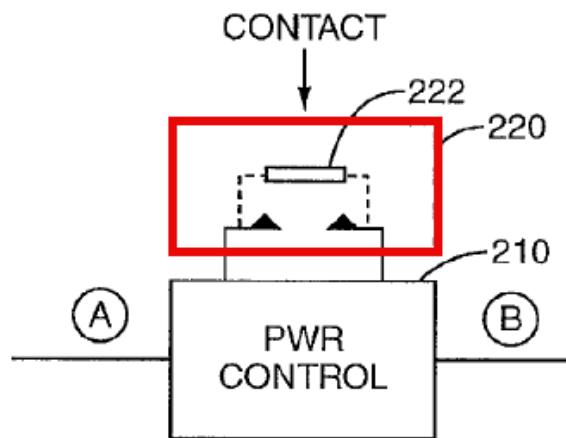


FIG. 4C

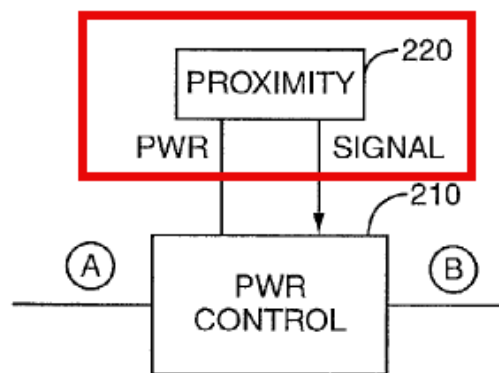


FIG. 4D

(EX1009, FIG. 4C (annotated), FIG. 4D (annotated); EX1003, ¶¶239, 240.)

Irvin is analogous art to the '355 patent at least because it is directed to the same field of endeavor: wearable devices with electrical components, including

those that provide audio output. (EX1001, Abstract; 3:37-47; EX1009, 3:28-45; EX1003, ¶242.) Irvin is reasonably pertinent to the problems faced by the '355 patent inventors, because Irvin and the '355 patent both relate to how to determine when a wearable device is being used or worn by the user, so that the device can be controlled accordingly. (EX1001, 92:41-93:57; EX1009, 2:16-51; EX1003, ¶242.) Additionally, both Irvin and the '355 patent strive to minimize power consumption, and thus maximize the battery life, of the wearable device. (EX1001, 70:31-42; EX1009, 2:16-51; EX1003, ¶242.)

Irvin was not cited during prosecution.

B. Motivation to Combine with Reasonable Expectation of Success

A POSITA would have been motivated to combine Anderson and Lynch with Irvin to meet the claim limitations. (EX1003, ¶244.) Anderson recognizes that that battery life (and thus power consumption) is a concern for its hearing aid device: “[e]arpiece power consumption is preferably minimized to extend battery life”. (EX1010, 6:55-57; EX1003, ¶244.) Reduced power consumption improves usability by extending operation time and enabling smaller, lighter batteries—important for head-worn devices. (EX1003, ¶244.) And as Irvin notes, “battery life is a key component of operator convenience,” and “it is important that wireless headset design incorporates provisions maximizing battery life.” (EX1009, 2:1-5; EX1003, ¶244.)

Although Anderson proposes earpiece designs that reduce power usage and use rechargeable batteries, this is an imperfect solution because the device cannot be used while the battery is being charged. (EX1010, 22:35-39; EX1003, ¶245.) The POSITA would have sought further improvements to reduce charging time and avoid periods of non-use—particularly problematic for hearing aids, where the device’s unavailability can pose health and safety risks. (EX1003, ¶245.)

The POSITA would have looked to Irvin, which provides such a solution by teaching automatic transitions between active and low-power states based on user activity. (EX1009, 2:8-51; EX1003, ¶246.) Irvin discloses sensors responsive to natural user stimuli (e.g., motion, orientation, or proximity) to control device state. (EX1009, 2:16-28; EX1003, ¶246.) Incorporating these teachings into the Anderson/Lynch system would improve power efficiency, reliability, and usability by enabling automatic, hands-free operation without mechanical switches. (EX1009, 1:13-2:51; EX1003, ¶246.) By using a sensor to determine when the device is in use (*e.g.*, in motion, and/or being worn), Irvin teaches implementing a power save function in a way that is reliable, convenient, hands-free, and requires minimal user intervention. (EX1009, 1:13-2:51; EX1003, ¶246.) This improves upon Anderson, which relies on manual controls. (EX1010, 21:20-25, 22:14-20; EX1003, ¶246.)

Irvin’s sensor 220 can be, *e.g.*, a contact sensor (such as a contact switch) or

a proximity sensor. (EX1009, 2:27-28, 5:1-6:33; EX1003, ¶247.) The POSITA would have been motivated to combine either of these sensor types with Anderson and Lynch. (EX1003, ¶247.) In Irvin, a “particular” sensor 220 may be selected and configured to detect “actual use” while avoiding inadvertent activation. (EX1009, 5:1-17; EX1003, ¶247.) As guided by Irvin, the POSITA would have selected the sensor based on the use conditions of the hearing aid device—for example, a contact sensor for reliable detection when worn, or a proximity sensor where contact sensing may be unreliable (*e.g.*, when the hearing aid is particularly lightweight or when the user cannot apply sufficient force). (EX1009, 5:1-17, 6:3-8; EX1003, ¶¶247, 248.)

The POSITA would have had a reasonable expectation of success in making the combination. (EX1003, ¶249.) Anderson, Lynch, and Irvin all disclose head-worn devices with analogous components (*e.g.*, batteries, programmable logic devices (*e.g.*, ASICs), power electronics, sensors microphones, speakers) and head-worn headset form factors; and Anderson already contemplates multiple sensors. (EX1010, 2:55-59, 24:23-26; EX1008, FIG. 4; EX1009, 3:28-4:38, 8:4-10, FIG. 2A; EX1003, ¶249.) The combination thus would have involved the application of known methods to analogous and well-understood components. (EX1003, ¶249.) Irvin further teaches integrating sensor 220 into headset components, such as by “[i]deally” placing sensor 220 in the earpiece, in a retaining member, or in a

retaining pad—analogous to headset components of Anderson (earpiece 22, headset 21) and Lynch (ALD Cap 600). (EX1009, 3:29-32, 6:10-13, FIG. 1B; EX1003, ¶249.) These disclosures underscore that the POSITA would have had a reasonable expectation of success in combining Irvin’s teachings with the hearing aid of Anderson/Lynch. (EX1003, ¶249.)

C. Claim 13

1. [Preamble]

See claim 1. (EX1003, ¶250.)

2. [A]

Irvin discloses that its proximity sensor 220 can be an “active or passive [infrared] sensor,” which the POSITA would have understood to include a detector for detecting capturing infrared radiation data (*i.e.*, an amount of infrared radiation detected by the infrared sensor). (*See* EX1001, 104:30-33; EX1009, 6:22-24; EX1015, 216-17; EX1003, ¶251.) The POSITA would have combined Irvin’s proximity sensor 220 with the head-worn personal electronic apparatus of Anderson in view of Lynch as described in Section IX.A such that the apparatus includes the proximity sensor. (EX1003, ¶251.)

3. [B]

Irvin teaches that electronic circuitry processes data received from sensor 220 (*e.g.*, an infrared proximity sensor indicating the distance to the user’s head) to

enable or disable the headset's electronic circuitry based on whether the headset is being worn:

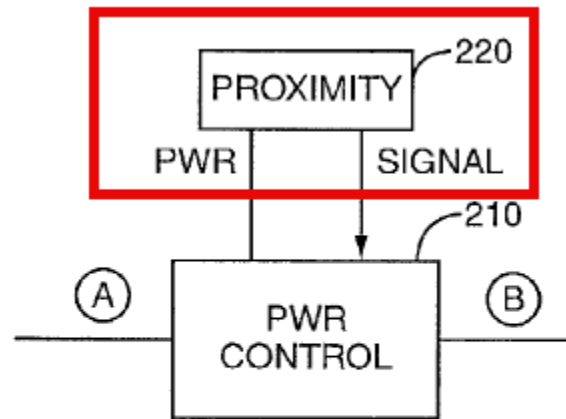


FIG. 4D

(EX1009, 4:3-10, 4:39-49, 6:20-33, FIG. 4D (annotated); EX1003, ¶252.)

For example, communications circuit 230 transitions to an active state 620 after the sensor 220 indicates a stimulus (*e.g.*, infrared radiation data indicating that the device is worn); and transitions to an inactive state 610 or a sleep state 720 after the indication is no longer provided. (EX1009, 8:11-9:39; FIG. 6, FIG. 7; EX1003, ¶253.) The POSITA would have understood that in the combination, the electronic circuitry would be implemented by Anderson's RPU (*e.g.*, DSP 645) and/or earpiece (*e.g.*, ASIC 845), at least because Anderson discloses these components as configured to interface with sensors. (EX1010, 24:23-26; EX1003, ¶253.)

4. [C]

See element [B]. (EX1003, ¶254.)

D. Claim 14

1. [Preamble]

See claim 1. (EX1003, ¶255.)

2. [A]

Irvin teaches that electronic circuitry processes data received from contact sensor 220 (*e.g.*, a contact switch activated by the application of force) to enable or disable the headset's electronic circuitry based on whether the headset is being worn:

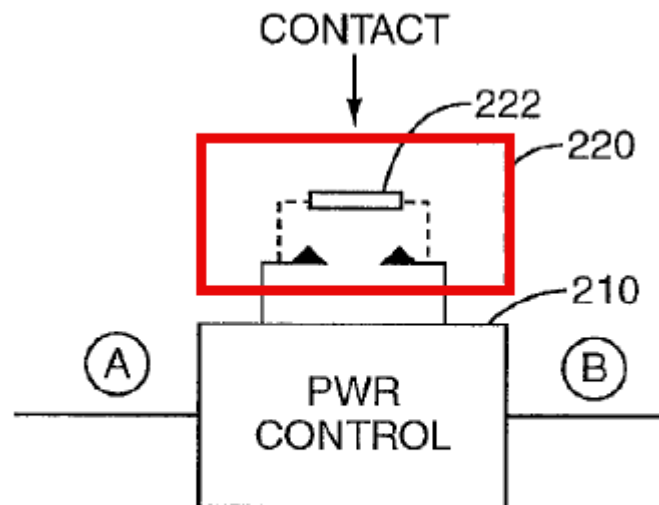


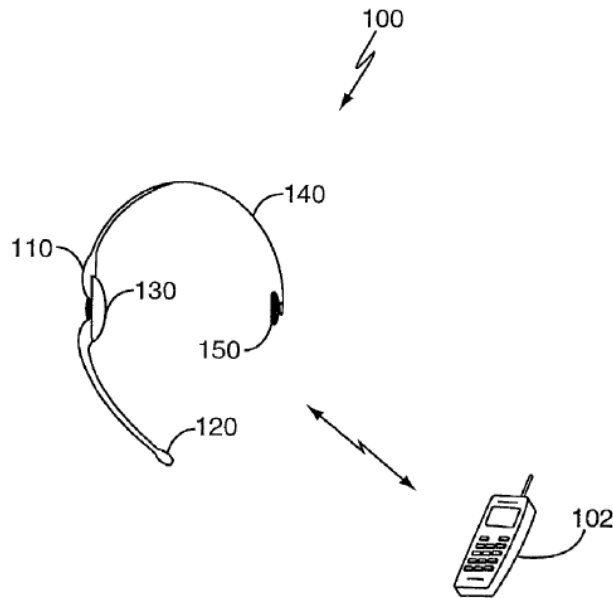
FIG. 4C

(EX1009, 4:3-10, 4:39-49, 6:20-33, FIG. 4C (annotated); EX1003, ¶256.)

Irvin's communications circuit 230 transitions between states based on whether the contact sensor 220 indicates a stimulus (*e.g.*, that force has been applied to the contact switch). (EX1009, 8:11-9:39; FIG. 6, FIG. 7; EX1003, ¶257.) The POSITA would have understood that in the combination, the electronic circuitry would be implemented by Anderson's RPU (*e.g.*, DSP 645) and/or earpiece (*e.g.*, ASIC 845), at least because Anderson discloses these components as configured to interface with sensors. (EX1010, 24:23-26; EX1003, ¶257.)

3. [B]

Irvin's sensor 220 can be a contact switch that is "actuated when the user places the wireless headset 100 on their body," and is "ideally" placed in the earpiece 130, in the retaining member 140, or in the retaining pad 150, as shown in FIG. 1:

**FIG. 1**

(EX1009, 6:3-13, FIG. 1; EX1003, ¶258.)

These elements correspond to headset components of Anderson (*e.g.*, earpiece 22, headset 21) and Lynch (*e.g.*, ALD Cap 600), such that in combination with Anderson and Lynch, the contact switch will be activated when the user places the headset on his or her head. (EX1003, ¶259.) The POSITA would have understood the contact switch to be a force sensor configured to detect user input (*i.e.*, application of force against the switch by the user's head). (EX1003, ¶259.) The user input alters an operation of the combined head-worn apparatus, at least by causing transitions between states as described for [A]. (EX1003, ¶259.)

E. Claim 41

1. [Preamble]

See claim 17. (EX1003, ¶260.)

2. [A]

See claim 13[A]. (EX1003, ¶261.) Irvin’s proximity sensor 220 can be an *active* infrared sensor. (EX1009, 6:22-24; EX1003, ¶261.) The POSITA would have understood that such sensors “put out energy in the environment,” *i.e.*, “emit near-infrared energy and measure whether any significant amount of the IR light is returned” to determine whether an object is present. (*See* EX1015, 196, 216-217; EX1003, ¶261.) For example, the infrared radiation can be emitted by an LED. (EX1015, 216; EX1003, ¶261.) Accordingly, in the combination, the POSITA would have understood the apparatus to include an active infrared sensor with an emitter (*e.g.*, an LED) configured to emit infrared radiation toward the user when the headset is worn; and to measure an amount of IR radiation reflected toward the sensor by the user. (EX1003, ¶261.)

3. [B]

See element [A]. (EX1003, ¶262.) The POSITA would have understood the active infrared sensor in the combination to emit infrared radiation toward the user, and to measure an amount of IR radiation reflected toward the sensor by the user, with a “significant amount of the IR light” reflected indicating that the user is

present and wearing the apparatus. (EX1015, 216; EX1003, ¶262.)

4. [C]

As described above, Irvin's communications circuit transitions between states based on whether the proximity sensor 220 detects reflected infrared radiation (indicating that the user is wearing the device). (EX1009, 8:11-9:39; FIG. 6, FIG. 7; EX1015, 216-217; EX1003, ¶263.) The POSITA would have understood that in the combination, the electronic circuitry would be implemented by Anderson's RPU (*e.g.*, DSP 645) and/or earpiece (*e.g.*, ASIC 845), at least because Anderson discloses these components as configured to interface with sensors. (EX1010, 24:23-26; EX1003, ¶263.)

F. Claim 42

1. [Preamble]

See claim 41. (EX1003, ¶264.)

2. [A]

See claim 41[A]. (EX1003, ¶265.)

G. Claim 43

1. [Preamble]

See claim 17. (EX1003, ¶266.)

2. [A]

See claim 13[A]. (EX1003, ¶267.)

3. [B]

See claim 13[B]. (EX1003, ¶268.)

H. Claim 44

1. [Preamble]

See claim 43. (EX1003, ¶269.)

2. [A]

See claim 13[C]. (EX1003, ¶270.)

I. Claim 45

1. [Preamble]

See claim 44. (EX1003, ¶271.)

2. [A]

The POSITA would have understood Irvin’s infrared sensor to comprise a photodetector, because infrared sensors are devices that detect infrared radiation, and photodetectors are devices that detect radiated energy (such as infrared). (EX1023, 577; EX1009, 6:22-24; *see* EX1015, 216-217; EX1003, ¶272.) This understanding is consistent with the ’355 patent, which describes an infrared photodiode capturing reflected infrared radiation as an infrared detector; and describes (via an incorporated reference) that the Sharp PD100MCOMP infrared photodiode is a “suitable” photodetector. (EX1001, 2:22-26, 94:15-23; EX1018, 37:52-59; EX1019, 1, 3; EX1003, ¶272.) It is also consistent with Patent Owner’s position in the parallel litigation that the claimed radiation detector can comprise

“an infrared detector configured to sense infrared light using a photodetector.”

(EX1024, 354; EX1003, ¶272.)

J. Claim 46

1. [Preamble]

See claim 17. (EX1003, ¶273.)

2. [A]

See claim 14[A]. (EX1003, ¶274.)

K. Claim 47

1. [Preamble]

See claim 46. (EX1003, ¶275.)

2. [A]

See claim 14[B]. (EX1003, ¶276.)

L. Claim 48

1. [Preamble]

See claim 47. (EX1003, ¶277.)

2. [A]

See claim 14[B]. (EX1003, ¶278.) In the combination, the operation of the apparatus being altered includes transitioning between active and inactive states based on sensor 220, as described for claim 14[A]. (EX1003, ¶278.) The POSITA would have understood this to include controlling the audio output provided to the user, which is disabled in the inactive state (in which the audio interface 234 of the

communications circuit 230 is disconnected from the power source), and re-enabled in the active state. (EX1009, 2:17-23, 3:53-4:2, 8:11-50, FIG. 8; EX1003, ¶278.)

M. Claim 49

1. [Preamble]

See claim 17. (EX1003, ¶279.)

2. [A]

See claim 41[C] and claim 43. (EX1003, ¶280.) The claimed light detector is met by Irvin’s infrared radiation detector, and the claimed light data is met by Irvin’s infrared radiation data. (EX1003, ¶280.) The POSITA would have understood infrared (IR) radiation to be a form of light (*i.e.*, non-visible light in the infrared spectrum). (*See* EX1015, 216 (“Infrared sensors ... emit near-infrared energy and measure whether any significant amount of the **IR light** is returned”)(emphasis added); EX1020, 455 (“[a]t the ends of the visible spectrum are invisible **infrared** and ultraviolet **lights**”)(emphasis added); EX1021, 1237 (defining “light” to include electromagnetic radiation from infrared sources); EX1022, 697 (same); EX1003, ¶280.) This understanding is consistent with Patent Owner’s position in the parallel litigation that the light detector “is used to detect the presence of light (e.g., **infrared** and/or visible **light**)”. (EX1024, 354 (emphasis added); EX1003, ¶280.)

N. Claim 50**1. [Preamble]**

See claim 49. (EX1003, ¶281.)

2. [A]

See claim 45[A] and claim 49[A]. (EX1003, ¶282.)

X. GROUND 6: CLAIMS 15, 16, 77-82, 85, AND 86 ARE RENDERED OBVIOUS BY ANDERSON IN VIEW OF LYNCH, NEMIROVSKI, AND IRVIN

A. Motivation to Combine with Reasonable Expectation of Success

The POSITA would have been motivated to combine the teachings of Anderson with the teachings of Lynch, Nemirovski, and Irvin, with a reasonable expectation of success, for the reasons described in Sections V.C, VIII.B, and IX.B. (EX1003, ¶283.)

B. Claim 15**1. [Preamble]**

See claim 14. (EX1003, ¶284.)

2. [A]

See claim 7[A]. (EX1003, ¶285.)

3. [B]

See claim 7[B]. (EX1003, ¶286.)

4. [C]

See claim 60[C]. (EX1003, ¶287.)

C. Claim 16**1. [Preamble]**

See claim 15. (EX1003, ¶288.)

2. [A]

See claim 13[A]. (EX1003, ¶289.)

3. [B]

See claim 13[B] and claim 13[C]. (EX1003, ¶290.)

D. Claim 77**1. [Preamble]**

See claim 1[Preamble]. (EX1003, ¶291.)

2. [A]

See claim 1[A]. (EX1003, ¶292.)

3. [B]

See claim 17[B]. (EX1003, ¶293.)

4. [C]

See claim 17[C]. (EX1003, ¶294.)

5. [D]

See claim 14[A] and claim 14[B]. (EX1003, ¶295.)

6. [E]

See claim 7[A]. (EX1003, ¶296.)

7. [F]

See claim 7[B]. (EX1003, ¶297.)

8. [G]

See claim 1[G]. (EX1003, ¶298.)

E. Claim 78

1. [Preamble]

See claim 77. (EX1003, ¶299.)

2. [A]

See claim 13[A]. (EX1003, ¶300.)

3. [B]

See claim 13[B] and claim 13[C]. (EX1003, ¶301.)

F. Claim 79

1. [Preamble]

See claim 77. (EX1003, ¶302.)

2. [A]

See claim 54[B]. (EX1003, ¶303.)

G. Claim 80

1. [Preamble]

See claim 77. (EX1003, ¶304.)

2. [A]

See claim 15[C]. (EX1003, ¶305.)

H. Claim 81

1. [Preamble]

See claim 77. (EX1003, ¶306.)

2. [A]

See claim 40[C]. (EX1003, ¶307.)

I. Claim 82

1. [Preamble]

See claim 77. (EX1003, ¶308.)

2. [A]

See claim 12[D]. (EX1003, ¶309.)

3. [B]

See claim 12[E]. (EX1003, ¶310.)

J. Claim 85

1. [Preamble]

See claim 77. (EX1003, ¶311.)

2. [A]

See claim 9[A]. (EX1003, ¶312.)

3. [B]

See claim 9[B]. (EX1003, ¶313.)

K. Claim 86**1. [Preamble]**

See claim 85. (EX1003, ¶314.)

2. [A]

See claim 10[A]. (EX1003, ¶315.)

3. [B]

See claim 10[B]. (EX1003, ¶316.)

**XI. GROUND 7: CLAIMS 25-28 ARE RENDERED OBVIOUS BY
ANDERSON IN VIEW OF LYNCH, BODLEY AND IRVIN****A. Motivation to Combine with Reasonable Expectation of Success**

The POSITA would have been motivated to combine the teachings of Anderson with the teachings of Lynch, Bodley, and Irvin, with a reasonable expectation of success, for the reasons described in Sections V.C, VI.B, and IX.B. (EX1003, ¶317.)

B. Claim 25**1. [Preamble]**

See claim 19. (EX1003, ¶318.)

2. [A]

See claim 14. (EX1003, ¶319.)

C. Claim 26**1. [Preamble]**

See claim 25. (EX1003, ¶320.)

2. [A]

See claim 14[B]. (EX1003, ¶321.)

D. Claim 27**1. [Preamble]**

See claim 26. (EX1003, ¶322.)

2. [A]

See claim 48[A]. (EX1003, ¶323.)

E. Claim 28**1. [Preamble]**

See claim 26. (EX1003, ¶324.)

2. [A]

See claim 14[B]. (EX1003, ¶325.)

**XII. GROUND 8: CLAIMS 61-64 ARE RENDERED OBVIOUS BY
ANDERSON IN VIEW OF LYNCH, NEMIROVSKI, BODLEY, AND
ZADESKY**

A. Motivation to Combine with Reasonable Expectation of Success

The POSITA would have been motivated to combine the teachings of Anderson with the teachings of Lynch, Nemirovski, Bodley, and Zadesky, with a reasonable expectation of success, for the reasons described in Sections V.C, VI.B,

VII.B, and VIII.B. (EX1003, ¶326.)

B. Claim 61

1. [Preamble]

See claim 60. (EX1003, ¶327.)

2. [A]

See claim 6[A]. (EX1003, ¶328.) Zadesky’s sensing of user touch input on the touch surface, as described for claim 6[A], is based on “capacitive sensing.” (EX1006, 2:29-34; EX1003, ¶328.) Such capacitive touchpads were in “popular” use as input devices by the priority date. (EX1016, 5, 138; EX1003, ¶328.) The POSITA would have understood the touch surface (a user input device) to be based on a capacitive effect in that it receives the user touch input, which induces a capacitive change and produces an electrical response (*i.e.*, output signals provided to the RPU). (*See* EX1016, 1, 5, 138-139; EX1003, ¶328.)

C. Claim 62

1. [Preamble]

See claim 61. (EX1003, ¶329.)

2. [A]

See claim 24[A]. (EX1003, ¶330.)

D. Claim 63**1. [Preamble]**

See claim 61. (EX1003, ¶331.)

2. [A]

Anderson discloses that a “[s]elf-contained user-carried inertial navigation package[]” with an accelerometer can reside in or be attached to the RPU to provide user location information. (EX1010, 25:51-65; EX1003, ¶332.)

E. Claim 64**1. [Preamble]**

See claim 63. (EX1003, ¶333.)

2. [A]

See claim 13. (EX1003, ¶334.) Irvin’s proximity sensor 220 can be an active infrared radiation sensor configured to sense infrared radiation. (EX1009, 6:20-24; EX1003, ¶334.) The POSITA would have understood that such an active sensor “put[s] out energy into the environment” and thus must be operatively connected to a power source; in the combination, the power source is Anderson’s battery, which may be a rechargeable battery. (*See* EX1015, 196; EX1010, 6:55-57, FIG. 8; EX1003, ¶334.)

XIII. GROUND 9: CLAIMS 65-72, 75, 76, 87-92, AND 95-100 ARE RENDERED OBVIOUS BY ANDERSON IN VIEW OF LYNCH, NEMIROVSKI, BODLEY, AND IRVIN

A. Motivation to Combine with Reasonable Expectation of Success

The POSITA would have been motivated to combine the teachings of Anderson with the teachings of Lynch, Nemirovski, Bodley, and Irvin, with a reasonable expectation of success, for the reasons described in Sections V.C, VI.B, VII.B, and VIII.B. (EX1003, ¶335.)

B. Claim 65

1. [Preamble]

See claim 1[Preamble]. (EX1003, ¶336.)

2. [A]

See claim 1[A]. (EX1003, ¶337.)

3. [B]

See claim 17[B]. (EX1003, ¶338.)

4. [C]

See claim 17[C]. (EX1003, ¶339.)

5. [D]

See claim 3[A]. (EX1003, ¶340.)

6. [E]

See claim 14[A] and claim 14[B]. (EX1003, ¶341.)

7. [F]

See claim 7[A]. (EX1003, ¶342.)

8. [G]

See claim 7[B]. (EX1003, ¶343.)

9. [H]

See claim 1[G]. (EX1003, ¶344.)

C. Claim 66**1. [Preamble]**

See claim 65. (EX1003, ¶345.)

2. [A]

See claim 13[A]. (EX1003, ¶346.)

3. [B]

See claim 13[B]. (EX1003, ¶347.)

D. Claim 67**1. [Preamble]**

See claim 65. (EX1003, ¶348.)

2. [A]

See claim 54[B]. (EX1003, ¶349.)

E. Claim 68**1. [Preamble]**

See claim 65. (EX1003, ¶350.)

2. [A]

See claim 15[C]. (EX1003, ¶351.)

F. Claim 69**1. [Preamble]**

See claim 65. (EX1003, ¶352.)

2. [A]

See claim 40[C]. (EX1003, ¶353.)

G. Claim 70**1. [Preamble]**

See claim 65. (EX1003, ¶354.)

2. [A]

See claim 12[D]. (EX1003, ¶355.)

3. [B]

See claim 12[E]. (EX1003, ¶356.)

H. Claim 71**1. [Preamble]**

See claim 65. (EX1003, ¶357.)

2. [A]

See claim 4[A]. (EX1003, ¶358.)

3. [B]

See claim 4[B]. (EX1003, ¶359.)

I. Claim 72

1. [Preamble]

See claim 65. (EX1003, ¶360.)

2. [A]

See claim 5[A]. (EX1003, ¶361.)

J. Claim 75

1. [Preamble]

See claim 65. (EX1003, ¶362.)

2. [A]

See claim 9[A]. (EX1003, ¶363.)

3. [B]

See claim 9[B]. (EX1003, ¶364.)

K. Claim 76

1. [Preamble]

See claim 75. (EX1003, ¶365.)

2. [A]

See claim 10[A]. (EX1003, ¶366.)

3. [B]

See claim 10[B]. (EX1003, ¶367.)

L. Claim 87**1. [Preamble]**

See claim 1[Preamble]. (EX1003, ¶368.)

2. [A]

See claim 1[A]. (EX1003, ¶369.)

3. [B]

See claim 17[B]. (EX1003, ¶370.)

4. [C]

See claim 17[C]. (EX1003, ¶371.)

5. [D]

See claim 3. (EX1003, ¶372.)

6. [E]

See claim 65[E]. (EX1003, ¶373.)

7. [F]

See claim 15[A]. (EX1003, ¶374.)

8. [G]

See claim 15[B]. (EX1003, ¶375.)

9. [H]

See claim 1[G]. (EX1003, ¶376.)

M. Claim 88**1. [Preamble]**

See claim 87. (EX1003, ¶377.)

2. [A]

See claim 54[B]. (EX1003, ¶378.)

N. Claim 89**1. [Preamble]**

See claim 87. (EX1003, ¶379.)

2. [A]

See claim 15[C]. (EX1003, ¶380.)

O. Claim 90**1. [Preamble]**

See claim 87. (EX1003, ¶381.)

2. [A]

See claim 40[C]. (EX1003, ¶382.)

P. Claim 91**1. [Preamble]**

See claim 87. (EX1003, ¶383.)

2. [A]

See claim 12[D]. (EX1003, ¶384.)

3. [B]

See claim 12[E]. (EX1003, ¶385.)

Q. Claim 92**1. [Preamble]**

See claim 87. (EX1003, ¶386.)

2. [A]

See claim 38[C]. (EX1003, ¶387.)

3. [B]

See claim 38[D]. (EX1003, ¶388.)

R. Claim 95**1. [Preamble]**

See claim 87. (EX1003, ¶389.)

2. [A]

See claim 9[A]. (EX1003, ¶390.)

3. [B]

See claim 9[B]. (EX1003, ¶391.)

S. Claim 96**1. [Preamble]**

See claim 95. (EX1003, ¶392.)

2. [A]

See claim 10[A]. (EX1003, ¶393.)

3. [B]

See claim 10[B]. (EX1003, ¶394.)

T. Claim 97**1. [Preamble]**

See claim 87. (EX1003, ¶395.)

2. [A]

See claim 4[A]. (EX1003, ¶396.)

3. [B]

See claim 4[B]. (EX1003, ¶397.)

U. Claim 98**1. [Preamble]**

See claim 87. (EX1003, ¶398.)

2. [A]

See claim 5[A]. (EX1003, ¶399.)

V. Claim 99**1. [Preamble]**

See claim 87. (EX1003, ¶400.)

2. [A]

See claim 51[A]. (EX1003, ¶401.)

3. [B]

See claim 52[A]. (EX1003, ¶402.)

W. Claim 100**1. [Preamble]**

See claim 87. (EX1003, ¶403.)

2. [A]

See claim 15[C]. (EX1003, ¶404.)

3. [B]

See claim 7[A]. (EX1003, ¶405.)

4. [C]

See claim 7[B]. (EX1003, ¶406.)

XIV. NOTICES AND STATEMENTS

Pursuant to 37 C.F.R. § 42.8(b)(1), Apple Inc. is the real party-in-interest for Petitioner.

Pursuant to 37 C.F.R. § 42.8(b)(2), Petitioner identifies the following related matters. The '355 patent is asserted in the following litigation matter: *IngenioSpec, LLC v. Apple, Inc.*, Case No. 1:25-cv-00867 (W.D. Tex.).

Additionally, Petitioner files this Petition concurrently with a second petition (IPR2026-00332) challenging the '355 patent.

Pursuant to 37 C.F.R. § 42.8(b)(3), Petitioner identifies the following counsel (and a power of attorney accompanies this Petition).

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Pursuant to 37 C.F.R. § 42.8(b)(4), service information for lead and back-up counsel is provided above. Petitioner consents to electronic service by email to Apple-IngenioSpec-IPR@mofo.com.

Pursuant to 37 C.F.R. § 42.104(a), Petitioners certify that the '355 patent is available for *inter partes* review and that Petitioners are not barred or estopped from requesting an *inter partes* review challenging the patent claims on the grounds identified in this Petition.

XV. CONCLUSION

Petitioner requests that the Board initiate *inter partes* review and cancel all challenged claims of the '355 Patent.

The USPTO is authorized to charge any required fees, including the fee as set forth in 37 C.F.R. § 42.15(a) and any excess claim fees, to Deposit Account No. **03-1952** referencing Docket No. **10684-0000909**.

Dated: April 3, 2026

Respectfully submitted,

By /Alex S. Yap/

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XVI. CLAIMS APPENDIX

Claim 1

[Preamble] *A head-worn personal electronic apparatus operable to at least output customized audio output, comprising:*

[A] *at least one speaker, the at least one speaker being configured to be wearable proximate to an ear of a user;*

[B] *a wireless receiver configured to wirelessly receive audio output signals to be output to the user via the at least one speaker; and*

[C] *electronic circuitry including at least an integrated circuit, the electronic circuitry being configured to*

[D] *(i) store hearing characteristics associated with the user;*

[E] *(ii) customize the received audio output signals to produce customized audio output signals for the user based on at least a portion of the stored hearing characteristics associated with the user such that the customized audio output signals at least compensate for the hearing impairment regarding the user's ability to hear; and*

[F] *(iii) output the customized audio output signals to the at least one speaker,*

[G] *wherein the at least one speaker is configured to generate at least a portion of the customized audio output for the user in accordance with at least the portion of the customized audio output signals.*

Claim 2

[Preamble] *A head-worn personal electronic apparatus as recited in claim 1,*

[A] *wherein the received audio output signals are wirelessly received from a mobile communication device associated with the user.*

Claim 3

[Preamble] *A head-worn personal electronic apparatus as recited in claim 1,*

[A] wherein the head-worn personal electronic apparatus comprises: a touch sensitive surface at least partially contained within the head-worn personal electronic apparatus and configured to sense a touch input associated with the user,

[B] wherein the sensed touch input operating to at least alter operation of the head-worn electronic personal audio apparatus.

Claim 4

[Preamble] A head-worn personal electronic apparatus as recited in claim 3,

[A] wherein head-worn personal electronic apparatus is configured to support voice calls to the user, and

[B] wherein the at least one operation of the head-worn personal electronic apparatus being altered concerns at least accepting or declining a voice call to the user.

Claim 5

[Preamble] A head-worn personal electronic apparatus recited in claim 3,

[A] wherein the at least one operation of the head-worn personal electronic apparatus being altered concerns control of the customized audio output being provided to the user.

Claim 6

[Preamble] A head-worn personal electronic apparatus as recited in claim 3,

[A] wherein the head-worn personal electronic apparatus is configured to detect at least a sliding of a finger action with respect to the touch sensitive surface.

Claim 7

[Preamble] A head-worn personal electronic apparatus as recited in claim 1,

[A] wherein the head-worn personal electronic apparatus comprises: a first microphone configured to pick up at least audio input from at least the user, the first microphone being at least partially in the head-worn personal electronic apparatus and is positioned to be directed towards the user when the head-worn personal electronic apparatus is being worn by the user; and

[B] a second microphone configured to pick up at least ambient sound input associated with an environment in the vicinity of the head-worn personal electronic apparatus, the second microphone being positioned to be directed away from the user when the head-worn wearable electronic device is being worn by the user.

Claim 8

[Preamble] A head-worn personal electronic apparatus as recited in claim 7,

[A] wherein the electronic circuitry is configured to: determine an ambient sound level; and

[B] modify audio output to the at least one speaker dependent at least in part on the ambient sound level.

Claim 9

[Preamble] A head-worn personal electronic apparatus as recited in claim 7,

[A] wherein the electronic circuitry is configured to: produce an ambient audio output signal based on at least the ambient sound input; and

[B] provide at least the ambient audio output signal to the at least one speaker.

Claim 10

[Preamble] A head-worn personal electronic apparatus as recited in claim 7,

[A] wherein the electronic circuitry is configured to: determine an ambient noise level based on at least the ambient sound input,

[B] wherein the ambient audio output signal is dependent on the ambient noise level.

Claim 11

[Preamble] A head-worn personal electronic apparatus as recited in claim 1,

[A] wherein the head-worn personal electronic apparatus comprises: a first microphone; and

[B] a second microphone;

[C] wherein the first microphone is configured to pick up at least audio input from at least the user,

[D] wherein the second microphone is configured to pick up at least environmental audio input associated with an environment in the vicinity of the head-worn wearable electronic device, and

[E] wherein the electronic circuitry is configured to process the audio input from at least the user picked-up via the first microphone to remove at least a portion of the environmental audio input associated with the environment picked-up via the second microphone.

Claim 12

[Preamble] A head-worn personal electronic apparatus as recited in claim 1,

[A] wherein the head-worn wearable electronic device comprises at least a first microphone and a second microphone,

[B] wherein the first microphone is configured to pick up at least audio sound from at least the user,

[C] wherein the second microphone is configured to pick up at least ambient noise associated with an environment in the vicinity of the head-worn wearable electronic device, and

[D] *wherein the electronic circuitry is configured to: determine an ambient noise level based on at least the ambient noise; and*

[E] *modify at least a portion of the audio sound picked-up via the first microphone, with the modification being at least in part dependent on the ambient noise level.*

Claim 13

[Preamble] *A head-worn personal electronic apparatus as recited in claim 1,*

[A] *wherein the head-worn personal electronic apparatus comprises: a radiation detector configured to capture radiation data,*

[B] *wherein the electronic circuitry is configured to process at least the radiation data captured by the radiation detector, and*

[C] *wherein the electronic circuitry is configured to determine whether the head-worn personal electronic apparatus is being worn by a user based on at least the processed radiation data.*

Claim 14

[Preamble] *A head-worn personal electronic apparatus as recited in claim 1,*

[A] *wherein the head-worn personal electronic apparatus includes a force sensor configured to receive a user input based at least on sensing force applied to the force sensor, and*

[B] *wherein the force sensor is configured to detect the user input, the detected user input operating to alter at least an operation of the head-worn wearable electronic device.*

Claim 15

[Preamble] *A head-worn personal electronic apparatus as recited in claim 14,*

[A] *wherein the head-worn personal electronic apparatus comprises: a first microphone at least partially contained within the head-worn personal electronic apparatus, the first microphone being positioned to pick up at least audio input from at least the user; and*

[B] *a second microphone at least partially contained within the head-worn personal electronic apparatus, the second microphone being positioned to pick up at least environmental audio input associated with an environment around the head-worn personal electronic apparatus,*

[C] *wherein the electronic circuitry is configured to modify the customized audio output signals to be output to the user via the at least one speaker to cancel at least a portion of noise associated with the environment, the modification of the customized audio output signals being dependent at least in part on the environmental audio input picked-up via the second microphone.*

Claim 16

[Preamble] *A head-worn personal electronic apparatus as recited in claim 15,*

[A] *wherein the head-worn personal electronic apparatus comprises: a radiation detector configured to capture radiation data,*

[B] *wherein the electronic circuitry is configured to process at least the radiation data captured by the radiation detector, and configured to determine whether the head-worn personal electronic apparatus is being worn by a user based on at least the processed radiation data.*

Claim 17

[Preamble] *A head-worn personal electronic apparatus operable to at least output customized audio output, comprising:*

[A] *at least one speaker, the at least one speaker being configured to be wearable proximate to an ear of a user;*

[B] *a wireless receiver configured to wirelessly receive customized audio output signals for the user, the customized audio output signals having been customized based on at least predetermined hearing characteristics associated with the user*

such that the customized audio output signals at least compensate for the hearing impairment regarding the user's ability to hear; and

[C] electronic circuitry including at least an integrated circuit, the electronic circuitry being configured to output the customized audio output signals to the at least one speaker,

[D] wherein the at least one speaker is configured to generate at least a portion of the customized audio output for the user in accordance with at least the portion of the customized audio output signals.

Claim 18

[Preamble] A head-worn personal electronic apparatus as recited in claim 17,

[A] wherein the customized audio output signals are wirelessly received from a mobile communication device associated with the user.

Claim 19

[Preamble] A head-worn personal electronic apparatus as recited in claim 17,

[A] wherein the head-worn personal electronic apparatus comprises: a touch sensitive surface at least partially contained within the head-worn personal electronic apparatus and configured to sense a touch input associated with the user,

[B] wherein the sensed touch input operating to at least alter operation of the head-worn electronic personal audio apparatus.

Claim 20

[Preamble] A head-worn personal electronic apparatus as recited in claim 19,

[A] wherein head-worn personal electronic apparatus is configured to support voice calls to the user, and

[B] wherein the at least one operation of the head-worn personal electronic apparatus being altered concerns at least accepting or declining a voice call to the user.

Claim 21

[Preamble] A head-worn personal electronic apparatus recited in claim 19,

[A] wherein the at least one operation of the head-worn personal electronic apparatus being altered concerns control of the customized audio output being provided to the user.

Claim 22

[Preamble] A head-worn personal electronic apparatus as recited in claim 19,

[A] wherein the head-worn personal electronic apparatus is configured to distinguish at least a direction of the user input with respect to the touch sensitive surface.

Claim 23

[Preamble] A head-worn personal electronic apparatus as recited in claim 19,

[A] wherein the head-worn personal electronic apparatus is configured to detect at least a sliding of a finger action with respect to the touch sensitive surface.

Claim 24

[Preamble] A head-worn personal electronic apparatus as recited in claim 19,

[A] wherein the head-worn personal electronic apparatus is configured to facilitate determination at least whether the user input pertains to a forward sliding action or a backward sliding action with respect to the touch sensitive surface.

Claim 25

[Preamble] *A head-worn personal electronic apparatus as recited in claim 19,*

[A] *wherein the head-worn personal electronic apparatus comprises: a sensor at least partially contained within the head-worn personal electronic structure and configured to sense data indicative of whether the head-worn personal electronic apparatus is being worn by the user.*

Claim 26

[Preamble] *A head-worn personal electronic apparatus as recited in claim 25,*

[A] *wherein the head-worn personal electronic apparatus is configured to at least alter operation of the head-worn personal electronic apparatus based at least in part on the sensed data from the sensor.*

Claim 27

[Preamble] *A head-worn personal electronic apparatus as recited in claim 26,*

[A] *wherein the operation of the head-worn personal electronic apparatus being altered concerns control of the audio output being provided to the user.*

Claim 28

[Preamble] *A head-worn personal electronic apparatus as recited in claim 26,*

[A] *wherein the operation of the head-worn personal electronic apparatus being altered concerns operation of the head-worn personal electronic apparatus in a lower power operation.*

Claim 29

[Preamble] *A head-worn personal electronic apparatus as recited in claim 17,*

[A] wherein the head-worn personal electronic apparatus comprises: a first microphone configured to pick up at least audio input from at least the user, the first microphone being at least partially in the head-worn personal electronic apparatus and is positioned to be directed towards the user when the head-worn personal electronic apparatus is being worn by the user; and

[B] a second microphone configured to pick up at least ambient sound input associated with an environment in the vicinity of the head-worn personal electronic apparatus, the second microphone being positioned to be directed away from the user when the head-worn wearable electronic device is being worn by the user.

Claim 30

[Preamble] A head-worn personal electronic apparatus as recited in claim 29,

[A] wherein the electronic circuitry is configured to: determine an ambient sound level; and

[B] modify audio output to the at least one speaker dependent at least in part on the ambient sound level.

Claim 31

[Preamble] A head-worn personal electronic apparatus as recited in claim 29,

[A] wherein the electronic circuitry is configured to: produce an ambient audio output signal based on at least the ambient sound input; and

[B] provide at least the ambient audio output signal to the at least one speaker.

Claim 32

[Preamble] A head-worn personal electronic apparatus as recited in claim 31,

[A] wherein the electronic circuitry is configured to: determine an ambient noise level based on at least the ambient sound input,

[B] *wherein the ambient audio output signal is dependent on the ambient noise level.*

Claim 33

[Preamble] *A head-worn personal electronic apparatus as recited in claim 17,*

[A] *a first microphone configured to pick up at least audio input from at least the user, the first microphone being at least partially in the head-worn personal electronic apparatus; and*

[B] *a second microphone configured to pick up at least ambient sound input associated with an environment in the vicinity of the head-worn personal electronic apparatus, the second microphone being at least partially in the head-worn personal electronic apparatus,*

[C] *wherein the second microphone is positioned to be further away from mouth of the user than the first microphone when at least the head-worn personal electronic apparatus of the head-worn personal electronic apparatus is being worn.*

Claim 34

[Preamble] *A head-worn personal electronic apparatus as recited in claim 17,*

[A] *wherein the head-worn personal electronic apparatus comprises: a first microphone; and*

[B] *a second microphone;*

[C] *wherein the first microphone is configured to pick up at least audio input from at least the user,*

[D] *wherein the second microphone is configured to pick up at least environmental audio input associated with an environment in the vicinity of the head-worn wearable electronic device, and*

[E] *wherein the electronic circuitry is configured to process the audio input from at least the user picked-up via the first microphone to remove at least a portion of*

the environmental audio input associated with the environment picked-up via the second microphone.

Claim 35

[Preamble] *A head-worn personal electronic apparatus as recited in claim 34,*

[A] *wherein the audio input from at least the user picked-up via the first microphone includes at least a voice input, and*

[B] *wherein the environmental audio input associated with the environment includes at least ambient noise.*

Claim 36

[Preamble] *A head-worn personal electronic apparatus as recited in claim 34,*

[A] *wherein the first microphone is at least partially in the head-worn personal electronic apparatus and is positioned so as to be directed towards the user of the head-worn personal electronic apparatus, and*

[B] *wherein the second microphone is at least partially in the head-worn personal electronic apparatus and is positioned so as to be directed away from the user of the head-worn personal electronic apparatus.*

Claim 37

[Preamble] *A head-worn personal electronic apparatus as recited in claim 36,*

[A] *wherein the audio input from at least the user includes at least a voice input, and*

[B] *wherein the environmental audio input includes at least ambient noise.*

Claim 38

[Preamble] *A head-worn personal electronic apparatus as recited in claim 17,*

- [A] *wherein the head-worn wearable electronic device comprises: a first microphone configured to pick up at least audio input from at least the user; and*
- [B] *a second microphone configured to pickup at least environmental audio input associated with environmental sound in the vicinity of the head-worn personal electronic apparatus, and*
- [C] *wherein the electronic circuitry is configured to: determine an environmental sound level based on at least the environmental audio input; and*
- [D] *amplify at least a portion of the audio input from the first microphone, with the amplification being at least in part dependent on the environmental sound level.*

Claim 39

- [Preamble] *A head-worn personal electronic apparatus as recited in claim 17,*
- [A] *wherein the head-worn wearable electronic device comprises at least a first microphone and a second microphone,*
- [B] *wherein the first microphone is configured to pick up at least audio sound from at least the user,*
- [C] *wherein the second microphone is configured to pick up at least ambient noise associated with an environment in the vicinity of the head-worn wearable electronic device, and*
- [D] *wherein the electronic circuitry is configured to: determine an ambient noise level based on at least the ambient noise; and*
- [E] *modify at least a portion of the audio sound picked-up via the first microphone, with the modification being at least in part dependent on the ambient noise level.*

Claim 40

- [Preamble] *A head-worn personal electronic apparatus as recited in claim 17,*
- [A] *a first microphone configured to receive audio picked-up from the user; and*

[B] *a second microphone configured to receive audio picked-up outward away from the user,*

[C] *wherein the audio picked-up from at least the second microphone is used at least for noise cancelation, and at least a portion of the audio picked-up from the second microphone is subtracted from the audio picked-up from the first microphone.*

Claim 41

[Preamble] *A head-worn personal electronic apparatus as recited in claim 17,*

[A] *wherein the head-worn personal electronic apparatus comprises: a radiation emitter at least partially contained within the head-worn personal electronic apparatus and configured to at least direct radiation towards the user when at least the head-worn personal electronic apparatus of the head-worn personal electronic apparatus is being worn; and*

[B] *a radiation detector at least partially contained within the head-worn personal electronic apparatus and configured to detect radiation reflected back from the user when at least the head-worn personal electronic apparatus of the head-worn personal electronic apparatus is being worn,*

[C] *wherein the radiation detector is operatively connected to the electronic circuitry, and wherein electronic circuitry within the head-worn personal electronic apparatus is configured to facilitate determining whether the head-worn personal electronic apparatus of the head-worn personal electronic apparatus is being worn by the user based on at least the detected radiation.*

Claim 42

[Preamble] *A head-worn personal electronic apparatus as recited in claim 41,*

[A] *wherein the detected radiation is at least infrared radiation.*

Claim 43

[Preamble] *A head-worn personal electronic apparatus as recited in claim 17,*

[A] *wherein the head-worn personal electronic apparatus comprises: a radiation detector configured to capture radiation data,*

[B] *wherein the electronic circuitry is configured to process at least the radiation data captured by the radiation detector.*

Claim 44

[Preamble] *A head-worn personal electronic apparatus as recited in claim 43,*

[A] *wherein the electronic circuitry is configured to determine whether the head-worn personal electronic apparatus is being worn by a user based on at least the processed radiation data.*

Claim 45

[Preamble] *A head-worn personal electronic apparatus as recited in claim 44,*

[A] *wherein the radiation detector comprises a photodetector.*

Claim 46

[Preamble] *A head-worn personal electronic apparatus as recited in claim 17,*

[A] *wherein the head-worn personal electronic apparatus comprises a force sensor configured to receive a user input based at least on sensing force applied to the force sensor.*

Claim 47

[Preamble] *A head-worn personal electronic apparatus as recited in claim 46,*

[A] wherein the force sensor is configured to detect the user input, the detected user input operating to alter at least an operation of the head-worn wearable electronic device.

Claim 48

[Preamble] A head-worn personal electronic apparatus as recited in claim 47,

[A] wherein the at least one operation of the head-worn personal electronic apparatus being altered concerns control of the audio output being provided to the user.

Claim 49

[Preamble] A head-worn personal electronic apparatus as recited in claim 17,

[A] wherein the head-worn personal electronic apparatus comprises: a light detector configured to capture light data, the light detector being electrically connected to the electronic circuitry, and the electronic circuitry being configured to process at least the light data captured by the light detector.

Claim 50

[Preamble] A head-worn personal electronic apparatus as recited in claim 49,

[A] wherein the light detector comprises a photodetector.

Claim 51

[Preamble] head-worn personal electronic apparatus as recited in claim 17,

[A] wherein the head-worn personal electronic apparatus is configured to provide audio alerts to the user via the at least one speaker.

Claim 52

[Preamble] *A head-worn personal electronic apparatus as recited in claim 51,*

[A] *wherein the audio alerts are dependent on one or more user preference settings.*

Claim 53

[Preamble] *A head-worn personal electronic apparatus as recited in claim 17,*

[A] *wherein the at least one speaker is configured to be at least partially inserted into an ear of the user.*

Claim 54

[Preamble] *A head-worn personal electronic apparatus as recited in claim 17,*

[A] *wherein the head-worn personal electronic apparatus comprises: a microphone at least partially internal to the head-worn personal electronic apparatus,*

[B] *wherein the head-worn personal electronic device is configured to receive a voice input via the microphone, determine a requested operation from the voice input using voice recognition, and control an operation by the head-worn personal electronic device based on the requested operation.*

Claim 55

[Preamble] *A head-worn personal electronic apparatus as recited in claim 17,*

[A] *wherein the head-worn personal electronic apparatus comprises: a Hall effect detector at least partially contained within the head-worn personal electronic apparatus and configured to capture data associated with a magnetic characteristic.*

Claim 57

[Preamble] *A head-worn personal electronic apparatus as recited in claim 17,*

[A] *wherein the head-worn personal electronic apparatus comprises: an array of microphones configured for directional audio pickup.*

Claim 58

[Preamble] *A head-worn personal electronic apparatus as recited in claim 17,*

[A] *wherein the customized audio output includes music that was wirelessly received via the wireless receiver.*

Claim 59

[Preamble] *A head-worn personal electronic apparatus as recited in claim 17,*

[A] *wherein the customized audio output signals result from amplifying or attenuating different frequency bands differently according to at least the predetermined hearing characteristics associated with the user.*

Claim 60

[Preamble] *A head-worn personal electronic apparatus as recited in claim 59,*

[A] *wherein the head-worn personal electronic apparatus comprises: a first microphone at least partially contained within the head-worn personal electronic apparatus, the first microphone being positioned to pick up at least audio input from at least the user; and*

[B] *a second microphone at least partially contained within the head-worn personal electronic apparatus, the second microphone being positioned to pick up at least environmental audio input associated with an environment around the head-worn personal electronic apparatus,*

[C] *wherein the electronic circuitry is configured to modify the customized audio output signals to be output to the user via the at least one speaker to cancel at least a portion of noise associated with the environment, the modification of the*

customized audio output signals being dependent at least in part on the environmental audio input picked-up via the second microphone.

Claim 61

[Preamble] *A head-worn personal electronic apparatus as recited in claim 60,*

[A] *wherein the head-worn personal electronic apparatus comprises: a user input device supported by the head-worn personal electronic apparatus, the user input device being configured to receive a user input, the user input device is based on at least capacitive effect, wherein the user input being received induces at least a capacitive change to produce at least an electrical response.*

Claim 62

[Preamble] *A head-worn personal electronic apparatus as recited in claim 61,*

[A] *wherein the electronic circuitry is electrically connected to the user input device to receive user input data from the user input device, and wherein the head-worn personal electronic apparatus is configured to distinguish at least whether the user input pertains to a forward sliding action or a backward sliding action with respect to the user input device using at least the electronic circuitry and the user input data.*

Claim 63

[Preamble] *A head-worn personal electronic apparatus as recited in claim 61,*

[A] *wherein the head-worn wearable electronic device includes an accelerometer.*

Claim 64

[Preamble] *A head-worn personal electronic apparatus as recited in claim 63,*

[A] wherein the head-worn personal electronic apparatus comprises: a radiation sensor, operatively connected to the rechargeable battery, at least partially contained within the head-worn personal electronic apparatus and configured to sense radiation.

Claim 65

[Preamble] A head-worn personal electronic apparatus operable to at least output customized audio output, comprising:

[A] at least one speaker, the at least one speaker being configured to be wearable proximate to an ear of a user;

[B] a wireless receiver configured to wirelessly receive customized audio output signals for the user, the customized audio output signals having been customized based on at least predetermined hearing characteristics associated with the user such that the customized audio output signals at least compensate for the hearing impairment regarding the user's ability to hear;

[C] electronic circuitry including at least an integrated circuit, the electronic circuitry being configured to output the customized audio output signals to the at least one speaker;

[D] a touch sensitive surface at least partially contained within the head-worn personal electronic apparatus and configured to sense a touch input associated with the user, wherein the sensed touch input operating to at least alter operation of the head-worn electronic personal audio apparatus;

[E] a sensor at least partially contained within the head-worn personal electronic structure and configured to sense data indicative of whether the head-worn personal electronic apparatus is being worn by the user, the head-worn personal electronic apparatus is configured to at least alter operation of the head-worn personal electronic apparatus based at least in part on the sensed data from the sensor;

[F] a first microphone configured to pick up at least audio input from at least the user, the first microphone being at least partially in the head-worn personal electronic apparatus and is positioned to be directed towards the user when the head-worn personal electronic apparatus is being worn by the user; and

[G] *a second microphone configured to pick up at least ambient sound input associated with an environment in the vicinity of the head-worn personal electronic apparatus, the second microphone being positioned to be directed away from the user when the head-worn wearable electronic device is being worn by the user,*

[H] *wherein the at least one speaker is configured to generate at least a portion of the customized audio output for the user in accordance with at least the portion of the customized audio output signals.*

Claim 66

[Preamble] *A head-worn personal electronic apparatus as recited in claim 65,*

[A] *wherein the sensor comprises a radiation detector configured to capture radiation data, and*

[B] *wherein the electronic circuitry is configured to process at least the radiation data captured by the radiation detector, and configured to determine whether the head-worn personal electronic apparatus is being worn by a user based on at least the processed radiation data.*

Claim 67

[Preamble] *A head-worn personal electronic apparatus as recited in claim 65,*

[A] *wherein the head-worn personal electronic apparatus wherein the head-worn personal electronic device is configured to receive a voice input via the first microphone, determine a requested operation from the voice input using voice recognition, and control an operation by the head-worn personal electronic device based on the requested operation.*

Claim 68

[Preamble] *A head-worn personal electronic apparatus as recited in claim 65,*

[A] *wherein the electronic circuitry is configured to modify the customized audio output signals to be output to the user via the at least one speaker to cancel at least a portion of noise associated with the environment, the modification of the*

customized audio output signals being dependent at least in part on the ambient sound input picked-up via the second microphone.

Claim 69

[Preamble] *A head-worn personal electronic apparatus as recited in claim 65,*

[A] *wherein the ambient sound picked-up from at least the second microphone is used at least for noise cancelation, and at least a portion of the ambient sound picked-up from the second microphone is subtracted from the audio picked-up from the first microphone.*

Claim 70

[Preamble] *A head-worn personal electronic apparatus as recited in claim 65,*

[A] *wherein the electronic circuitry is configured to: determine an ambient noise level based on at least the ambient sound input; and*

[B] *modify at least a portion of the audio sound picked-up via the first microphone, with the modification being at least in part dependent on the ambient noise level.*

Claim 71

[Preamble] *A head-worn personal electronic apparatus as recited in claim 65,*

[A] *wherein head-worn personal electronic apparatus is configured to support voice calls to the user, and*

[B] *wherein the at least one operation of the head-worn personal electronic apparatus being altered concerns at least accepting or declining a voice call to the user.*

Claim 72

[Preamble] *A head-worn personal electronic apparatus as recited in claim 65,*

[A] wherein the at least one operation of the head-worn personal electronic apparatus being altered concerns control of the customized audio output being provided to the user.

Claim 75

[Preamble] A head-worn personal electronic apparatus as recited in claim 65,

[A] wherein the electronic circuitry is configured to: produce an ambient audio output signal based on at least the ambient sound input; and

[B] provide at least the ambient audio output signal to the at least one speaker.

Claim 76

[Preamble] A head-worn personal electronic apparatus as recited in claim 75,

[A] wherein the electronic circuitry is configured to: determine an ambient noise level based on at least the ambient sound input,

[B] wherein the ambient audio output signal is dependent on the ambient noise level.

Claim 77

[Preamble] A head-worn personal electronic apparatus operable to at least output customized audio output, comprising:

[A] at least one speaker, the at least one speaker being configured to be wearable proximate to an ear of a user;

[B] a wireless receiver configured to wirelessly receive customized audio output signals for the user, the customized audio output signals having been customized based on at least predetermined hearing characteristics associated with the user such that the customized audio output signals at least compensate for the hearing impairment regarding the user's ability to hear;

[C] *electronic circuitry including at least an integrated circuit, the electronic circuitry being configured to output the customized audio output signals to the at least one speaker;*

[D] *a force sensor at least partially contained within the head-worn personal electronic apparatus and configured to receive a user input based at least on sensing force applied to the force sensor, the force sensor is configured to detect the user input, the detected user input operating to alter at least an operation of the head-worn wearable electronic device;*

[E] *a first microphone configured to pick up at least audio input from at least the user, the first microphone being at least partially in the head-worn personal electronic apparatus and is positioned to be directed towards the user when the head-worn personal electronic apparatus is being worn by the user; and*

[F] *a second microphone configured to pick up at least ambient sound input associated with an environment in the vicinity of the head-worn personal electronic apparatus, the second microphone being positioned to be directed away from the user when the head-worn wearable electronic device is being worn by the user;*

[G] *wherein the at least one speaker is configured to generate at least a portion of the customized audio output for the user in accordance with at least the portion of the customized audio output signals.*

Claim 78

[Preamble] *A head-worn personal electronic apparatus as recited in claim 77,*

[A] *wherein the head-worn personal electronic apparatus comprises: a radiation detector configured to capture radiation data,*

[B] *wherein the electronic circuitry is configured to process at least the radiation data captured by the radiation detector, and configured to determine whether the head-worn personal electronic apparatus is being worn by a user based on at least the processed radiation data.*

Claim 79

[Preamble] *A head-worn personal electronic apparatus as recited in claim 77,*

[A] *wherein the head-worn personal electronic apparatus wherein the head-worn personal electronic device is configured to receive a voice input via the first microphone, determine a requested operation from the voice input using voice recognition, and control an operation by the head-worn personal electronic device based on the requested operation.*

Claim 80

[Preamble] *A head-worn personal electronic apparatus as recited in claim 77,*

[A] *wherein the electronic circuitry is configured to modify the customized audio output signals to be output to the user via the at least one speaker to cancel at least a portion of noise associated with the environment, the modification of the customized audio output signals being dependent at least in part on the ambient sound input picked-up via the second microphone.*

Claim 81

[Preamble] *A head-worn personal electronic apparatus as recited in claim 77,*

[A] *wherein the ambient sound input picked-up from at least the second microphone is used at least for noise cancelation, and at least a portion of the ambient sound input picked-up from the second microphone is subtracted from the audio picked-up from the first microphone.*

Claim 82

[Preamble] *A head-worn personal electronic apparatus as recited in claim 77,*

[A] *wherein the electronic circuitry is configured to: determine an ambient noise level based on at least the ambient sound input; and*

[B] *modify at least a portion of the audio sound picked-up via the first microphone, with the modification being at least in part dependent on the ambient noise level.*

Claim 85

[Preamble] *A head-worn personal electronic apparatus as recited in claim 77,*

[A] *wherein the electronic circuitry is configured to: produce an ambient audio output signal based on at least the ambient sound input; and*

[B] *provide at least the ambient audio output signal to the at least one speaker.*

Claim 86

[Preamble] *A head-worn personal electronic apparatus as recited in claim 85,*

[A] *wherein the electronic circuitry is configured to: determine an ambient noise level based on at least the ambient sound input,*

[B] *wherein the ambient audio output signal is dependent on the ambient noise level.*

Claim 87

[Preamble] *A head-worn personal electronic apparatus operable to at least output customized audio output, comprising:*

[A] *at least one speaker, the at least one speaker being configured to be wearable proximate to an ear of a user;*

[B] *a wireless receiver configured to wirelessly receive customized audio output signals for the user, the customized audio output signals having been customized based on at least predetermined hearing characteristics associated with the user such that the customized audio output signals at least compensate for the hearing impairment regarding the user's ability to hear;*

[C] *electronic circuitry including at least an integrated circuit, the electronic circuitry being configured to output the customized audio output signals to the at least one speaker;*

[D] *a user input device at least partially contained within the head-worn personal electronic apparatus and configured to receive a user input, the user input operating to alter at least an operation of the head-worn wearable electronic device;*

[E] *a radiation detector at least partially contained within the head-worn personal electronic structure and configured to capture radiation data indicative of whether the head-worn personal electronic apparatus is being worn by the user, the head-worn personal electronic apparatus is configured to at least alter operation of the head-worn personal electronic apparatus based at least in part on the captured radiation data;*

[F] *a first microphone at least partially contained within the head-worn personal electronic apparatus, the first microphone being positioned to pick up at least audio input from at least the user; and*

[G] *a second microphone at least partially contained within the head-worn personal electronic apparatus, the second microphone being positioned to pick up at least environmental audio input associated with an environment around the head-worn personal electronic apparatus,*

[H] *wherein the at least one speaker is configured to generate at least a portion of the customized audio output for the user in accordance with at least the portion of the customized audio output signals.*

Claim 88

[Preamble] *A head-worn personal electronic apparatus as recited in claim 87,*

[A] *wherein the head-worn personal electronic apparatus wherein the head-worn personal electronic device is configured to receive a voice input via the first microphone, determine a requested operation from the voice input using voice recognition, and control an operation by the head-worn personal electronic device based on the requested operation.*

Claim 89

[Preamble] *A head-worn personal electronic apparatus as recited in claim 87,*

[A] *wherein the electronic circuitry is configured to modify the customized audio output signals to be output to the user via the at least one speaker to cancel at least a portion of noise associated with the environment, the modification of the customized audio output signals being dependent at least in part on the ambient sound input picked-up via the second microphone.*

Claim 90

[Preamble] *A head-worn personal electronic apparatus as recited in claim 87,*

[A] *wherein the ambient sound input picked-up from at least the second microphone is used at least for noise cancelation, and at least a portion of the ambient sound input picked-up from the second microphone is subtracted from the audio picked-up from the first microphone.*

Claim 91

[Preamble] *A head-worn personal electronic apparatus as recited in claim 87,*

[A] *wherein the electronic circuitry is configured to: determine an ambient noise level based on at least the ambient sound input; and*

[B] *modify at least a portion of the audio sound picked-up via the first microphone, with the modification being at least in part dependent on the ambient noise level.*

Claim 92

[Preamble] *A head-worn personal electronic apparatus as recited in claim 87,*

[A] *wherein the electronic circuitry is configured to: determine an environmental sound level based on at least the environmental audio input; and*

[B] *amplify at least a portion of the audio input from the first microphone, with the amplification being at least in part dependent on the environmental sound level.*

Claim 95

[Preamble] *A head-worn personal electronic apparatus as recited in claim 87,*

[A] *wherein the electronic circuitry is configured to: produce an ambient audio output signal based on at least the ambient sound input; and*

[B] *provide at least the ambient audio output signal to the at least one speaker.*

Claim 96

[Preamble] *A head-worn personal electronic apparatus as recited in claim 95,*

[A] *wherein the electronic circuitry is configured to: determine an ambient noise level based on at least the ambient sound input,*

[B] *wherein the ambient audio output signal is dependent on the ambient noise level.*

Claim 97

[Preamble] *A head-worn personal electronic apparatus as recited in claim 87,*

[A] *wherein head-worn personal electronic apparatus is configured to support voice calls to the user, and*

[B] *wherein the at least one operation of the head-worn personal electronic apparatus being altered concerns at least accepting or declining a voice call to the user.*

Claim 98

[Preamble] *A head-worn personal electronic apparatus as recited in claim 87,*

[A] *wherein the at least one operation of the head-worn personal electronic apparatus being altered concerns control of the customized audio output being provided to the user.*

Claim 99

[Preamble] *A head-worn personal electronic apparatus as recited in claim 87,*

[A] *wherein the head-worn personal electronic apparatus is configured to provide audio alerts to the user via the at least one speaker, and*

[B] *wherein the audio alerts are dependent on one or more user preference settings.*

Claim 100

[Preamble] *A head-worn personal electronic apparatus as recited in claim 87,*

[A] *wherein the electronic circuitry is configured to modify the customized audio output signals to be output to the user via the at least one speaker to cancel at least a portion of noise associated with the environment, the modification of the customized audio output signals being dependent at least in part on the environmental audio input picked-up via the second microphone,*

[B] *wherein, when the head-worn personal electronic apparatus is being worn by the user, the first microphone is positioned to be directed more towards the user's mouth than is the second microphone, and*

[C] *wherein, when the head-worn personal electronic apparatus is being worn by the user, the second microphone is directed more away from the user's mouth than is the first microphone.*

Certification of Word Count (37 C.F.R. § 42.24)

I hereby certify that this Petition for *Inter Partes* Review has 13,975 words (as counted by the “Word Count” feature of the Microsoft Word™ word-processing system), exclusive of “a table of contents, a table of authorities, mandatory notices under § 42.8, a certificate of service or word count, or appendix of exhibits or claim listing.”

Dated: April 3, 2026

By: /Bryan Blumenkopf/
Bryan Blumenkopf

Certificate of Service (37 C.F.R. § 42.6(e)(4) and 42.205(a))

I hereby certify that the attached Petition for *Inter Partes* Review and supporting materials are being filed on April 3, 2026, via the P-TACTS system and served on April 4, 2026, via UPS, which is a means at least as fast and reliable as Priority Mail Express®, on the Patent Owner at the correspondence address indicated for U.S. Patent No. 11,921,355:

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Dated: April 3, 2026

By: /Bryan Blumenkopf/
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