

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. IPR2026-00332

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 claim 55 of U.S. Patent No. 11,921,355 (“the ’355 Patent” (EX1001)). The challenged claim—issued just over two years ago—does 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 claim 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 challenged claim is 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 challenged claim is unpatentable regardless of whether the Board applies Petitioner’s litigation constructions or declines to construe the claim. (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 claim 55 of the ’355 Patent based on the following references and the accompanying Declaration of Dr. Chris Kyriakakis. (EX1003.) Claim 55 is 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. 7,599,508	Lynch (EX1008)
U.S. Patent No. 7,010,332	Irvin (EX1009)
U.S. Patent No. 5,721,783	Anderson (EX1010)
P. HOROWITZ AND W. HILL, THE ART OF ELECTRONICS (Cambridge Univ. Press 2nd Ed. 1989)	Horowitz (EX1011)

The statutory grounds for the challenge of the 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	Prior Art References
1	103	55	Anderson, Lynch, Irvin, Horowitz

Below, Petitioner discusses why the challenged claim is unpatentable, including by specifying how and where the prior art satisfies each limitation of the 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 its ground of invalidity as to the challenged claim.

V. GROUND 1: CLAIM 55 IS RENDERED OBVIOUS BY ANDERSON IN VIEW OF LYNCH, IRVIN, AND HOROWITZ

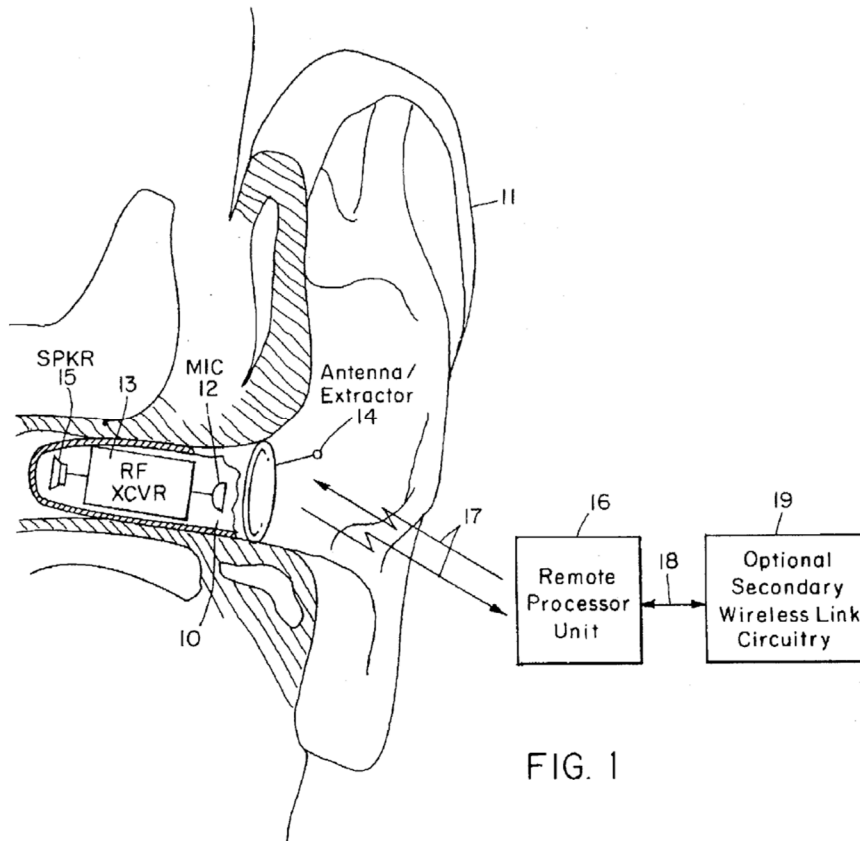
A. Summary of Anderson

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

¹ Petitioner also shows how the challenged claim's preamble is satisfied, but does not concede that the preamble is limiting.

processor unit (RPU) that receives signals from and transmits signals to the earpiece. (EX1010, 1:7-10; EX1003, ¶37.) FIG. 1 illustrates:



(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:

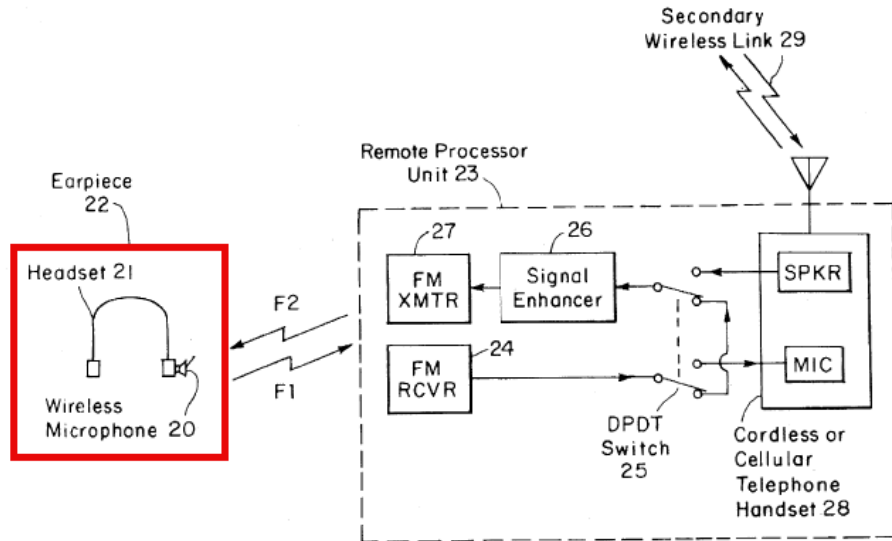


FIG. 2

(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

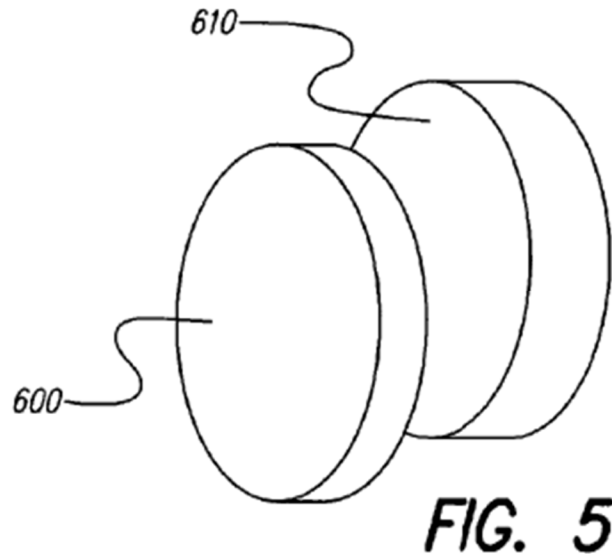
audio devices of the '355 patent. (*See* EX1001, 3:36-64; EX1010, 1:5-2:39; EX1003, ¶42.) Similarly, by disclosing systems in which “audio signals are enhanced according to the user’s needs,” Anderson is reasonably pertinent to a problem faced by the '355 patent inventor—using wearable devices to provide 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. 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:

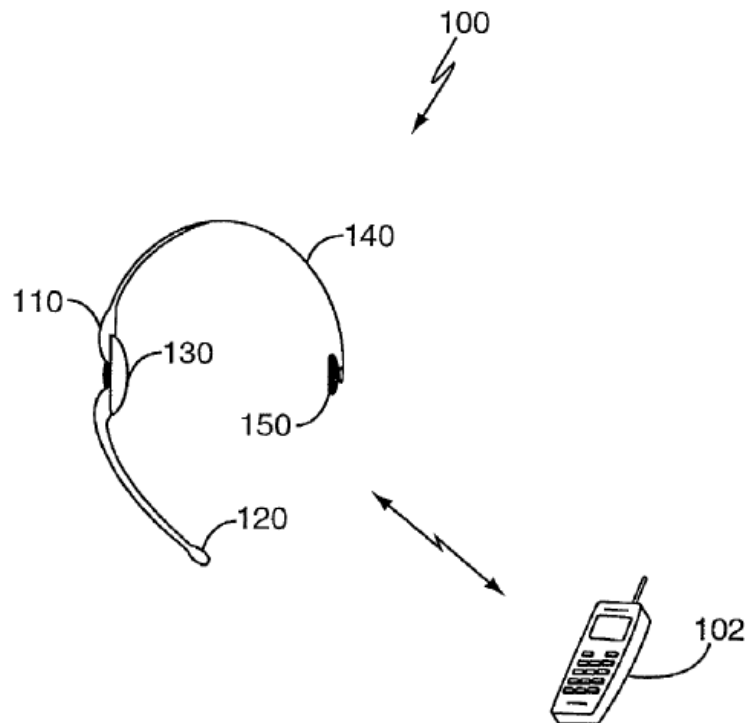


FIG. 1

(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:

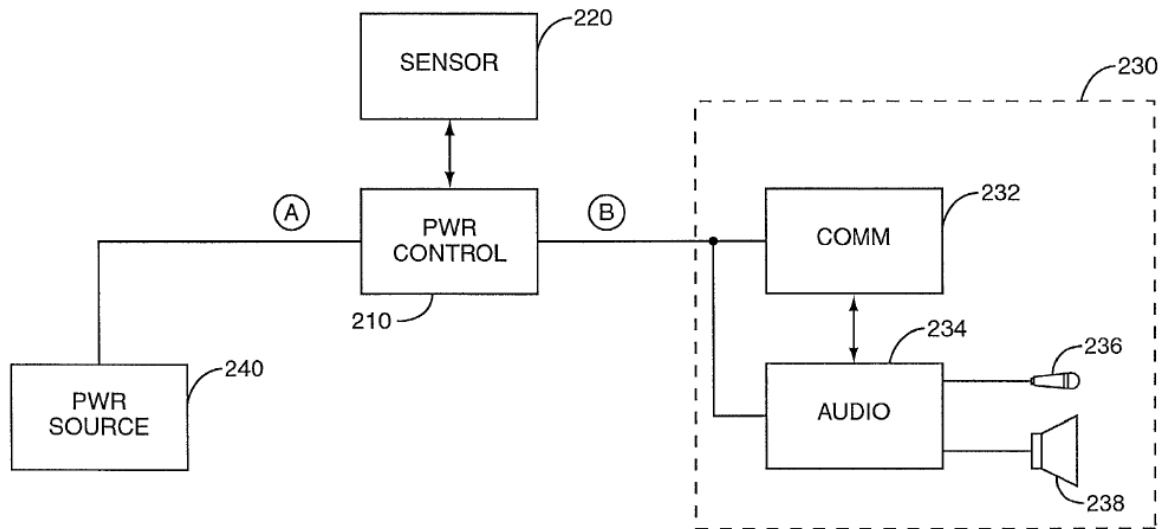


FIG. 2A

(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:

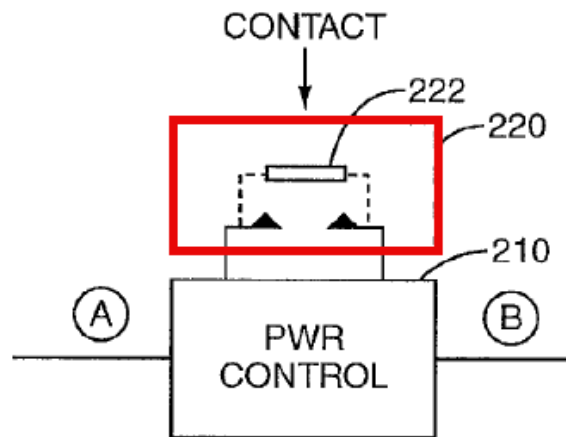


FIG. 4C

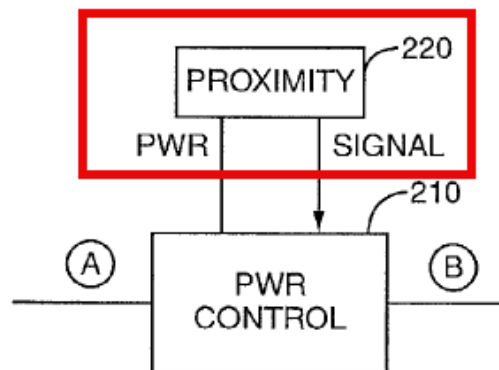


FIG. 4D

(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.

D. Summary of Horowitz

Horowitz is an electronics textbook published in 1989, setting forth a “definitive volume teaching the art of the subject.” (EX1011, *xix*; EX1003, ¶407.) Horowitz is prior art to the '355 patent under at least 35 U.S.C. §§102(a) and (b).

Relevant to this proceeding, Horowitz includes, in a chapter titled “Foundations,” disclosure of switches (“mundane but important devices [that] seem to wind up in most electronic equipment”), including Hall effect switches. (EX1011, 53-55; EX1003, ¶408.) Horowitz further discloses, in a chapter titled “Digital Meets Analog,” the use of Hall effect switches to implement switching circuits and overcome “bounce” problems common to mechanical switches (EX1011, 575-577; EX1003, ¶408.) Horowitz provides specific instructions, including schematics and instrumentation diagrams, for implementing switches

into practical electronic circuits. (EX1011, 575-577; EX1003, ¶408.)

Horowitz is analogous art to the '355 patent at least because it is a “definitive volume” in the same general field of endeavor (devices with electronic circuits) as the '355 patent; and provides disclosures analogous to those of the '355 patent. (EX1011, *xix*; EX1001, Abstract; EX1003, ¶409.) Horowitz provides specific guidance for implementing circuits and components analogous to those disclosed in the '355 patent, and in particular for interfacing digital input and output devices; and is thus reasonably pertinent to the problem of wearable electronic devices with electronic components faced by the inventor of the '355 patent. (EX1001, Abstract; EX1011, 565, *see* 565-671; EX1003, ¶409.)

E. Motivation to Combine Anderson with Lynch, Irvin, and Horowitz with Reasonable Expectation of Success

The POSITA would have been motivated to combine the teachings of Anderson, Lynch, Irvin, and Horowitz to meet the limitations of claim 55, and would had a reasonable expectation of success in doing so, as described below. (EX1003, ¶¶410-418.)

1. Motivation to Combine Anderson and Lynch

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.)

2. Motivation to Combine Anderson and Lynch with Irvin

A POSITA would have been motivated to combine Anderson and Lynch with Irvin. (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.)

3. Motivation to Combine Anderson, Lynch, and Irvin with Horowitz

The POSITA would have been motivated to combine the teachings of Anderson, Lynch, and Irvin, as described above, with the teachings of Horowitz, and would have had a reasonable expectation of success in doing so. (EX1003, ¶410.)

Irvin teaches the integration of sensor 220 into a wearable headset device, such as the wearable hearing aid of the combination of Anderson, Lynch, and Irvin; including the implementation of sensor 220 as a contact sensor with a contact switch that closes when brought into physical contact with the user, as described above. (EX1009, 6:3-19, FIG. 4C; EX1003, ¶411.) However, Irvin omits implementation detail for the contact switch, including the type of switch preferably used, or how to overcome mechanical bouncing and other problems common to contact switches. (EX1003, ¶411.) Accordingly, the POSITA would have been motivated to look to other teachings of how to implement contact sensor

220. (EX1003, ¶411.)

The POSITA would have consulted well-known and authoritative literature in the art, such as Horowitz, for guidance. (EX1003, ¶412.) This is particularly because Horowitz is a comprehensive and widely used textbook in the same general field (electronic circuits) as Anderson, Lynch, Irvin and the '355 patent, setting forth a “definitive volume teaching the art of the subject.” (EX1011, *xix*; EX1003, ¶412.) For example, Horowitz includes specific passages guiding the POSITA’s implementation of switching components in circuits where digital components interface with analog elements, such as Anderson’s earpiece and Irvin’s contact sensor 220. (EX1011, 53-55, 575-577; EX1003, ¶412.)

Horowitz explains options for implementing contact switches; for example, Horowitz discloses that a Hall effect switch is a commercially available type of electromechanical switch; and that such Hall effect switches advantageously produce a “debounced logic output” that overcomes mechanical bounce problems that “wreak havoc” in some contact switch circuits. (EX1011, 53-55; EX1003, ¶413.) Horowitz further discloses that such Hall effect switches are “magnetically operated solid-state switches” that advantageously “last just about forever” since they have “have no mechanical contact assembly to wear out”. (EX1011, 576-577; EX1003, ¶413.) These advantages in durability are particularly well suited for combination with Irvin, which seeks to provide a “reliable mechanism” for on/off

control of the headset; and for wearable devices in general, which are subject to daily wear and exposure to the elements. (EX1009, 1:29-31; EX1003, ¶413.) The POSITA would thus have been motivated to combine Horowitz's teachings of such Hall effect switches with those of Anderson, Lynch, and Irvin to implement the contact switch 220 and realize the advantages described by Horowitz. (EX1003, ¶413.)

The POSITA would have had a reasonable expectation of success in making the combination. (EX1003, ¶414.) For example, Horowitz discloses that Hall effect switches are commercially available in a "complete assembly" that operates at a standard logic-level voltage (5 volts), and produces a logic output suitable for interfacing with TTL and CMOS circuitry common to digital circuits. (EX1011, 577; EX1003, ¶414.) Horowitz additionally provides charts, tables, and schematics for implementing circuits such as Irvin's control switch 220, including with specific component numbers, removing guesswork from the implementation. (See EX1011, 565-671; EX1003, ¶414.) And Irvin provides additional guidance, including block diagrams for integrating contact sensor 220 into circuits for controlling wireless headsets such as in Anderson and Lynch. (EX1009, FIGS. 1-5, 8; EX1003, ¶414.) The combination would thus have been predictable, involving the combination of known methods and components, with specific implementation guidance provided. (EX1003, ¶414.)

F. Claim 17

This petition does not challenge claim 17 of the '355 patent. Claim 17 is discussed here because challenged claim 55 depends from claim 17 and thus includes the limitations of claim 17. As discussed herein, the limitations of claim 17 are rendered obvious by Anderson, Lynch, and Irvin in view of Horowitz.

1. [Preamble]² *A head-worn personal electronic apparatus operable to at least output customized audio output, comprising:*

Anderson in view of Lynch teaches the claimed head-worn personal electronic apparatus. (EX1003, ¶¶50, 76.) 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:

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

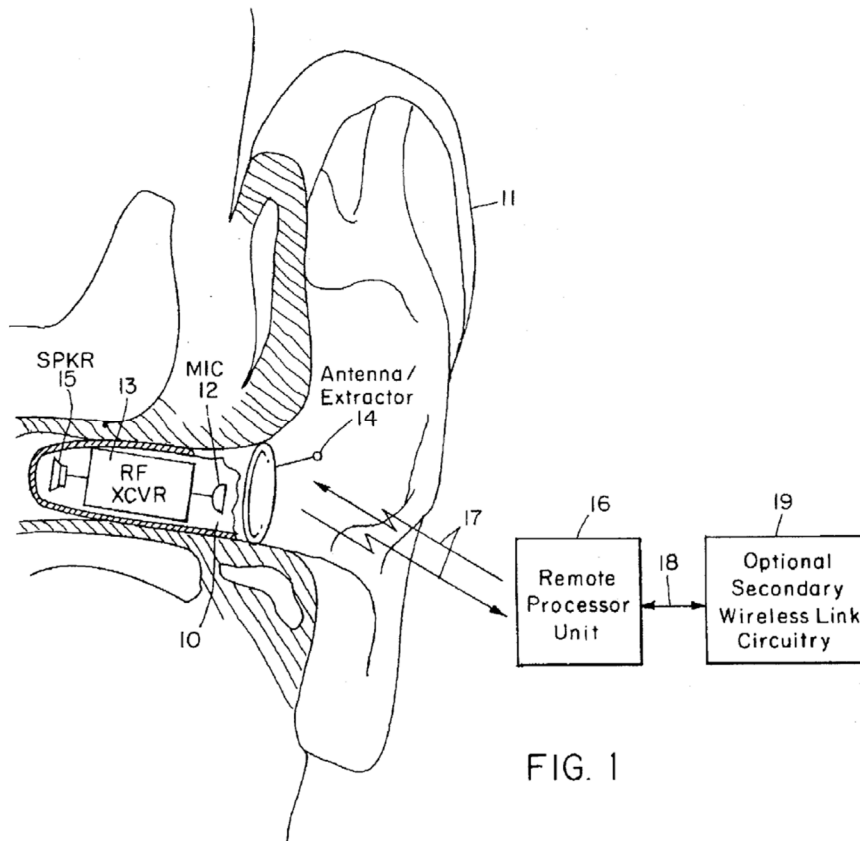


FIG. 1

(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:

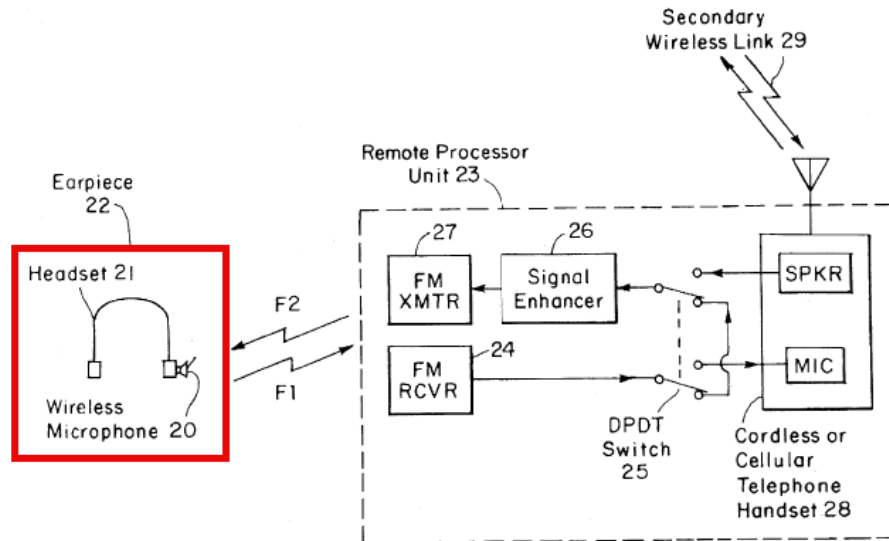


FIG. 2

(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, 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

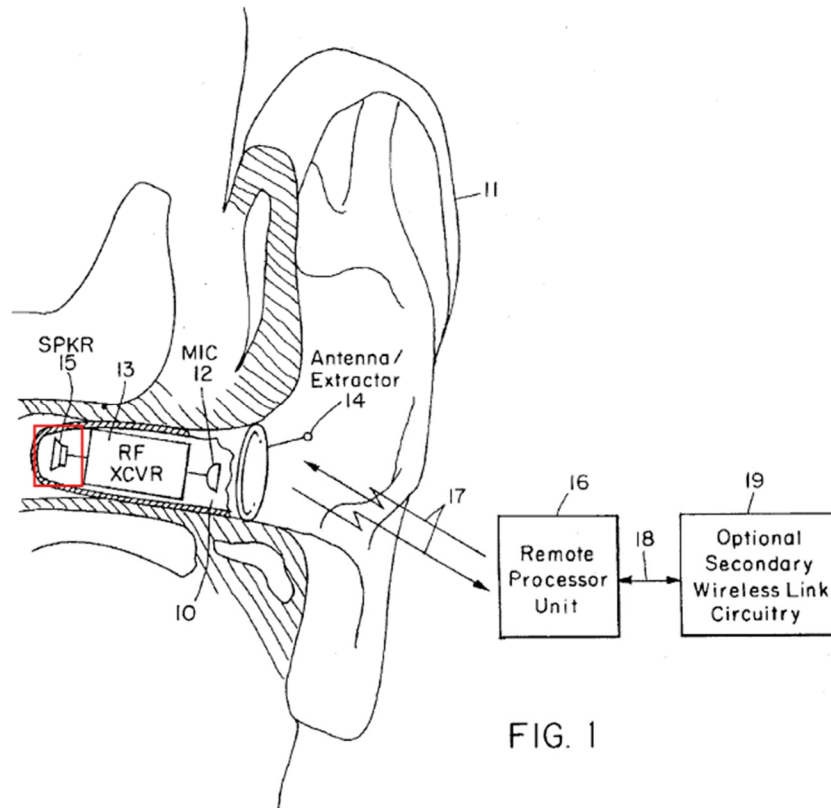
components. (EX1008, 2:56-66; EX1003, ¶59.) The POSITA would have understood such components to include headset 21, which is both external and head-mounted. (EX1003, ¶59.)

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

This element is met. (EX1003, ¶78.) 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:

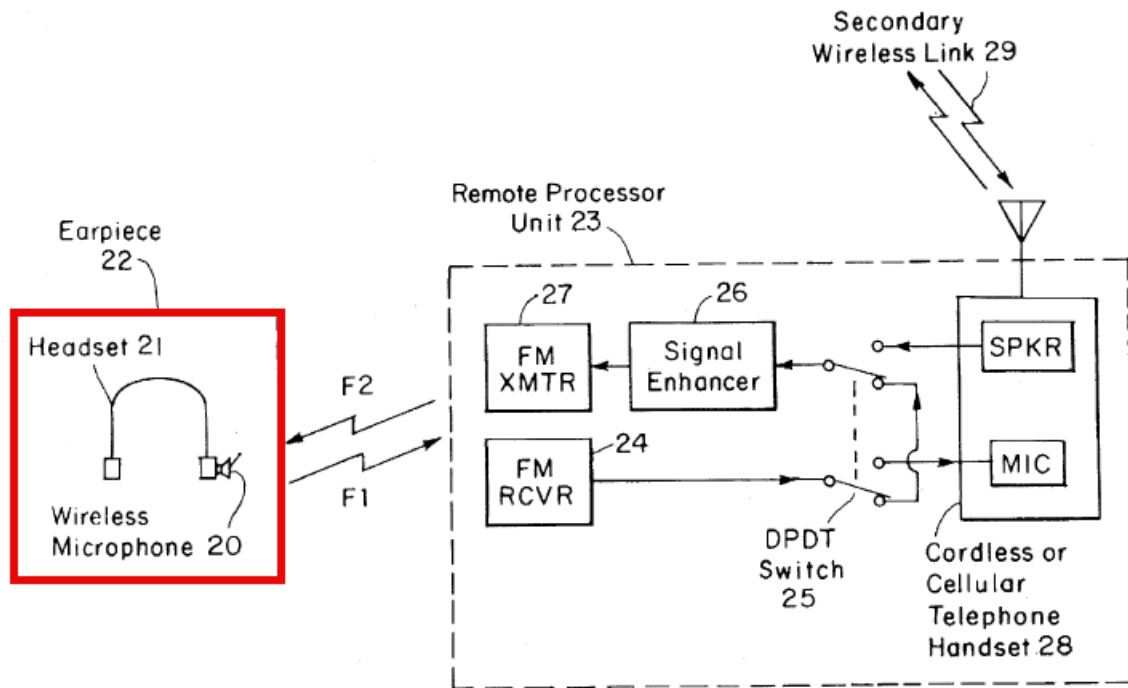


FIG. 2

(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] 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***

This element is met. (EX1003, ¶¶79.) 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.)

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.) 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.)

As described above, 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 above, 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.)

4. ***[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,***

This element is met. (EX1003, ¶¶80, 81.) 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:

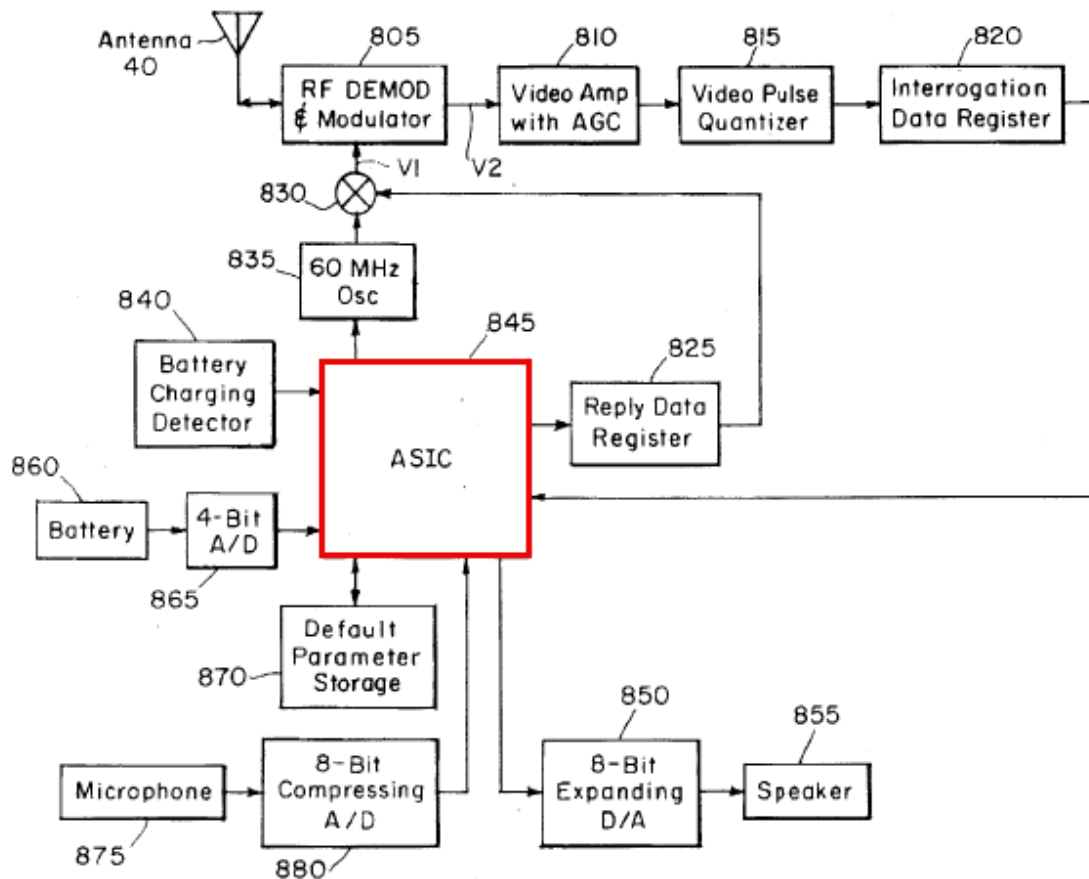


FIG. 8

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

Under control of the ASIC 845, as described for [B], the earpiece receives the customized audio signals and outputs the signals to the user via speaker 15.

(EX1010, 1:55-63, 22:62-23:14; EX1003, ¶¶73, 81.)

5. **[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.**

This element is met. (EX1003, ¶¶74, 82.) 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.) 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.)

G. Claim 55

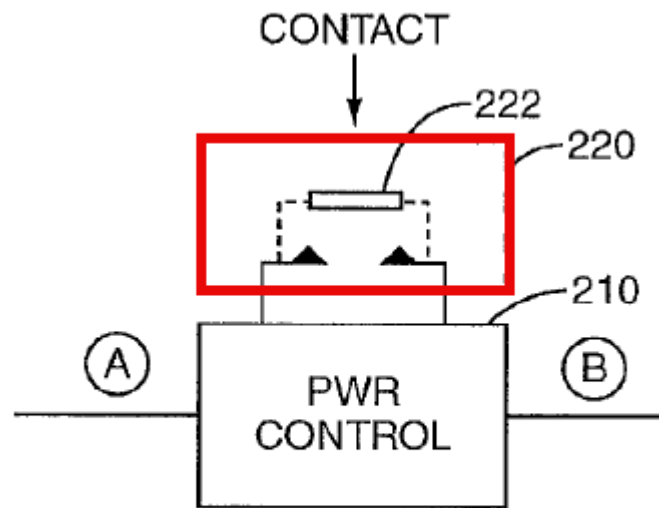
- a. [Preamble] *A head-worn personal electronic apparatus as recited in claim 17,***

The Preamble is met as set forth in the discussion of claim 17 above.

(EX1003, ¶415.)

- b. [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.***

This element is met. (EX1003, ¶416.) In combination with Anderson and Lynch, 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, 416.)

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.)

In the combination of Anderson, Lynch, and Irvin with Horowitz, Irvin's contact sensor 220 would be implemented in the combined apparatus using a Hall

effect switch as disclosed by Horowitz. (EX1003, ¶417.) The POSITA would have been motivated to make the combination as described above. (EX1003, ¶417.) As Horowitz discloses, the Hall effect switch is a magnetically operated solid-state switch that can be advantageously used in place of a mechanical switch such as the contact switch disclosed in Irvin. (EX1011, 576-577; EX1009, 6:3-10, FIG. 4C; EX1003, ¶417.)

Because the Hall effect sensor operates based on the principles of the well-known Hall effect, The POSITA would have understood the Hall effect switch to comprise a Hall effect detector for detecting a voltage generated in the switch by the Hall effect, *i.e.*, by the presence of an electrical current in a magnetic field. (See EX1013, 709-713; EX1003, ¶418.) The POSITA would similarly have understood the Hall effect switch to capture data associated with a magnetic characteristic, *e.g.*, the voltage produced as a function of the applied magnetic field, as characterized by the Hall effect. (See EX1013, 709-713; EX1003, ¶418.)

VI. 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 (IPR2026-00331) 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.

VII. CONCLUSION

Petitioner requests that the Board initiate *inter partes* review and cancel the challenged claim 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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VIII. 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 6,425 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 on the indicated for U.S. Patent No. 11,921,355.

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Dated: April 3, 2026

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