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Bose Exhibit 1002
Bose v. IngenioSpec

PTO/AIA/15 (10-17)
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UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.	IPVCP006X1C8
First Named Inventor	HOWELL et al.
Title	WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT
Priority Mail Express® Label No.	

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

1. [✓] **Fee Transmittal Form** (PTO/SB/17 or equivalent)
2. [ ] **Applicant asserts small entity status.** See 37 CFR 1.27
3. [ ] **Applicant certifies micro entity status.** See 37 CFR 1.29. Applicant must attach form PTO/SB/15A or B or equivalent.
4. [✓] **Specification** [*Total Pages* 124] Both the claims and abstract must start on a new page. *(See MPEP § 608.01(a) for information on the preferred arrangement)*
5. [✓] **Drawing(s)** (35 U.S.C. 113) [*Total Sheets* 72]
6. **Inventor's Oath or Declaration** [*Total Pages* 4] *(including substitute statements under 37 CFR 1.64 and assignments serving as an oath or declaration under 37 CFR 1.63(e))*
   a. [ ] Newly executed (original or copy)
   b. [✓] A copy from a prior application (37 CFR 1.63(d))
7. [✓] **Application Data Sheet** ** See note below.* See 37 CFR 1.76 (PTO/AIA/14 or equivalent)
8. **CD-ROM or CD-R** in duplicate, large table, or Computer Program (*Appendix*)
   [ ] Landscape Table on CD
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ACCOMPANYING APPLICATION PAPERS

10. [ ] **Assignment Papers** (cover sheet & document(s))
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11. [✓] **37 CFR 3.73(c) Statement** (*when there is an assignee*) [✓] **Power of Attorney**
12. [ ] **English Translation Document** (*if applicable*)
13. [✓] **Information Disclosure Statement** (PTO/SB/08 or PTO-1449)
    [ ] Copies of citations attached
14. [ ] **Preliminary Amendment**
15. [ ] **Return Receipt Postcard** (*MPEP § 503*) (*Should be specifically itemized*)
16. [ ] **Certified Copy of Priority Document(s)** (*if foreign priority is claimed*)
17. [ ] **Nonpublication Request** Under 35 U.S.C. 122(b)(2)(B)(i). Applicant must attach form PTO/SB/35 or equivalent.
18. [ ] **Other:** _____

*Note: (1) Benefit claims under 37 CFR 1.78 and foreign priority claims under 1.55 **must** be included in an Application Data Sheet (ADS).
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WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation of U.S. Patent Application No. 16/429,181, filed June 3, 2019, and entitled "EYEWEAR WITH PRINTED CIRCUIT BOARD SUPPORTING MESSAGES," which is hereby incorporated herein by reference, which in turn is a continuation of U.S. Patent Application No. 13/831,445, filed March 14, 2013, now U.S. Patent No. 10,310,296, and entitled "EYEWEAR WITH PRINTED CIRCUIT BOARD," which is hereby incorporated herein by reference, and which in turn is a continuation of U.S. Patent Application No. 12/803,732, filed July 1, 2010, now U.S. Patent No. 8,434,863, and entitled "EYEGLASSES WITH A PRINTED CIRCUIT BOARD," which is hereby incorporated herein by reference, which in turn is a continuation of U.S. Patent Application No. 11/546,685, filed October 11, 2006, now U.S. Patent No. 7,806,525, and entitled "EYEGLASSES HAVING A CAMERA" which is hereby incorporated herein by reference, which in turn is a continuation-in-part of U.S. Patent Application No. 11/183,256, filed July 15, 2005, now U.S. Patent No. 7,500,747, and entitled "EYEGLASSES WITH ELECTRICAL COMPONENTS," which is hereby incorporated herein by reference.

[0002] This application is related to U.S. Patent Application No. 10/964,011, filed October 12, 2004, now U.S. Patent No. 7,192,136, and entitled "TETHERED ELECTRICAL COMPONENTS FOR EYEGLASSES," which is hereby incorporated herein by reference; which in turn is related to each of: (i) U.S. Provisional Patent Application No. 60/509,631, filed October 9, 2003, and entitled "TETHERED ELECTRICAL COMPONENTS FOR EYEGLASSES," which is hereby incorporated herein by reference; (ii) U.S. Provisional Patent Application No. 60/527,565, filed December 8, 2003, and entitled "ADAPTABLE COMMUNICATION TECHNIQUES FOR ELECTRONIC DEVICES," which is hereby incorporated herein by reference; (iii) U.S. Provisional Patent Application No. 60/562,798, filed April 15, 2004, entitled "EYEWEAR WITH ULTRAVIOLET DETECTION SYSTEM," and which is hereby incorporated herein

by reference; (iv) U.S. Provisional Patent Application No. 60/583,169, filed June 26, 2004, entitled "ELECTRICAL COMPONENTS FOR USE WITH EYEWEAR, AND METHODS THEREFOR," and which is hereby incorporated herein by reference; (v) U.S. Provisional Patent Application No. 60/592,045, filed July 28, 2004, entitled "EYEGLASSES WITH A CLOCK OR OTHER ELECTRICAL COMPONENT," and which is hereby incorporated herein by reference; and (vi) U.S. Provisional Patent Application No. 60/605,191, filed August 28, 2004, entitled "ELECTRICAL COMPONENTS FOR USE WITH EYEWEAR, AND METHODS THEREFOR," and which is hereby incorporated herein by reference.

[0003] U.S. Patent Application No. 11/183,256 also claims priority to each of: (i) U.S. Provisional Patent Application No. 60/618,107, filed October 12, 2004, and entitled "TETHERED ELECTRICAL COMPONENTS FOR EYEGLASSES," which is hereby incorporated herein by reference; (ii) U.S. Provisional Patent Application No. 60/620,238, filed October 18, 2004, entitled "EYEGLASSES WITH HEARING ENHANCED AND OTHER AUDIO SIGNAL-GENERATING CAPABILITIES," and which is hereby incorporated herein by reference; (iii) U.S. Provisional Patent Application No. 60/647,836, filed January 31, 2005, and entitled "EYEGLASSES WITH HEART RATE MONITOR," which is hereby incorporated herein by reference; and (iv) U.S. Provisional Patent Application No. 60/647,826, filed January 31, 2005, and entitled "EYEWEAR WITH ELECTRICAL COMPONENTS," which is hereby incorporated herein by reference.

[0004] U. S. Patent Application 11/546,685 also claims priority to each of: (i) U.S. Provisional Patent Application No. 60/725,896, filed October 11, 2005, and entitled "EYEGLASSES WITH ELECTRICAL COMPONENTS," which is hereby incorporated herein by reference; (ii) U.S. Provisional Patent Application No. 60/725,999, filed October 11, 2005, and entitled "EYEWEAR SUPPORTING AFTER-MARKET ELECTRICAL COMPONENTS," which is hereby incorporated herein by reference; (iii) U.S. Provisional Patent Application No. 60/787,850, filed April 1, 2006, and entitled "EYEGLASSES WITH A HEART RATE MONITOR," which is hereby incorporated herein by reference; and (iv) U.S. Provisional Patent Application No. 60/846,150, filed September 20, 2006, and entitled "EYEGLASSES WITH ACTIVITY MONITORING," which is hereby incorporated herein by reference.

[0005] In addition, this application is related to each of: (i) U.S. Patent Application 10/822,218, filed April 12, 2004, and entitled "EYEGLASSES FOR WIRELESS COMMUNICATIONS," which is hereby incorporated herein by reference; (ii) U.S. Patent Application No. 10/964,011, filed October 12, 2004 now U.S. Patent No. 7,192,136, and entitled "TETHERED ELECTRICAL COMPONENTS FOR EYEGLASSES," which is hereby incorporated herein by reference; (iii) U.S. Patent Application No. 11/006,343, filed December 7, 2004 now U.S. Patent No. 7,116,976, and entitled "ADAPTABLE COMMUNICATION TECHNIQUES FOR ELECTRONIC DEVICES," which is hereby incorporated herein by reference; (iv) U.S. Patent Application No. 11/078,855, filed March 11, 2005 now U. S. Patent No. 7,500,746, and entitled "EYEWEAR WITH RADIATION DETECTION SYSTEM," which is hereby incorporated herein by reference; (v) U.S. Patent Application No. 11/078,857, filed March 11, 2005, and entitled "RADIATION MONITORING SYSTEM," which is hereby incorporated herein by reference; (vi) U.S. Patent Application No. 11/183,269, filed July 15, 2005 now U.S. Patent No. 7,380,936, and entitled "EYEWEAR SUPPORTING AFTER-MARKET ELECTRICAL COMPONENTS," which is hereby incorporated herein by reference; (vii) U.S. Patent Application No. 11/183,283, filed July 15, 2005, and entitled "EVENT EYEGLASSES," which is hereby incorporated herein by reference; (viii) U.S. Patent Application No. 11/183,262, filed July 15, 2005, and entitled "EYEGLASSES WITH HEARING ENHANCED AND OTHER AUDIO SIGNAL-GENERATING CAPABILITIES," which is hereby incorporated herein by reference; (ix) U.S. Patent Application No. 11/183,263, filed July 15, 2005 now U.S. Patent No. 7,380,936, and entitled "EYEGLASSES WITH A CLOCK OR OTHER ELECTRICAL COMPONENT," which is hereby incorporated herein by reference; (x) U.S. Patent Application No. 11/183,276, filed July 15, 2005 now U.S. Patent No. 7,255,437, and entitled "EYEGLASSES WITH ACTIVITY MONITORING," which is hereby incorporated herein by reference; and (xi) U.S. Patent Application No. 11,580,222, filed October 11, 2006 now U.S. Patent No. 7,581,833, and entitled "EYEGLASSES SUPPORTING AFTER MARKET ELECTRICAL COMPONENTS", which is hereby incorporated herein by reference.

BACKGROUND OF THE INVENTION

[0006] Many of us have experienced the inconvenience of trying to listen to a piece of music from a portable device in an outdoor environment, particularly in cold weather. First, we remove the device from inside our jacket. Then, we take off our gloves to find the right song, connect the device to a headset, and put on the headset. After we have finished listening, we go through the process again to put the device back into our jacket. To a certain degree, we are somewhat used to such procedures. However, to look at this objectively, going through the multi-step process just to listen to a piece of music is cumbersome. Such inconvenient procedures are not limited to hearing music. For example, it may not be much easier for us to use the cell phones or cameras and the like.

[0007] It should be apparent from the foregoing that there is still a need to increase the ease of handling electronic devices.

SUMMARY OF THE INVENTION

[0008] In one embodiment, an eyeglass frame includes a lens holder, a first temple with a first end close to the lens holder and a second end further away, a second temple, an electrical connector and a printed circuit board. The printed circuit board with at least one electrical component attached thereon can be provided in the first temple. The connector can be provided close to the first end of the first temple, facing downward, and configured to be electrically connected to the at least one electrical component.

[0009] In another embodiment, an eyeglass frame includes a first printed circuit board with at least one electrical component. The first printed circuit board can be connected to an electrical component at the frame via a second printed circuit board.

[00010] Different embodiments of glasses can be applied to multiple functions. With a user wearing such a pair of glasses, it would be more difficult for a third party to know the specific function or reason the user is wearing the glasses for. Regarding the locations of the electrical components for the multiple functions, different embodiments range from all of the components in the glasses to the glasses primarily functioning as a headset.

[00011] In one embodiment, a pair of glasses can be provided with hearing enhancement and other signal generating capabilities. Most people today do not desire to wear hearing aids or hearing enhancement devices. One major reason could be that they do not want to be perceived as being old. In this embodiment, a pair of glasses, with speakers, has hearing enhancement capabilities. With the speakers in the glasses, the speakers can be positioned in close proximity to the ears of the users. In addition to having hearing enhancement capabilities, the glasses also include at least one electrical component to generate other audio signals. For example, the glasses can play music. Such a hearing-enhanced device can remove the associated stigma of conventional hearing aids. A third party may not be able to tell whether the user is wearing the glasses to hear music or whether the user is wearing the glasses to have his hearing enhanced.

[00012] In one embodiment, a pair of glasses can include at least one speaker and typically two. Each speaker is in one of the temples of the glasses, closer to the

corresponding hinge of that temple than the other end (the free end) of the temple. There can also be a tube extending from the speaker to guide sound generated by the speaker to the corresponding ear of the user. The tube can be rotated, such as from behind the temple to being downward at an angle towards the ear of the user. The two speakers can also be electrically connected by a conductor, with the conductor linking the speakers through the lens holders of the glasses. The glasses can include a microphone, which can be located close to one of the hinges of the glasses. In another embodiment, there can be two microphones. The one or more microphones can be directional for receiving signals in specific directions.

[00013] In another embodiment, to reduce the weight of the glasses and to enhance the ease of aesthetic design of the glasses, some of the hearing enhanced electronics are not in the glasses. Instead they are in a portable device carried by the user. The portable device is electronically coupled to the glasses wirelessly or through a wired connection.

[00014] In another embodiment, the glasses can include a wireless transceiver. In this embodiment, the microphone does not have to be at the glasses. The microphone can also be wirelessly coupled to the glasses and/or the portable device.

[00015] In another embodiment, the glasses can include a connector for at least one wire to be connected to the glasses. The connector can be at the free end of one of the temples of the glasses, or the connector can be at another location at the glasses. Different types of standard or non-standard connectors can be used.

[00016] In the wired embodiment, the microphone also does not have to be at the glasses. The microphone can be mounted on the wire that connects the glasses to the portable device.

[00017] The glasses can have a number of hearing enhancing capabilities. In one embodiment, the hearing enhancement is for those with mild or medium hearing loss. In another embodiment, the hearing enhancement is for those with severe hearing loss.

[00018] One hearing enhancement functionality is frequency-dependent amplification. For example, higher frequencies are amplified more than lower

frequencies; certain frequency bands are not amplified; or the frequencies to be amplified are tailored to the user.

[00019] To tailor the amplification to a user, hearing enhancement capabilities can be calibrated against the user. The calibration can be done by the user or by a third party. The calibration can be performed through a website, which guides the user through the process. The calibrated frequency hearing profile of the user can be stored. Such calibration can be performed periodically, such as once a year.

[00020] The glasses may also include at least one electrical component for power management. Hearing enhancement does not have to be fully functional at all times. In one embodiment, the hearing enhancement function is on demand. The enhancement can go into a sleep mode when there is no audio fluctuation beyond a certain threshold in the ambient environment. The amplification can also depend on the ambient noise level.

[00021] In other embodiments, the glasses can also have at least one electrical component to generate other audio signals. These other audio signals do not originate from signals captured by the microphone(s) in the glasses. These signals can originate from relatively private sources or public sources.

[00022] In one example of signals originating from private sources, the glasses can include the electrical components to operate as a phone. The glasses can pick up signals from a caller, and the speaker(s) in the glasses re-generate the audio signals of the caller. Again some of the electrical components of the phone can be in a portable device wired or wirelessly coupled to the glasses. There can be an indicator indicating an incoming call. The indicator could be a signal light.

[00023] Regarding processing an incoming call, in one embodiment, if the user wants to pick up the incoming call, the hearing enhancement mode can be deactivated. In another embodiment, one or more functionalities of the hearing enhancement mode can operate on the incoming call. There can also be noise cancellation functionalities, such as through two directional microphones, one pointing at the user's mouth, and the other pointing away.

[00024] In another example of signals originating from private sources, the glasses can include the electrical components to operate as a player. Again some of the electrical components of the player can be in a portable device wired or wirelessly coupled to the glasses. The player can be a MP3 or other multimedia asset player. The player can be a radio. The radio can be personalized to the user, for example, by being aware of the songs the user prefers. In one embodiment, when the user starts the player, the hearing enhancement mode can be deactivated. In another embodiment, different capabilities of the hearing enhancement mode operate on the signals from the player.

[00025] In yet another embodiment, the other audio signals are from public sources. For example, the glasses can be coupled to a conference microphone or a theater speaker wirelessly, and thus be capable of capturing and enhancing the signals from those sources. Again, the coupling can be through a portable device wired or wirelessly coupled to the glasses.

[00026] There can be one or more control knobs or switches at the glasses or at a portable device coupled to the glasses. Different types of switches are applicable for different applications.

[00027] Regarding power sources for the electrical components in the glasses, in one embodiment, the power sources, such as batteries, are in the glasses. In another embodiment, the power sources are located outside the glasses, but connected to the glasses through an adapter. In yet another embodiment, the power sources are in a portable device electrically connected to the glasses, and the power sources can be rechargeable.

[00028] A number of embodiments have been described with glasses having hearing enhanced and/or other audio signal generation capabilities. In one embodiment, the glasses function as a headset and are adaptable for different applications, such as hearing enhancement, communication (e.g. phone operation) and listening to audio signals (e.g. MP3 operation). When a person is using the headset, a third party again may not be able to tell whether the person is having his hearing enhanced, or listening to other audio signals generated.

[00029] Additional benefits of having glasses as headsets are that eyeglasses frames tend to be very compact and lightweight and thus have little space for electrical components. With at least a portion of the electrical components for a system, such as a hearing enhancement system, outside the glasses, additional weights required for the system on the glasses are reduced. Further, eyeglass frames are often fashionable items whose designs are important. By reducing the amount of electrical components, and in turn, space required in the glasses, design tradeoffs required due to having electrical components in the eyeglass frames are reduced.

[00030] In a first example of glasses functioning as a headset, the glasses can include a connector and two speakers, one at each temple, both speakers electrically connected through the glasses. The connector can be located at the free end of one of the temples. The connector can be used to receive stereo signals, such as from an MP3 player. Based on a headset-to-phone cord, the speakers in the headset can also be used to receive a phone call.

[00031] In a second example of the glasses functioning as a headset, the glasses can include two connectors. Each connector can be at one of the temple tips of the glasses, and each connector can be connected to the speaker at that temple. To send audio signals to the speakers, the two connectors can be tethered and connected together through a connector external to the glasses. The external connector can then operate as the connector in the first example. Regarding other embodiments, the speakers can be in the temples, such as closer to their corresponding lens holders than the free end of the temples. In another example, the speakers can be in the region of the temple tips. The speakers can be embedded in the glasses or can be external to the glasses on stubs or extensions. For speakers that are embedded in the glasses, each speaker can have a tube extending towards an ear to guide audio signals. At the end of each tube, there can be an ear bud for inserting into the ear. The tubes can be permanently attached to the glasses, or each can be attachable to the glasses. The tubes or the stubs can also be retractable and extendable, and the position of the tubes or the stubs can be adjustable.

[00032] Other aspects and advantages of the present invention will become apparent from the following detailed description, which, when taken in conjunction with the accompanying drawings, illustrates by way of example the principles of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[00033] FIG. 1 shows one embodiment of the invention with a speaker in one of the temples of the glasses.

[00034] FIG. 2 shows a tube extending from a speaker at a temple of the glasses to guide sound to one of the ears of the user according to one embodiment of the invention.

[00035] FIG. 3 shows a retractable tube extending from a speaker at a temple of the glasses according to one embodiment of the invention.

[00036] FIG. 4 shows a funnel at the output of a speaker in the glasses according to one embodiment of the invention.

[00037] FIG. 5 shows a male connector at the end of a temple according to one embodiment of the invention.

[00038] FIGS. 6A-6B illustrate a process to make a non-standard female plug couple to a male connector at a pair of glasses according to one embodiment of the invention.

[00039] FIG. 7 illustrates another non-standard connector, applicable to clamp onto a temple of a pair of glasses according to an embodiment of the invention.

[00040] FIGS. 8A-8E shows different embodiments of standard connectors located at different positions on the temple of a pair of glasses according to the invention.

[00041] FIGs. 8F-8H are diagrams pertaining to providing a removable electronic device with an eyeglass frame according to one embodiment of the invention.

[00042] FIG. 8I is a diagram of a temple of an eyeglass frame according to another embodiment of the invention.

[00043] FIG. 9 shows some of the electrical components for a MP3 player according to an embodiment of the invention.

[00044] FIG. 10 shows an embodiment of the invention where a user is wearing a pair of glasses with electrical components, tethered to a base, which is connected to a portable device.

[00045] FIGS. 11A-11B show different embodiments of the present invention illustrating some of the electrical components for wireless connections to a pair of glasses.

[00046] FIG. 12 shows a process for a personalized radio according to one embodiment of the present invention.

[00047] FIG. 13 shows a number of attributes of control knobs according to different embodiments of the present invention.

[00048] FIG. 14 shows some of the electrical components for capturing images with a pair of glasses according to an embodiment of the present invention.

[00049] FIG. 15 shows an operation of taking actions based on images captured with a pair of glasses with wireless transceiver capability according to one embodiment of the invention.

[00050] FIG. 16 shows an operation to provide messages to a user based on images captured by a pair of glasses according to an embodiment of the present invention.

[00051] FIG. 17A is a chart that depicts examples of sensors in a pair of glasses according to different embodiments of the present invention.

[00052] FIG. 17B is a diagram of a temple arrangement according to one embodiment of the invention.

[00053] FIG. 17C is a diagram of a cover that at least partially covers a temple according to one embodiment of the invention.

[00054] FIG. 17D is a diagram of a fit-over temple that at least partially fits over a temple according to one embodiment of the invention.

[00055] FIG. 18 shows an embodiment including an eye mask according to the invention.

[00056] FIG. 19 shows an embodiment including a night cap according to the invention.

[00057] FIG. 20A is a diagram illustrating a temple having a slot for receiving a removable electronic device according to one embodiment of the invention

[00058] FIG. 20B is a diagram illustrating the temple having a recessed lower portion according to another embodiment of the invention.

[00059] FIGs. 21A and 21B are diagrams illustrating a pair of glasses having a camera coupled thereto, according to one embodiment.

[00060] FIG. 22 is a diagram of a pair of glasses having a camera according to one embodiment of the invention.

[00061] FIG. 23A is a diagram of a pair of glasses having a camera according to one embodiment of the invention.

[00062] FIG. 23B is a diagram of the pair of glasses according to another embodiment.

[00063] FIG. 24 is a side view of a pair of eyeglasses according to another embodiment of the invention.

[00064] FIG. 25 is a communication system according to one embodiment of the invention.

[00065] FIG. 26 is a flow diagram of a personal call response process according to one embodiment of the invention.

[00066] FIG. 27 is a flow diagram of an audio message response process according to one embodiment of the invention.

[00067] FIG. 28 is a flow diagram of a text message response process according to one embodiment of the invention.

[00068] FIG. 29 is a flow diagram of an automated call response process according to one embodiment of the invention.

[00069] FIG. 30 is a flow diagram of a message presentation process according to one embodiment of the invention.

[00070] FIG. 31 is a flow diagram of a reply message process according to one embodiment of the invention.

[00071] Fig. 32 illustrates a number of forces activating a switch according to a number of embodiments of the invention.

[00072] Fig. 33 illustrates a number of mechanical forces activating a switch according to a number of embodiments of the invention.

[00073] FIG. 34 shows a Hall-effect detector at a joint of a pair of glasses according to an embodiment of the invention.

[00074] FIGs. 35A-35C illustrate different embodiments of a quadrature sensor according to the invention.

[00075] FIG. 36 shows one embodiment of the invention with a pair of glasses having speakers.

[00076] FIG. 37 shows a tube extending from a speaker at a temple of the glasses to guide sound to one of the ears of the user according to one embodiment of the invention.

[00077] FIG. 38 shows a retractable tube extending from a speaker at one of the temples of the glasses according to one embodiment of the invention.

[00078] FIG. 39 shows a funnel at the output of a speaker in the glasses according to one embodiment of the invention.

[00079] FIGs. 40A-40B show an embodiment of the invention with a wire connecting speakers in the glasses.

[00080] FIG. 41 shows one embodiment of the invention with a pair of glasses having speakers that are wirelessly coupled to a portable device.

[00081] FIGs. 42A-42B show different embodiments of the present invention illustrating some of the electrical components for wireless connections to a pair of glasses.

[00082] FIG. 43 shows a male stereo connector at the end of a temple according to one embodiment of the invention.

[00083] FIG. 44 illustrates a connector applicable to clamp onto a temple of a pair of glasses according to an embodiment of the invention.

[00084] FIG. 45 shows one embodiment of the invention with a pair of glasses having a microphone coupled to the wire connected to a portable device.

[00085] FIG. 46 shows different embodiments regarding frequency-dependent amplification of the present invention.

[00086] FIG. 47 shows a number of embodiments regarding hearing calibration of the present invention.

[00087] FIG. 48 shows a number of embodiments regarding power management of the present invention.

[00088] FIG. 49 shows different embodiments of sources of other audio signals generated by the glasses according to the present invention.

[00089] FIG. 50 is a flow diagram of call processing according to one embodiment of the invention.

[00090] FIG. 51 shows some of the electrical components for an MP3 player according to an embodiment of the invention.

[00091] FIG. 52 shows one embodiment of the invention that has a card with electrical components coupled to a pair of glasses through a connector at a temple of the glasses.

[00092] FIG. 53 shows a process for a personalized radio according to one embodiment of the present invention.

[00093] FIG. 54 shows a number of attributes of control knobs according to different embodiments of the present invention.

[00094] FIGs. 55A-55C illustrate different embodiments of power sources for a pair of glasses according to the invention.

[00095] FIGs. 56A-56B show different embodiments of headset-to-phone cords according to the present invention.

[00096] FIG. 57 shows an embodiment of the invention of a cord with a switch for both a cell phone and a player.

[00097] FIG. 58 shows one embodiment of a mono-plugs-to-stereo-plug adapter cord according to the invention.

[00098] FIG. 59 shows an embodiment of the invention with a speaker at a temple tip with an extension for attachment to a tube.

[00099] FIG. 60 shows an embodiment of the invention with the temples not extending behind the ears.

[000100] FIG. 61 shows an embodiment of the invention with a pair of eyeglasses functioning as a headset that has a camera, a microphone and a speaker.

[000101] Same numerals in Figures 1-61 are assigned to similar elements in all the figures. Embodiments of the invention are discussed below with reference to Figures 1-61. However, those skilled in the art will readily appreciate that the detailed description given herein with respect to these figures is for explanatory purposes as the invention extends beyond these limited embodiments.

DETAILED DESCRIPTION OF THE INVENTION

[000102] A number of embodiments according to the present invention regarding glasses with one or more electrical components attached, partially embedded or fully embedded are described. Many of them are applicable to different types of glasses, such as sunglasses, auxiliary frames, fit-over glasses, prescription glasses, safety glasses, swim masks, and goggles, such as ski goggles. In a number of embodiments, the frames of the glasses have more surface area than frames with minimal structure. For example, the temple regions of the glasses can have a tapered profile. They are wider or broader when they are closer to the lens holders. Then they get narrower. In one embodiment, a wider or broader temple implies that the temple spans across a wider or broader area longitudinally down from the top of the head of the user. FIG. 1 shows an example of such an embodiment.

[000103] FIG. 1 shows one embodiment 100 of the invention where there is a speaker 102 at least partially embedded in one of the temples 104 of the glasses 106. The speaker 102 is closer to one end of the temple 104 than the other end. The end of the temple that the speaker 102 is closer to is the end that is in the vicinity of the lens holder or the hinge of the glasses 106, instead of the end 108 that is free. The speaker can be partially embedded in the glasses. For example, the mouth of the speaker, where sometimes there can be small holes on a cover, can be exposed.

[000104] In the embodiment shown in FIG. 1, the speaker 102 outputs audio signals in the direction towards the user. In another embodiment, the speaker 102 outputs audio signals in the direction away from the user. For example, the mouth of the speaker 102 can be facing outwards away from the user.

[000105] There are different approaches to embed an electrical component into a pair of glasses. For example, the glasses can be made of plastic (e.g., plastic frames). One way to produce such frames is to first assemble electrical components onto a circuit board. The circuit board can be shaped to fit, for example, the temple of the glasses. The circuit board is placed into a mold. Then, hot, molten plastic is injected around the circuit

board to form the temple piece of the glasses. To reduce weight, the wall of the glasses can be made relatively thin through injection molding techniques.

[000106] In another embodiment, the glasses have metallic frames. For example, the frames can be made of Titanium, which is a relatively light metal. Also, Titanium is relatively non-conductive and strong, and is quite immune to corrosion. Further, Titanium can be anodized or heat colored.

[000107] For glasses with metallic frames, to prevent circuits from being shorted or to reduce leakage current, one embodiment provides an insulating layer between the electrical components or circuit board and the metallic frames. One example of an insulting layer is a tape to encapsulate the electrical components. The tape is non-conducting so as to provide insulation and, to a certain degree, can also provide mechanical stiffness. One way to make such temples is to have two sheets of the metal die-stamped to form the two halves, or the two faces of the temple piece. A circuit board is made to fit into the space between the faces. Then, two die-cut pieces of insulator material (e.g., dielectric tape) can cover the top and the bottom surfaces of the circuit board. The board is then sandwiched between the faces to form the temple. In one example, the dielectric tape can be double-sided sticky tape, with one side sticking to the circuit board, and the other side sticking to the temple. An adhesive can be used to glue the two faces of the temple piece together.

[000108] In yet another embodiment, the frames are made of hard rubber. The frames can be manufactured in an approach similar to injection molding techniques, with circuit boards inserted into the mold along with the rubber at the time of molding.

[000109] Different types of speakers can be used, such as, standard, fixed-magnet/moving coil speakers; speakers with fixed-coil and a steel diaphragm; piezo-electric speakers; and electrostatic speakers.

[000110] In one embodiment, the glasses further include a tube, such as a plastic tube, extending from a speaker. The tube serves to guide sound generated by the speaker to one of the ears of the user. FIG. 2 shows an embodiment where a tube 150 is located

on the outside of a temple 152. In another embodiment, the tube can be on the inside of a temple.

[000111] In one embodiment, the tube 150 can be rotated, such as from behind the temple 152 (if the tube is on the inside of the temple) to being downward at an angle towards one of the ears of the user, such as the position shown in FIG. 2. To increase flexibility, the tube can be attached to a rotating disk 154, which allows rotation about the speaker.

[000112] In another embodiment, the tube is malleable. This allows the tube to be placed in different positions.

[000113] In one embodiment, the length of the tube is adjustable. FIG. 3 shows such an embodiment 200 of a pair of glasses with a retractable tube 202. In the figure, the tube is shown to be in its extended position.

[000114] To further enhance sound coupling, in one approach, there is a plug 156 at the end of the tube for inserting into an ear of the user. The plug can be an ear bud. The plug can provide a cushion, foam rubber or other materials. Such materials give comfort and/or enhance sound coupling to the ear canal.

[000115] In another approach, there is a funnel at the output of the speaker. FIG. 4 shows the cross section of such a funnel from a speaker at a temple region of the glasses. As shown in FIG. 4, the speaker 254 sits on a speaker frame 252, and the speaker 254 is electrically connected to a circuit board 256. As sound is generated from the speaker 254, the sound propagates to a tube 258 through a structure 260 in the shape of a funnel. Such a structure helps guide the sound to the tube (i.e., improved sound coupling). Also, FIG. 4 shows the tube, which can be the tube 150 shown in FIG. 2, mounted onto the temple region of the glasses with a circular lip 262. Such a lip 262 allows the tube 258 to rotate relative to the glasses. In the embodiment shown in FIG. 4, the speaker 254 is fully embedded in the glasses.

[000116] As an alternative to or in conjunction with the tube, the glasses can include a channel to likewise guide sound generated by the speaker to one of the ears of the

user. For example, the channel can be formed within a temple. The temple also has an opening to output the sound towards the user's ear.

[000117] FIG. 1 shows one speaker at one of the temples. There can be more than one speaker at each temple. In one embodiment, there can also be at least one speaker at each temple. The two speakers can generate stereo effects.

[000118] In another embodiment, the glasses can provide four or more speakers to give a high fidelity sound or a surround sound effect. For example, each temple can include one speaker in front of the user's ear, and one speaker behind the user's ear. The different speakers can generate different portions or sections of the sound. Further, if a base (discussed below) or portable electronic device is coupled to the glasses, the base or portable electronic device can contain another speaker, such as a base or woofer speaker. Such embodiments enable the glasses to provide a personal high-fidelity sound or a surround-sound environment.

[000119] Electrical signals can be coupled to an electrical component, such as a speaker, in a pair of glasses through a number of mechanisms. In one embodiment, there is an electrical connector at least partially embedded in the glasses. In other words, at least a portion of the connector is inside the glasses. The connector is electrically coupled to the speaker (or other electrical component) by, for example, a conductor. The conductor can be on a printed-circuit board. In one embodiment, the conductor is also embedded in the glasses.

[000120] Regarding connectors, FIG. 5 shows one embodiment where the connector is not a standard connector. The end 108 of the temple 104 of the glasses 106 shown in FIG. 1 has a similar connector. In FIG. 5, the connector is a male plug or a male connector 300 at the end of a temple 302 of a pair of glasses. The connector 300 is connected to the speaker through, for example, one or more wires embedded in the temple. Electrical signals external to the glasses can then be coupled to the speaker (or other electrical component) through the plug.

[000121] As shown in FIG. 5, the free end of the temple 302 can have a relatively flat cross section. There can be one or more electrically-conductive contacts, such as 304

and 306, on one or both of the flat surfaces of the temple. In FIG. 5, four contacts are shown on one surface of the temple. The contacts, 304 and 306, can be metal pads or bumps.

[000122] In one embodiment, a non-standard connector can be made using printed-circuit board technologies. First, a printed-circuit board with printed conductors connected to metal contact bumps is produced. Then plastic is overmolded around the printed-circuit board, with the mold designed to shut off around the bumps or pads. The overmolded plastic can serve as the temple, and the pads would be left exposed. Thus, portions of the printed circuit board are covered by plastic, and areas with the bumps or pads are exposed for connection. These pads serve as the connectors for the glasses.

[000123] Regarding printed-circuit boards, there can be one or more circuit boards in the glasses. For example, there can be a circuit board in one of the temples of the glasses. Or, the circuits can be divided into two circuit boards, one in each temple of the glasses. The circuit boards can carry additional electrical components to be described below.

[000124] In one embodiment, the circuit boards are rigid. In another embodiment, the circuit boards are made of flexible materials, such as a polyimide sheet, like Kapton®. In one embodiment, the circuit board is configured or adapts to the shape of the temple in which it resides.

[000125] As shown in FIG. 5, the end of the temple 302 serves as a male connector (plug) 300. The non-standard male connector 300 can be received by a non-standard female connector (plug) 310. Typically, the female connector 310 makes electrical and physical connection through grabbing around the male plug. The female connector 310 can be connected to a cable 312.

[000126] FIGS. 6A-6B illustrate a process to make the non-standard female plug 310. First, an electrical wire 354 is attached to a small sheet or piece of metal 356. FIG. 6A shows a number of such wires, with a number of the metal sheets or pieces crimped to a hard PVC 358. The figure shows the back side of the crimped board with the wires and with a number of holes, such as 360. Then the frame is overmolded with a soft PVC. FIG. 6B shows a cross section of the overmolded frame 362 with the soft PVC. As shown in

the figure, a number of the metal sheets, such as 364 and 366, are exposed. They are the metal contacts in the female connector 310. Instead of the above approach, alternatively, a wire can be attached to a sheet of metal by putting the wire between the metal and the plastic as the metal is crimped onto a plastic. When the temple (i.e., male connector 300) is inserted into the female plug, the soft PVC material stretches slightly, providing a spring-force to keep the contacts connected.

[000127] The hard PVC can have a hardness of over 80 durometer, while the soft PVC can have a hardness of less than 50 durometer. The hard PVC can be replaced by other materials, such as Polypropylene or cloth. The soft PVC can be replaced by Silicone, or a thermo-plastic elastomer, such as Kraton®.

[000128] Referring to both FIG. 5 and FIG. 6B, when the male connector 300 is inserted into the slot 314 of the female connector 310, the metal pads, 304 and 306, will get in contact, or mate, with the metal sheets, 364 and 366.

[000129] In one embodiment, as long as the male connector 300 is pushed all the way into the female connector 310, the pads are aligned correctly to the sheets for electrical connections. In another embodiment, there is an alignment mechanism to guide the position of the temple relative to the female connector so as to ensure the conductive sheets to be in contact with the conductive pads. For example, there can be a registration location to indicate that the male connector is at the appropriate position relative to the female connector. There can be an alignment extension, which can be a partial sphere, close to the end of the temple 302, such as between the pads 304 and 306, at 316. And, there can be a corresponding alignment notch at the female connector 310. When the extension is received or caught by the notch, the male connector 300 is in the appropriate position relative to the female connector 310. In other words, the alignment is proper, and the pads and the sheets are in contact.

[000130] FIG. 5 shows the non-standard male connector 300 at one end of a temple of a pair of glasses. In yet another embodiment, a non-standard connector can be at another location. FIG. 7 shows another example of a non-standard connector 400. The connector 400 includes one or more conductive pads, 412 and 414, on the top side of a

temple 402. The connector 400 is designed to receive another connector 406 that grabs onto the side of the temple 402. There can be an indentation 404 on the temple 402 to receive the other connector 406. The other connector 406 can include a top 420 and a bottom 416 clip. There are a number of conductive pads or sheets inside the other connector 406. The indentation 404 provides an alignment to indicate where the top clip 420 of the other connector 406 should grab onto the temple 402 for connection. At that position, the conductive pads at the temple will be in contact with the conductive pads or sheets at the other connector 406. There can also be another indentation 418 at the temple 402 to receive the bottom clip 416. This can further enhance the alignment process and to secure the connection.

[000131] In FIG. 7, the other connector 406 is coupled to one end of a cord and a plug 408, which can be inserted into a portable device 410, can be connected to another end of the cord. The portable device, for example, can be a cell phone. This type of non-standard clip-type connector could be easily applied to the temple with one hand, for example, while the user is driving a car.

[000132] A number of non-standard connectors have been described. In another embodiment, the contacts are based on standard connectors, which can be off-the-shelf connectors. FIGS. 8A-8E show a number of examples of such connectors.

[000133] In one embodiment, the standard connector is a standard cylindrical plug located at the end of a temple. From a different perspective, the temple molds around the end of the plug. FIG. 8A shows one such embodiment. The plug 450 can be a standard audio connector or a 3-wire or three terminal plug, such as a 3.5 mm male stereo mini-phone plug. The 3 wires for such a plug are typically one for ground, the other two applicable for two signals, such as for creating stereo effects. FIG. 8A also shows the three wires, 452, 454 and 456, inside the temple, extended from the plug 450. These wires are for connection to electrical components of the glasses.

[000134] In one embodiment, the cylindrical plug 450 shown in FIG. 8A can be protected, encapsulated or shrouded. Or, at least a portion of the plug is protected, encapsulated or shrouded. Such protection can, for example, be for aesthetic reasons, or

to prevent the plug from scratching the face of the user when the user is putting on the pair of glasses. In FIG. 8A, the plug 450 is partially embedded in a temple.

[000135] Instead of a three terminal plug, other types of standard cylindrical plugs applicable to different embodiments of the present invention include a serial connector with 3 pins, typically one for ground, one for transmitting data (Tx) and the third for receiving data (Rx); or (b) a 2-wire connector, one served as ground, the other for carrying, such as power and modulated signals.

[000136] In yet another embodiment, instead of a cylindrical plug, the standard connector at the end of a temple of a pair of glasses is a USB or a FIREWIRE connector.

[000137] A number of embodiments have been described where the standard connector(s) at the glasses are male connectors. In yet another embodiment, the standard connector(s) in the glasses are female connectors. For example, there can be a 3.5 mm female stereo mini-phone plug at the end of a temple of a pair of glasses. At least a portion of the female connector can be protected, encapsulated or shrouded. For example, the female connector can be recessed within the end of a temple.

[000138] FIGS. 8B-8E show different examples of standard connectors located or partially embedded not at the end of a temple of a pair of glasses, but, for example, on the side of the temple, such as on the inside surface or the outside surface of a temple. FIG. 8B shows a 0.10" header plug 460, commonly known as a MOLEX connector, on such a surface. FIG. 8C shows a female mini-phone plug 465 on such a surface. FIG. 8D shows a card connector 470 to receive a card 472, such as a removable media card (e.g., memory card). There can be a cover 474 to secure and/or protect the media card 472 in place after it is inserted into the card connector 470. FIG. 8E shows a female USB connector 480 on the inside surface of a temple 482 to receive a male USB connector 484.

[000139] FIGs. 8F-8H are diagrams pertaining to providing a removable electronic device with an eyeglass frame according to one embodiment of the invention. FIG. 8F illustrates a temple 490 that includes a connector 492. The connector 492 includes an opening 494. A removable electronic device can be coupled to the temple 490 using the

connector 492. More particularly, FIG. 8G illustrates a removable electronic device 496 that includes an electronic device housing 498 and a connector 499. As an example, the removable electronic device 496 can be a memory storage device, sometimes referred to as a memory card. FIG. 8H illustrates the removable electronic device 496 coupled to the temple 490. The removable electronic device 496 is coupled to one side of the temple 490, such side can be either an inside or outside surface of the eyeglass frame. When the removable electronic device 496 is coupled to the temple 490, the connector 499 of the removable electronic device 496 is inserted into the opening 494 of the connector 492. Physical forces between the connector 499 and the connector 492 operate to secure the removable electronic device 496 to the temple 490, yet permit the removable electronic device 496 to be removable therefrom.

[000140] In one embodiment, the connector 492 is not electrically connected to any electronic circuitry within the temple 490 or other parts of the eyeglass frame. In other words, the connector 492 provides a convenient means by which removable electronic devices can be coupled to the eyeglass frame. In another embodiment, the connector 492 can be coupled to electrical circuitry within the temple 490 or elsewhere within the eyeglass frame. Such an embodiment allows the electronic components within the removable electronic device 496 to be utilized with the electrical circuitry within the temple 490 or elsewhere within the eyeglass frame. For example, the removable electronic device 496 can provide data storage and/or other software modules to be utilized by or to utilize the other electrical circuitry within the temple 490 or elsewhere within the eyeglass frame. In any case, by attaching the removable electronic device 496 to the temple 490 (and thus the eyeglass frame), the removable electronic device 496 is able to be conveniently carried by the user of the eyeglass frame. In one implementation, the eyeglass frame, which includes the connector 492, becomes a docking station for the removable electronic device 496. As such, a variety of different removable electronic devices can be interconnected with the eyeglass frame, as desired. For example, the eyeglass frame can thus support different function or operations depending on the removable electronic device that is attached. For example, the eyeglass frame might

operate as a camera, data storage device, FM radio, MP3 player, mobile telephone, pedometer, hearing enhancer, sun sensor, time piece, etc.

[000141] In one embodiment, the removable electronic device 496 can align itself with the orientation of the temple 490, such as shown in FIG. 8H. In FIG. 8G, the electronic device housing 498 can be said to have an elongated housing. The configuration (e.g., shape) and/or color of the removable electronic device 496 can also be designed to conform or complement the design of the temple 490. In one embodiment, the temple 490 might also have a recessed region to allow the portable electronic device to be less visually perceptible when attached to the temple 490 or to provide a more consistent contour of the temple 490.

[000142] In one embodiment, the connector 499 is a male connector, and the connector 492 is a female connector or a similarly sized structure. In one implementation the connector 499 is a peripheral bus connector, such as a Universal Serial Bus (USB) connector. In such cases, the connector 492 can also be a peripheral bus connector (either electrically functional or non-functional as noted above).

[000143] Although the embodiment illustrated in FIGs. 8F-8H utilize connectors, namely, electrical connectors, the removable electronic device 496 could be attached to the temple in other ways. For example, other means to provide physical forces to hold the removable electronic device 496 in place can be used.

[000144] FIG. 8I is a diagram of a temple of an eyeglass frame according to another embodiment of the invention. In this embodiment, the temple 490' includes an opening 491 through which a cable 493 extends outward. The cable 493 has an electrical connector 495 connected at its end. The electrical connector 495 is electrically connected to electrical circuits within the temple 490' or elsewhere within the eyeglass frame such as by way of one or more wires contained within the cable 493. In one implementation, the length of the cable 493 is about one to four inches. The temple 490' shown in FIG. 8I also includes a receptacle 497. The receptacle 497 is affixed to or integral with the temple 490 to receive the electrical connector 495. Typically, the receptacle 497 provides a holding mechanism for the electrical connector 495 when not been utilized. When the

electrical connector 495 is being utilized, the electrical connector 495 is removed from the receptacle 497 and coupled to a corresponding counterpart connector of another electrical device. The cord 493 can provide ease-of-use so that the electrical connector 495 can be maneuvered to couple to the counterpart connector. In one embodiment, the temple 490' can provide a recess for receiving the entire cable 493, with the outer surface of the receptacle 497 being substantially flush to the surface of the temple 490. So when the connector 495 is not in use, the connector 495 can be in the receptacle 497, with the cable 493 in the recess. In one embodiment, when the cable 493 is in the recess and the connector 495 inside the receptacle 497, the cable 493 has substantially no slack. Also, in another embodiment, the cable 493 can be retractable into the opening 491. In the embodiment shown in FIG. 8I, the electrical connector 495 is a male connector, and the receptacle 497 is a female connector or a similarly sized structure.

[000145] A number of standard and non-standard connectors have been described. Other types of connectors can also be used. In one embodiment, there is a connector adapter, which serves to transform such other type of connectors to a different interface. For example, an adapter can be a cord with one type of connector at one end and a different type of connector at the other end.

[000146] In one or more of the above embodiments, the glasses can access audio signals from another device through a connector at the glasses. The another device can be a multimedia asset players or a radio.

[000147] In one embodiment of the invention, the glasses have a storage medium (i.e., memory). The memory can be on a printed-circuit board and, for example, store 256 MBs or more. The memory can be a built-in or removable flash memory. The memory can be coupled to a device external to the glasses through one or more connectors at the glasses. As an example, a 256 MB flash memory is in one of the temples of a pair of glasses, and there is a USB connector at the free end of that temple to couple to an external device.

[000148] With the embedded storage medium, the glasses can upload information in the memory to or download information into the memory from an external device, such as

a computer. A user can plug the glasses into the computer through a connector, either directly, or indirectly, with, for example, an intermediate wire in between. The user can store files in the glasses. Such an embodiment should reduce the chances of the user losing the files because the user has to lose the glasses as well.

[000149] In yet another embodiment of the invention, a pair of glasses includes a multimedia asset player, such as a MP3 player. FIG. 9 shows some of the electrical components for a MP3 player 500 according to an embodiment of the invention. The player 500 includes a speaker 502 and a data bus 512, which facilitates data transfer among, for example, a processor 506, a storage device 510, and a coder/decoder (CODEC) 504. The processor 506, which can be a microprocessor or controller, controls the operation of the player 500. The storage device 510 stores the multimedia assets, such as MP3 files, or other types of media data that are appropriately formatted. In one example, the MP3 files are digitally encoded songs or other types of audio signals. The storage device 510 can include a number of separate storage elements. For example, the device 510 can be a flash memory device, or a minidisk device, and a cache, which can improve the access time and reduce power consumption of the storage device. The storage device 510 typically also includes a Read-Only Memory (ROM), which stores programs, utilities or processes to be executed in a non-volatile manner. The player 500 can also include a RAM, such as for the cache.

[000150] Once a media asset, such as a song, is selected to be played, the processor 506 would supply the asset to the CODEC 504, which decompresses the asset and produces analog output signals for the speaker 502. In one embodiment, the bus 512 is also coupled to an input/output device 508, which would allow a user to upload songs in the glasses to an external instrument, such as a computer, or download songs from the instrument to the glasses.

[000151] There are different approaches to select a song. In one embodiment, the songs or the media assets can be categorized in the MP3 player, and the categorization can be hierarchical, with multiple levels in the hierarchy. To illustrate, assume that there are three levels. The top level can be the name of the singer; the second level can be the time period when the asset was produced, and the third level can be the names of the

songs. The entries, such as the name of the singer, can be abbreviated. There can be a small display and a control knob to allow a user to scroll down entries in a level. By pushing the knob, the user selects an entry, which can lead the user to a lower level. There can be an entry for moving up a level also. In another embodiment, the display is a touch-screen display, allowing entries to be entered directly on the display. In yet another embodiment, entries can be selected based on voice recognition.

[000152] A number of embodiments have been described with the glasses having a connector. In one embodiment, the glasses can have more than one connector. For example, a pair of glasses with two connectors also has a speaker. One connector is, for example, at a broad side of a temple, as in FIG. 8D. The connector can be for coupling to multimedia assets of a MP3 player. Another connector is, for example, at the end of a temple, as in FIG. 8A. That connector can couple power to the glasses. The speaker can play the multimedia assets accessed from one connector, based on power from another connector.

[000153] As described, power (e.g., external power source) can be coupled to the glasses through a connector. In one embodiment, the power source is embedded inside or inserted into the glasses. Different types of power sources are applicable. For example, the power source can be a battery, a fuel cell, a solar cell, or a re-chargeable battery. The rechargeable battery can be charged through a connector at the glasses.

[000154] In an earlier application, namely, U.S. Provisional Patent Application No. 60/509,631, filed October 9, 2003, and entitled "TETHERED ELECTRICAL COMPONENTS FOR EYEGLASSES," which has been incorporated herein by reference, there can be a base connected to the glasses through a cord. The cord can be just a piece of flexible conductor encapsulated by a flexible insulator. Typically, a cord includes a number of electrical wires or conductors. There can be one or more electrical components in the base, and there can also be one or more electrical components in the cord. The different types of connectors previously described can be located in the base. In one embodiment, a power source is an electrical component in the base tethered to a pair of glasses. In another embodiment, the glasses are tethered to a base that has a connector. The connector is connected to and draws power from an external electronic

device. In this embodiment, electrical components in the glasses draw power from the external electronic devices.

[000155] FIG. 10 shows an embodiment where a user 550 is wearing a pair of glasses 552, which include electrical components. There are also tethered electrical components in a base 554, which is connected to the glasses 552 through a cord 556. In addition, there is a wire 558 connected to a connector at the base 554 to a portable electronic device 560. The portable device 560 can be (a) a multimedia device, such as a MP3 player/recorder or a minidisk players, (b) a wireless communication device, such as a cell phone, or (c) a personal digital assistant, or other types of portable devices with computing and/or entertaining and/or communication capabilities.

[000156] Note that instead of connecting to the portable electronic device 560 through the base 554, in another embodiment, the glasses 552 directly connect to the portable device 560 through a cord.

[000157] In one embodiment, there is an attachment device 562, such as a pin or clip. The attachment device attaches at least a part of the glasses to the user's clothing. The attachment device 562 can serve to attach the cord 556 and/or the wire 558 and/or the base 554 to the user's clothing. The attachment can also be through other mechanisms, such as Velcro.

[000158] In a number of embodiments, the speaker described is assumed to emit audio signals. In one embodiment, the speaker emits ultrasonic signals. The glasses can be used, for example, as an insect repellant by transmitting ultrasound to repel insects, such as mosquitoes. In this embodiment, the one or more speakers broadcast the ultrasonic signals away from the user. In other words, the speakers face outwards, not inwards towards the user. In this embodiment, the glasses, which can include a base, also has a power source to provide power to the speaker. There can also be a control knob to turn the one or more speakers on/off on the glasses. There will be additional discussions on the control knob below.

[000159] In another embodiment, the glasses generating ultrasonic signals can be used to produce audio signals that are more directional. For example, two ultrasonic

signals are generated by a speaker in the glasses, with their difference frequencies being the audio signals. The audio signals generated based on mixing the two ultrasonic signals can be much more directional than audio signals directly generated from the speaker.

[000160] Referring back to FIG. 1, in one embodiment, the glasses include a microphone 110. The microphone 110 can be at the end of a temple 104 close to a lens holder 112. Or, the microphone 110 can be in the lens holder 112, located directly adjacent to the temple 104. In yet another embodiment, there can be a small protrusion extending down from the temple to house the microphone.

[000161] With glasses having a microphone, one can use the glasses to record voices into, for example, a storage medium. The storage medium can be in the glasses, or can be in a base or a portable device attached to the glasses.

[000162] Different types of microphones can be used. For example, they can be electret microphones, crystal microphones, resistance microphones, piezoelectric microphones or moving-coil microphones.

[000163] In one embodiment, the glasses with a microphone also include a speaker that can generate directional sound. A user can speak into the microphone and his message can be transmitted from the glasses in a more directional manner.

[000164] In another embodiment, the glasses also include a notification electrical component to provide a notification to the user wearing the glasses. The notification can be to notify, alert or display information to the user. There can be a display located at the inside 114 of the lens holder, or at the vicinity of the junction 116 or the hinge of a lens holder and its corresponding temple facing the user. Or, there can be a display at the inside surface of a temple, or at other locations on the glasses. The display can be one or more light emitting diodes. To alert the user, one or more diodes can blink. The blinking can be of a specific sequence. Instead of diodes, the display can be a liquid crystal display. The display can provide indications or information to the user. For example, a number or a variable-height bar can be shown. Other than visual indications, the notification or alert can be audio, like a beeper.

[000165] In one embodiment, the notification electrical component is for selecting a multimedia asset in a multimedia asset player in a pair of glasses for the multimedia to play. The multimedia asset player can be a MP3 player.

[000166] A number of embodiments of the present invention have been described where electrical signals are transmitted to or from a pair of glasses through a physical connection. In one embodiment, electrical signals are wirelessly coupled to a pair of glasses. The coupling can be short range or long range. The coupling can be directly to the glasses, or to a base connected to a pair of glasses. The glasses with wireless coupling capabilities can be used to couple to a Bluetooth network, the Internet, a WiFi network, a WiMax network, a cell-phone network or other types of networks. The coupling can also be through a point-to-point link, such as an infrared link. In different embodiments, the glasses provide wireless communication capability for its user. In this regard, the glasses contain wireless communications circuitry that enables the eyeglasses to communicate in a wireless manner, to, for example, a wireless communication device (e.g. mobile telephone), a portable computing device (e.g. Personal Digital Assistant (PDA), handheld computer or wearable computer), or an entertainment device (e.g., stereo system, television, media player (portable or stationary)).

[000167] FIGS. 11A-11B show examples of some of the electrical components in or tethered to a pair of glasses for wireless connections, according to embodiments of the present invention. In FIG. 11A, a high frequency or RF antenna 602 wirelessly captures high frequency or RF signals for RF transceiver circuits 604. If the transceiver circuits are for a conventional superheterodyne system, the transceiver circuits 604 mix the RF signals down to IF signals. Then the IF signals are processed by baseband circuits. Digital outputs from the baseband circuits are coupled to a processor 608 for analysis and synthesis.

[000168] Outputs from the processor 608 are fed to a D-to-A converter 610 to generate audio signals for a speaker 612. Similarly, audio analog signals from a microphone 614 can be fed to an A-to-D converter 616 to generate digital low frequency signals for the processor 608 and then to the RF transceiver circuits 604. The low

frequency signals are up-converted by the RF transceiver circuits 604 and wirelessly transmitted by the antenna 602.

[000169] In another embodiment, digital conversion is moved closer to the antenna. For example, instead of mixing RF into IF signals, the RF transceiver circuits 604 directly perform digital conversion from the RF signals.

[000170] Typically, high frequency filters are used at the front end of the RF transceiver circuits 604 for the RF signals. In one embodiment, to save space, FBAR (film bulk acoustic resonator) duplexer is employed. A set of piezoelectric filters can be used to separate incoming and outgoing signals. For cell phone operation, such filters can enable a user to hear and speak simultaneously. A number of these electronic devices can be on a circuit board in the glasses. Or, some of the devices are in the glasses, while other in the base tethered to the glasses.

[000171] FIG. 11B shows another example of some of the electrical components in or tethered to a pair of glasses for wireless connections according to the present invention. In this embodiment, there does not need to have digital data. A speaker 620 and a microphone 622 are connected to an analog interface circuit 624, which is coupled to a RF transceiver circuit 626 and an antenna 628. For the speaker application, the transceiver circuit 626 mixes the RF signals down into IF signals, which are converted by the analog interface circuit 624 into analog signals for the speaker 620. Similarly, for the microphone application, its analog signals are converted into the IF signals by the analog interface circuit 624 to be up converted by the transceiver circuit 626 into RF signals for the antenna 628. These types of circuitry are suitable for, such as, simple radios, analog cell phones, CB radios, walkee-talkees, police radios or intercom systems.

[000172] In one embodiment, most of the electrical components are not in the glasses. The pair of glasses includes an antenna to capture the wireless signals, and a connector. The wireless signals captured are transmitted through the connector to electrical circuits external to the glasses.

[000173] A number of processors have been described. The processors can use different types of operating systems. In one embodiment, Symbian Operating Systems

are used. In another embodiment, operating systems, such as TinyOS, are used. The operating system could be programmed in C++ and then compiled into machine codes.

[000174] For privacy protection, signals can be encrypted before transmission. Encryption can take significant computation power, and may generate a fair amount of heat. In one embodiment, encryption capabilities are located in a base tethered to the glasses. There can be a fan inside the base. The fan can be turned on during encryption. In another embodiment, the fan is activated during other high capacity uses for heat dissipation purposes.

[000175] In yet another embodiment, there is a fan in the glasses. The fan is located at a temple of the glasses, in the region close to its lens holder. The fan is used to cool the wearer of the glasses.

[000176] In one embodiment, a pair of glasses has access to voice recognition software. The software can be embedded in (a) the glasses, (b) a base tethered to the glasses, (c) a portable device wired or wirelessly coupled to the glasses or to the base, or (d) a computing system wired or wirelessly coupled to the glasses. Or, the software or firmware can be in more than one of the above devices.

[000177] Glasses that can couple to signals wirelessly can be used in different applications. For example, the glasses can be a cell phone wireless head set, such as a Bluetooth cordless headset. Such short-distance wireless technologies allow the headset to connect to the user's cell phone without a wire. This would allow the user to drive, eat or perform other functions without getting tangled in a pesky wire.

[000178] In one embodiment, the cell phone is a VOIP (voice over Internet protocol) phone.

[000179] In one embodiment, for the glasses operating as a cell phone head set, the head set includes active noise cancellation mechanism. For example, the glasses include two microphones. One microphone is for capturing the voice of the user. But the microphone captures ambient noise also. It can be embedded in a protrusion extending from the end of the temple close to a lens holder, towards the mouth of the user, as the microphone 110 in FIG. 1. Another microphone can be located at the top of one of the

lens holders pointing away from the mouth of the user. This microphone is for capturing ambient noise. As a first order approximation, outputs from the two microphones could be subtracted from each other to provide voice signals with noise reduced.

[000180] In yet another embodiment, the glasses with wireless coupling capabilities also have a multimedia asset player, such as a MP3 player. The glasses can be used to receive music directly in digital format over, for example, a data-capable network of a mobile operator. The music can be received, for example, at a speed of 16 Kbits per second, providing sound quality close to compact disc. If the music is transmitted in a compressed manner, such as in a MP3 format, then the music data can be received at a much lower speed. In one embodiment, the glasses also have a microphone and can serve as a cellular phone or a wireless headset of a cellular phone.

[000181] In yet another embodiment, the glasses can serve as a radio, again through electrical components in or tethered to the glasses. In this embodiment, the glasses can include a tuner with one or more control knobs. The knobs can be used to select channels and to set the volume.

[000182] In one embodiment, a pair of glasses allows personalization by including a preference indicator. The indicator allows a user to provide his preference, such as on whatever is being output by the glasses. In one example, the glasses also has a radio having a speaker and with electrical components for wireless connection. In this example, the indicator can be used by the user to provide his preference regarding whatever is being played by the radio at that time. This preference can be wirelessly transmitted from the glasses to a third party. To illustrate, when the user is listening to a piece of music, the user can indicate he likes the piece of music by pressing a control knob on the glasses. This piece of preference information is then transmitted and received by a service provider, which is then informed of the user's preference. Instead of a control knob, in another embodiment, the preference indicator is a system with a microphone and voice recognition software. The user can indicate his preference vocally.

[000183] In another example regarding the personalization process, the glasses can serve as a multimedia asset player, such as a MP3 player. The song that the user has shown preference can be stored in a storage device, which can be in the glasses.

[000184] FIG. 12 shows a process 650 according to one embodiment of the present invention for a personalized radio.

[000185] Initially, a pair of glasses according to the present invention receives 652 a piece of music from a radio station. That piece of music is stored 654 in a buffer or a temporary storage area. This temporary storage area can be in the glasses or tethered to the glasses. The piece of music is also sent 656 to a speaker in the glasses.

[000186] Assume that the user likes the music. Based on the preference indicator, the user shows his preference. After the glasses receive 658 an indication of the user's preference, the glasses determine 660 the song corresponding to the indication. That piece of music can then be moved 662 from the buffer to a permanent storage area, such as into a flash memory. This would then allow the user to subsequently access the piece of music.

[000187] There are different ways to determine 660 the song or the content being played by the radio corresponding to the indication. For example, one rule is that when the user pushes the preference button or voices his preference, the song (or media asset or media file) that is being played is the one the user likes. Since the operating system knows what song is being played at what time, based on the rule, the song of preference is determined. Another rule is that when the user shows his preference, and there is no song being played at that instance, the song immediately preceding the break is the song of preference.

[000188] In another embodiment, the glasses can get 664 an identification for the song of preference. For example, the glasses can ask the user to provide an identification for the piece of music. This identification can be the type of music, the singer, the name of the music or other identification. In another embodiment, there can be meta data embedded, such as in the beginning part of the music (or media asset). Having such meta data embedded is not uncommon for music in digital format. The meta data can include

identifications for the music. The glasses can get 664 such identification. Based on the identification, the song is categorized 666 accordingly, such as grouped with other songs having the same identification. Such categorization process would enhance the ease of accessing the song by the user at a later time.

[000189] A number of control knobs have been described. FIG. 13 shows a number of attributes 700 regarding control knobs according to the present invention. The knobs can be of different physical structure 702. For example, a control knob can be a roller, a switch or a push-button. A control knob serving as an up/down controller can use two buttons, or a roller.

[000190] A control knob can be more intelligent 704. For example, a push-button control knob can serve different purposes depending on the duration the knob is being pushed. If a user pushes it for more than three seconds, the knob serves as an on-off toggle switch. In another example, a knob can serve multiple purposes, and the specific purpose depends on the number of times the knob is pushed.

[000191] A knob can also be programmed. A user can connect the glasses to a computer and program the knob accordingly. For example, one can program a knob such that if the knob is pushed more than three seconds, the knob would serve as an on/off switch for the glasses. As another example, a knob can provide reset to delete certain information previously captured by a process and to allow re-starting the process.

[000192] The location 706 of a control knob can vary for different applications. A control knob can be located on the glasses. A control knob can be on the top, the side or the bottom of the temple. A control knob can be located at the inside of a temple facing the user. Assume that there are a number of control knobs and all of them are on the edges of a temple, except one. By being at a position different from other control knobs, this knob can serve a specific purpose. For example, it can be an on/off control knob. In yet another embodiment, a control knob can be located in a base tethered to the glasses.

[000193] The number 708 of control knobs can vary depending on operations. For example, there is an on/off control knob and a volume up/down control knob. If the glasses are used for cell phone headset application, in one embodiment, there is also an

answer/hang-up control knob. If the glasses serve as a radio, in one embodiment, there is also a tuning control knob, which can be two push buttons. If the glasses serve as a CD player, in one embodiment, there is a play control knob, a stop control knob, and a skip forward/backward control knob. If the glasses serve as a multimedia asset player, such as a MP3 player, in one embodiment, there is a save-this-song control knob, a skip-forward/backward-song control knob and a select-song-to-play control knob.

[000194] A number of embodiments of the present invention have been described regarding audio signals. In one embodiment, the glasses further serve as a camera.

[000195] FIG. 14 shows one embodiment of electrical components in a pair of glasses with image capturing capabilities. A processor 752 is coupled to a CCD interface chip 754 and then to a CCD chip 756. Images focused by a lens 758 are captured and collected by the CCD chip. In another embodiment, there is also be a flash controller 760 connected to the processor 752 to control a flash 762.

[000196] In one embodiment, a number of pixels of the CCD chip 756 are used as light sensors. The pixels can be used to adjust the sensitivity of the CCD chip 756 based on the amount of ambient light. For example, if the outside environment is dim, it would take a longer period of time to collect enough charges by the CCD chip 756 to re-create the image. This implies that the integration time of the CCD chip 756 should increase.

[000197] In yet another embodiment, the camera can pertain to a video camera. The capacity of the memory 753 increases so as to store the video images.

[000198] In one embodiment, the glasses do not offer adjustment on the image distance. The CCD chip 756 can be located, for example, at the focal point of the lens 758. In another embodiment, there is an image distance control knob. For example, a mechanical lever can be pre-programmed or pre-set to move the lens to one or more different positions. One position can be for close-up shots, such as objects from 2 to 4 ft, and another for scenic or vista images, such as objects greater than 6 ft.

[000199] Depending on the embodiment, electrical components of a camera can be in a pair of glasses, and/or a base tethered to the glasses, and/or a portable device

tethered to the glasses or to the base. For example, the memory 753 can be in the base tethered to the glasses.

[000200] The location of the lens 758 can vary depending on the embodiment. In one embodiment, referring to FIG. 1, one location is at the bridge of the glasses, with the lens of the camera facing forward. In this situation, what the user sees is substantially what the captured image would be. In other words, in a general sense, what the user sees is what the user gets. With such an embodiment, it is relatively easy for a user to take pictures, hands-free. In another embodiment, another location for the lens 758 are at a side portion adjacent to a lens holder, before the joint of the corresponding temple, such as at 116 in FIG. 1. Again, the lens of the camera faces forward. Some of the electrical components of the camera can be in that location, and other components in the temple 104. These components are electrically connected through one of the joints, such as with a flexible pc board. In yet another embodiment, the lens 758 can face sideways and outwards in a temple of a pair of glasses, towards the left or right side of the user.

[000201] Regarding storing the images, in one embodiment, the images are stored locally. One approach to determine which image to store is the first-in-first-out approach. Once the camera is turned on, the camera takes pictures continually in an automatic mode, such as once every few seconds. When the memory becomes full or under other pre-set or pre-programmed condition, the first picture stored will be deleted when the next picture comes in. In another embodiment, the digital content in one picture is compared to the digital content in, for example, the fifth picture further down. If the difference between the two is not more than a pre-set threshold, the four pictures in between will be deleted. One approach to determine the difference is by comparing the total charges collected by the CCD chip for the two images. If the two sets of charges do not differ by more than a certain threshold, the images in between would be deleted.

[000202] The images captured can also be stored at a remote site. For example, the glasses can upload the images to a computer, wirelessly or through a wired connection from a connector at the glasses.

[000203] FIG. 15 shows an operation 800 of taking certain actions based on images captured by a pair of glasses with a wireless transceiver, according to one embodiment of the invention. This operation can be used by a police officer on patrol. Before the officer gets out of his patrol vehicle to confront a suspect, the officer can inform the station. At that point, the camera is turned on 802.

[000204] There can be different approaches to turn on the camera. In one embodiment, an operator at the station can remind the officer to turn on the camera. Or, the operator can remotely turn on the camera. In yet another embodiment, the camera can be automatically turned on under certain condition. One such condition is that if the camera is out of the patrol vehicle, the camera is automatically turned on. With the glasses having the capability to wirelessly communicate with the patrol vehicle, one method to detect if the glasses are out of the patrol vehicle is based on the wireless signal strength of the glasses. The patrol vehicle can detect the signal strength of the wireless signals, which depends on the distance between glasses and the vehicle. A threshold can be set. If the signal strength is below the preset threshold, the glasses would be assumed to be out of the car, and the camera would be automatically turned on.

[000205] After the camera is turned on 802, the glasses start to continually take 804 pictures, such as once every few seconds. The pictures taken are automatically transmitted back 806 to the patrol vehicle in a wireless manner. In this situation, the patrol vehicle serves as a hub, which stores the pictures. Then, the hub re-transmits 808 the pictures back to the station. Note that the pictures can be compressed by standard algorithms before they are transmitted. This compression mechanism can be performed by a computer in the patrol vehicle. When the station gets the pictures, they are de-compressed before being viewed, such as by the operator. The pictures enable the operator at the station to see what the officer is confronting. This effectively allows the operator at the station to perform real-time monitoring of or for the officer. If it is a high risk situation, the operator can quickly react 810, such as by dispatching additional support for the officer. In one embodiment, the glasses can include not only a camera but also a microphone for audio pickup, such as sounds from the officer, suspect, witness or environmental sounds (such as door opening, gun shot, etc.).

[000206] Regarding ownership of the glasses, the user can own the glasses. In one embodiment, the user leases the glasses from a provider. For example, the user leases a ski goggle with a camera. After the user turns on the camera, as the user skis, the goggle automatically takes pictures. Later, the user can return the goggle to the provider or a kiosk, where the pictures can be retrieved and/or stored. Alternatively, the goggle can include a wireless transceiver and the images could be uploaded continually or automatically to the provider or the kiosk via a wireless network. The provider or the kiosk can transmit the images to a website, such as a website associated with the user. In another embodiment, the user picks up hardcopies of the images, e.g., a CD with the images or a DVD with the video, from the provider or the kiosk.

[000207] In one embodiment, the glasses allow the user to enter his identification. This can be done, for example, through a control knob at the glasses. Such identification is then linked to the images. Based on the identification, the user can return to the provider or kiosk at a subsequent time to pick up the images previously left behind.

[000208] In yet another embodiment, the pair of glasses with a camera also has a speaker and a wireless transceiver. It can be used to remotely control or direct the user wearing the glasses. FIG. 16 shows one such operation 850 according to one embodiment.

[000209] To illustrate the operation 850, assume that the user is a paramedic helping a patient. The glasses continually take pictures 852 of objects directly in front of the paramedic, such as images around four feet away from the eyes of the paramedic. The pictures are wirelessly transmitted 854 to a remote site, such as a hospital, to be viewed by a doctor. Again, this transmission can be a two-step process. For example, pictures can be transmitted to the paramedic's ambulance, which can then re-transmit to the remote site. The first transmission from the glasses to the ambulance can be through a low-power, short-range, broadband, wireless transmission protocol. The second transmission from the ambulance to the hospital can be through a much longer-range, higher power, broadband, wireless transmission protocol. Again, compression and de-compression techniques can be used to enhance the rate of transmission by reducing the amount of data to be transmitted.

[000210] Based on the images, the doctor sends out voice messages to the paramedic. These messages are wirelessly transmitted to and received 856 by the glasses. The speaker in the glasses outputs 858 the messages to the paramedic.

[000211] In another embodiment, the glasses also have a microphone, which allows the paramedic to communicate directly with the doctor also.

[000212] In one embodiment, the glasses can take pictures and can be a multimedia asset player. Pictures and the multimedia assets can share the same memory storage device. In this situation, the capacity for the multimedia assets and pictures can be interrelated. For example, a user can take more pictures if there are less multimedia assets, such as fewer songs in the storage device.

[000213] A number of embodiments have been described regarding electrical components in the temples of glasses. The locations selected are for illustration purposes. In other embodiments, some of the components are embedded fully or partially in other areas of the glasses, such as the lens holders or the bridges of the glasses. For example, there are glasses where there are shields at the edges of the lens holders of the glasses. These shields can wrap around, or better conform to the profile of, the face of the wearer. There can be transparent or translucent windows on these shields also. The shields are not limited to be in primary frames. They can be in, for example, fit-over glasses, auxiliary frames or safety glasses. To illustrate, in fit-over glasses, such shields can go over or cover at least a portion of the primary frames. One or more electrical components can be in such shields. In still another embodiment, one or more electrical components can be in a strap tied to the corresponding eyewear, such as a sports strap tied to the corresponding sports eyewear. For example, the one or more electrical components can be at least partially embedded in or attached to a strap. As one particular example, an audio player or wireless communication module can be at least partially embedded in or attached to the strap. The strap may also provide electrical conductors (that are attached or internal to the strap). Such electrical conductors can be coupled to a speaker to produce audio output to the speaker, or can be coupled to a microphone to receive audio input from the microphone. The speaker and/or microphone can also be attached to or integral with the strap.

[000214] Note that in one embodiment, a pair of glasses does not have to include lenses. Also, a number of embodiments have been described with a pair of glasses tethered to a base. In one embodiment, a pair of glasses includes a base and a cord connecting the base to the glasses.

[000215] In yet another embodiment, a pair of glasses also includes a sensor. FIG. 17A is a chart 900 that depicts examples of sensors in the glasses.

[000216] In one embodiment, the sensor is a "being worn" sensor. The "being worn" sensor indicates whether the glasses are being worn by its user. The "being worn" operation can be performed using, for example, a thermal sensor, a motion detector, a stress sensor or a switch.

[000217] In one embodiment, a motion detector is used as a "being worn" sensor. A threshold can be set, such that if the amount of motion exceeds the threshold, the eyewear is assumed to be worn. The motion detector can, for example, be achieved by a mechanical means or an accelerometer.

[000218] In another embodiment, the "being worn" sensor includes two thermal sensors. One sensor can be at approximately the middle of a temple, such as in a region that touches the head of the user wearing the glasses. The other sensor can be at the end of the temple, close to its hinge. If the temperature differential between the two sensors is beyond a certain preset value, the eyewear would be assumed to be worn. The differential is presumed to be caused by a person wearing the pair of glasses.

[000219] In yet another embodiment, the "being worn" sensor includes a stress sensor at the hinge of the temple. The assumption is that when the eyewear is worn, the hinge is typically slightly stretched because typically, the width of the head of the user is slightly wider than the width between the temples when the two temples are in the extended positions. If the value of the stress sensor is beyond a certain preset value, the glasses would be assumed to be worn.

[000220] In a further embodiment, the "being worn" sensor can be a switch. For example, at the hinge between a temple and its corresponding lens holder, there is a switch. When that temple is fully extended outwards, the switch is turned on. The switch

can be a pin. When the temple is fully extended outwards, the pin is pressed. When both temples are fully extended outwards, in one embodiment, the glasses would be assumed to be worn by the user.

[000221] In one embodiment, another type of sensor is an environmental sensor. The environmental sensor can sense environmental conditions, such as one or more of ultraviolet radiation, temperature (e.g., ambient temperature), pressure, light, humidity and toxins (e.g., chemicals, radiation, etc.).

[000222] In another embodiment, another type of sensor is a condition sensor. The condition sensor can sense the conditions of the user of the glasses. Examples of condition sensors include sensing one or more of distance traveled, location, speed, calories consumed, temperature and vital signs associated with the user of the glasses. The distance traveled could represent the horizontal distance traveled or the vertical distance (i.e. elevation) traveled. The speed can be the rate of movement along the horizontal distance traveled and/or the vertical distance. In yet another embodiment, the condition sensor can sense the emotional conditions of the user of the glasses. In one embodiment, a condition sensor can sense whether at least one of the user's eyes is open or not. The condition sensor can sense if the user is crying. The condition sensor can sense the direction the user is looking.

[000223] The sensors can be provided in a redundant or fault-tolerant manner. For example, sensors can come in pairs in the glasses. When one malfunctions, the other one will take over its operation. In another embodiment, the sensor information can be processed in a differential manner to examine changes to the sensor information. The sensors can by powered by a battery, solar energy, or kinetic energy. For reduced power consumption, the sensors can remain in a low-power state unless data is being acquired by the sensors. In yet another embodiment, two or more of the auxiliary sensors can communicate with one another (wired or wirelessly) to exchange data or control information.

[000224] A number of embodiments have been described regarding one or more electrical components at least partially embedded in a pair of glasses. In one

embodiment, one or more electrical components are at least partially embedded in a temple tip of a pair of glasses. Temple tips are particularly common for wire or metal frames. The pair of glasses has a first and a second lens holders for receiving lenses. Each of the lens holders has a first side and a second side. The pair of glasses has a bridge element that couples the first side of the first lens holder to the second side of the second lens holder. The pair of glasses also includes a first temple and a second temple. The first temple is pivotally secured to the second side of the first lens holder through a joint, while the second temple is pivotally secured to the first side of the second lens holder through another joint. A temple typically has two ends, a first end and a second end. The first end can be the end that is pivotally secured to a lens holder through a joint, and the second end can be the other end of the temple. It is not uncommon that a temple includes a main body and an enclosure that grabs onto the main body of the temple. The second end is typically where the enclosure grabs onto the main body. The enclosure can be made of a different material than the main body of the temple. In one embodiment, such an enclosure is a temple tip, and there is an electrical component, partially or fully, embedded in the tip. There can also be a connector, such as the connector 300 shown in FIG. 5, at the temple tip. In another embodiment, the temple tip can include a female connector, which can be similar to the female connector 310 shown in FIG. 6B. As the temple tip grabs onto the main body of the temple, the female connector can make electrical contact with a male connector at the main body of the temple. Typically, particularly before a pair of glasses has been extensively worn, the temple tip can be removed and re-inserted back on to the main body of the temple without a lot of difficulties. Such a temple tip can be an after-market component, with different temple tips having different electrical components to serve different functions.

[000225] FIG. 17B is a diagram of a temple arrangement 910 according to one embodiment of the invention. In this arrangement, a temple tip is not considered as a part of the temple. The temple arrangement 910 includes a temple 912 that is associated with a pair of eyeglasses. Over the end of the temple 912 that is opposite the associated lens holder, a temple tip 914 is provided. The temple tip 914 can be held to the temple 912 by frictional forces and/or adhesive. The temple tip 914 includes at least one electrical

component 916 that is at least partially embedded therein. The temple tip 914 can be manufactured and delivered to resellers or retailers as such. Alternatively, the temple tip 914 can be separately provided as an optional replacement temple tip for an existing temple tip. Hence, as after manufacture, upgrade to the eyewear can be had through replacing the existing temple tip with the replacement temple tip. The colors and shapes of the temple tip 914 can vary widely. In the after manufacturing environment, the reseller or retailer can be provided with a range of different colors and shapes so that a user can receive a replacement tip that reasonably matches the color and shape of the temple or that provides an altered appearance as desired by the user.

[000226] Besides a replacement temple tip such as illustrated in FIG. 17B, a temple tip can also be effectively modified by a fit-over temple or temple cover. FIG. 17C is a diagram of a temple cover 920 that at least partially covers a temple (e.g., temple 912) according to one embodiment of the invention. As another example, the temple cover 920 can be a fabric or other material, such as a sock or sleeve, that slides over and at least partially covers a temple tip. The temple cover 920 can include at one electrical component 922 that is either attached thereto or at least partially embedded therein. The temple cover 920 can also include an opening 924 so as to received a temple or a temple tip. The temple cover 920 can be held to a temple by frictional forces and/or adhesive. FIG. 17D is a diagram of a fit-over temple 926 that at least partially fits over a temple according to one embodiment of the invention. For example, the fit-over temple 926 can at least partial fit-over a temple tip. The fit-over temple 926 includes at one electrical component 928 that is either attached thereto or at least partially embedded therein. The fit-over temple 926 can also include an opening 930 so as to receive a temple. The fit-over temple 926 can be held to a temple by frictional forces and/or adhesive. As an example, the fit-over temple 926 can be plastic or other material. The colors and shapes of the fit-over temple 926 can vary widely. In the after manufacturing environment, the reseller or retailer can be provided with a range of different colors and shapes so that a user can receive a replacement temple cover or fit-over temple that reasonably matches the color and shape of the temple or that provides an altered appearance as desired by the user.

[000227] In one embodiment, a fit-over temple or temple cover according to the invention can further include a connector or cable to facilitate electrical connection with the at least one electrical component that is either attached to a temple or a temple tip or at least partially embedded therein.

[000228] In one embodiment, an electrical component is a component of an electrical circuit, and the electrical circuit is for performing at least a desired, intended or predetermined function.

[000229] A number of embodiments have been described above for an eyeglass frame, i.e., primary frame, are also applicable to an auxiliary frame. An auxiliary frame can attach to a primary frame through different techniques, such as using clips. Another technique to attach an auxiliary frame to a primary frame is by way of magnets. Examples of using magnets as an attachment technique can be found, for example, in U.S. Patent 6,012,811, entitled, "EYEGLASS FRAMES WITH MAGNETS AT BRIDGES FOR ATTACHMENT."

[000230] A number of embodiments have been described where one or more electrical components are at least partially embedded in a pair of glasses. In yet another embodiment, the one or more electrical components are at least partially embedded in an eye mask.

[000231] FIG. 18 shows one embodiment 925 where one or more electrical components are at least partially embedded in an eye mask 927. The eye mask 927 includes a piece of fabric that is opaque so that when the mask is worn, the mask wraps around the eyes to block light from entering into the eyes of the user.

[000232] The embodiment 925 includes a wrapping mechanism to hold the fabric onto the head of a user so that when the mask is worn by the user, the mechanism allows the fabric to have a relatively tight and comfortable fit over the face of the user. In one approach the wrapping mechanism is achieved with the fabric in the shape of a band and having a certain degree of elasticity. When the mask is worn by the user, the elasticity of the fabric allows the mask to establish a relatively tight fit over the face of the user. In another example, the fabric is a long piece of material. The wrapping mechanism includes

a clip or Velcro at the two ends of the piece of material to tie the two ends together. In another example, the wrapping mechanism includes two elastic pieces of elastic materials at the two ends of the fabric. To wear the mask, each elastic piece of material goes over one of the ears of the user so that the fabric establishes a relatively tight fit over the face of the user. In yet another embodiment, the mask 927 includes a notch 935 to accommodate the nose of the user. In another embodiment, there can be additional padding in the vicinity of the one or more electrical components so that if an electrical component is pressed against the user, the padding serves as a buffer or cushion.

[000233] In one embodiment, a speaker 929 can be at least partially embedded in the mask 927, and can be positioned close to and facing one of the ears of the user. The speaker 929, through an electrical connector, is electrically connected to a cable 931. The cable 931 can also have a connector 933 at its distal end. The connector 933 can be plugged into another device, such as a MP3 player or a CD player. After putting on the mask, with the connector 933 plugged into the another device, the user would be able to hear, for example, audio sounds such as music. The eyemask 925 can be applied to different areas. For example, the user can be on a plane, and would like to rest. The user can put on the eyemask 925, and plug the connector 933 into a media outlet at an armrest of her seat in the plane. Thus, the user can enjoy music while taking a rest. The embodiment 925 could also include a plurality of speakers, such as one for each of the user's ears.

[000234] In another embodiment, the eyemask 927 includes the speaker 929 and a battery that is electrically connected to the speaker 929. The battery can be in a pocket on the eyemask and can be replaceable. The battery can also be a rechargeable battery, such as a lithium-ion battery, and there is a connector at least partially embedded in the eyemask. The connector can be used to recharge the battery.

[000235] FIG. 19 shows another embodiment 950 where one or more electrical components are at least partially embedded in a night cap 952. In one embodiment, the cap 952 is at least partially made of fabric. In another embodiment, the cap 952 is entirely made of fabric. The cap includes a wrapping mechanism. When the cap is worn, the wrapping mechanism holds the cap onto the head of the user, and allows the cap to have

a relatively tight and comfortable fit over the head of the user. Again the wrapping mechanism can be an elastic band at the base 963 of the cap 952. Or, the wrapping mechanism can include clips or Velcro as previously described.

[000236] The cap can include at least one speaker 954, which is at least partially embedded in the cap 952. When the cap 952 is worn by a user, the speaker 954 is positioned close to and facing one of the ears of the user. The speaker 954 can, for example, be electrically connected through a connector to a device 962 in a pocket 960 on the cap 952. The electrical connection can be through a cable 956 external to the cap 952. The cable 956 also can have a connector 958 to be plugged into the device 962. In another embodiment, the cable 956 is embedded in the cap. The device 962 can be an asset player, such as a MP3 player, with a battery. Through the connector 958, audio signals from the device 962 can be received by the speaker 954 and heard by the user. There can be one or more additional pockets on the night cap for one or more additional electrical components. When worn, the night cap does not have to cover the eyes of the user. In yet another embodiment, when worn, the night cap further covers the eyes of the user, as shown in FIG. 19. In one embodiment, the embodiment 950 further includes padding in the vicinity of an electrical component to serve as a buffer or cushion between the user and the electrical component.

[000237] A number of embodiments have been described involving a speaker in an eyemask or a night cap. In one embodiment, the audio output from the speaker can serve to cancel the environmental sounds in the vicinity of the user. For example, if the user is on an airplane, the surrounding environmental sound has a relatively high level of white noise. This white noise can be detected by a pickup device and cancelled by noise cancellation circuitry provided within the eyemask or night cap. Namely, the audio output from the speaker serves to cancel the white noise of the user's environment. In another embodiment, the electrical component embedded or partially embedded is not a speaker, but can be a sensor, which can sense a physiological function of the user.

[000238] FIG. 20A is a diagram illustrating a temple 1000 having a slot for receiving a removable electronic device 1002 according to one embodiment of the invention. In one example, the removable electronic device 1002 can be a memory storage device,

sometimes referred to as a memory card. As shown in FIG. 20A, the removable electronic device 1002 is inserted into the slot. Although the slot could be electrically non-functional, typically the slot provides an avenue for the removable electronic device 1002 to be physically and electrically connected to electrical circuitry within the temple 1000 or elsewhere within the eyeglass frame. FIG. 20B is a diagram illustrating the temple 1000 having a recessed lower portion 1004 according to another embodiment of the invention. The recessed lower portion 1004 facilitates the insertion and removal of the removable electronic device 1002. In either embodiment, the removable electronic device can be manually inserted and removed or can use more complicated mechanical mechanisms to assist with the insertion and removal (e.g., spring-based push and release structure).

[000239] FIGs. 21A and 21B are diagrams illustrating a pair of glasses 2100 having a camera 2101 coupled thereto, according to one embodiment. The camera includes an image sensor 2102 and a camera housing 2106 (also referred to as a camera support arm). In this embodiment, the camera 2101 is rotatably coupled to an exterior surface of a temple 2104 of the pair of glasses 2100. The camera support arm 2106 is attached to the temple 2104. The camera support arm 2106 can couple to the temple 2104 using a hinge 2108. In one implementation, the hinge 2108 can use a spring or cam mechanism so that the camera support arm 2106 is held either against the temple 2104 when not in use or held in an open or extended position when in use. FIG. 21A illustrates one position of the camera support arm 2106 when the camera 2101 is not in use. FIG. 21B illustrates one position of the camera support arm 2106 when the camera 2101 is in use. The presence of the camera 2101 with the pair of eyeglasses 2100 enables a wearer of the pair of eyeglasses 2100 to take pictures of what the wearer is looking at. It should be noted that other supporting circuitry such as data storage for pictures, switches, battery, and electronics for the camera 2101 can be in the temple 2104, in the camera support arm 2106, elsewhere in the pair of glasses 2100, or even tethered thereto. However, in one implementation, the camera 2101 is completely self-contained in the camera housing 2106. In one embodiment, the hinge 2108 can also serve as a switch to turn the image sensor 2102 on or off.

[000240] In one implementation, to improve overall appearance of the pair of glasses 2100, the temple 2100 can provide a recess for receiving the camera support arm 2106 when the camera is not being utilized. Such may improve the aesthetic appearance of the pair of glasses 2100.

[000241] In another implementation, the pair of glasses 2100 can further provide a viewfinder. The viewfinder can assist the user in directing the image sensor 2102 towards whenever the user desired to photograph. The viewfinder can be a separate apparatus that is extended by user action or can be a viewfinder that is visually present or presented on one of the lenses. In one example, the viewfinder can be an extendable viewer through which the user can look through to determine the field of reference of the image sensor 2102. The viewfinder can be extendible from either of the temples, such as in a telescoping, sliding or flipping action. Additionally, when the camera support arm 2106 is extended, a viewfinder can be automatically initiated. For example, indicators on one of the lens can be visually presented, such as through optical projection from one or more light sources. In another embodiment, the viewfinder can be always present, such as with indicators on one of the lens of the pair of glasses 2100. The indicators can be a few faint dots to define an area (e.g., a square) on the lens.

[000242] In one embodiment, the camera support arm (camera housing) 2106 is removably coupled to the hinge 2108. As such, the camera 2101 can be removed from or attached to the pair of glasses 2100. Indeed, the camera support arm (camera housing) 2106 can be a camera body that houses electronics for the camera 2101. In such case, the camera 2101 can operate as a camera apart from the pair of glasses 2100.

[000243] In one implementation, the camera support arm 2106 has a connector and the hinge 2108 has a counterpart connector. In one example, the connectors are peripheral bus connectors, such as USB connectors. In such case, the camera support arm 2106 can be attached and removed from the pair of glasses 2100. Such a connection via the connectors can be electrically functional or non-functional. If functional, electrical components in the pair of glasses 2100 can be electrically connected to electrical components in the camera 2101.

[000244] Still further, in one embodiment, the connector at the end of the hinge 2108 enables connection of a variety of different peripheral devices to the pair of glasses 2100. For example, the different peripheral devices (portable electronic devices) can be the camera, a memory card, or a media player. In one embodiment, electrical components integral with the pair of glasses 2100 can be shared by the different peripheral components. The hinge 2108 is not necessary in other embodiments, see FIGs. 8F-8H, where a connector is attached or integral with a temple of a pair of glasses. If desired, the camera 2101 or other peripheral devices can include in its structure a hinge or other mechanism to permit positioning the camera or other peripheral devices.

[000245] In still another embodiment, an angled or hinged adapter can be inserted between a connector attached to the pair of glasses 2100 and a connector of the camera 2101 or other peripheral devices. The adapter can be electrically functional or non-functional.

[000246] In yet in another embodiment, a pair of glasses functioning as a headset with a speaker and a microphone further includes a camera. FIG. 22 is a diagram of a pair of glasses 2200 having a camera according to one embodiment of the invention. The glasses 2200 include a temple 2205 that has a microphone 2204, a speaker 2206 and a camera 2208 with a connector 2210. The connector 2210 is for connecting, for example, to another electronic device that provides at least one of data or information transfer capabilities or a power source for the glasses.

[000247] In one embodiment, the camera 2208 is a digital camera with an on/off switch 2212. For example, the camera 2208 is a CCD camera including a CCD controller coupled to a CCD chip to capture images, a CCD memory device and a lens.

[000248] In one embodiment, with the connector 2210 connected to another electronic device (e.g., a portable electronic device), when the switch 2212 is pushed on, the CCD chip takes a picture. The charges in the CCD chip are digitized and transmitted through the connector 2210 to the other electronic device, under the management of the controller. At least some of the charges can be temporarily stored in the CCD memory device, for example, to accommodate the differences in speed in taking pictures and

sending the pictures to the portable device through the connector. In this embodiment, images can be stored at the other electronic device. In another embodiment, the glasses can include sufficient data storage capabilities to store the pictures, at least until transferred to another electronic device.

[000249] In one embodiment, the glasses do not offer focusing capability. The CCD chip can be located, for example, at the focal point of the lens. In another embodiment, there is an image distance control knob. For example, a mechanical lever can be pre-programmed or pre-set to move the lens to one or more different positions. In one implementation, there can be just two positions. One position can be for close-up shots and another for distance shots, such as close-up being about 2 ft from the lens and the distant being about 6 ft away; or close-up being about 8 inches away and distant being about 2 ft away.

[000250] FIG. 22 shows one embodiment regarding the location of the camera 2208 at the end of the temple or arm 2205 of the glasses 2200 next to the hinge. The lens of the camera faces forward. In this situation, what the user sees is substantially what the captured image would be. In other words, in a general sense, what the user sees through the glasses is what the user gets, without the need for an additional view finder. With such an embodiment, it is relatively easy for a user to take pictures, hands-free, without the need for an additional strap for holding the camera.

[000251] The connector 2210 at the end of the glasses 2200 can be, for example, a 4-terminal connector, one for ground, one for power and the other two for transmit and receive signals. In another embodiment, the connector 2210 can be a 3-terminal connector, with the power line and one of the signal lines sharing one terminal.

[000252] Regarding the embodiment shown in FIG. 22, the speaker 2206 can be in the glasses, with a tube 2216 and an ear bud 2218, to help bring audio signals to the user. In one embodiment, the tube 2216 can be rotated at its end where it connects to the glasses. In another embodiment, the speaker 2206 can be provided at the ear bud 2218.

[000253] In one embodiment, the CCD chip with the CCD memory device and the CCD controller are on the same integrated circuit.

[000254] The embodiment shown in FIG. 22 also includes a microphone 2204. In one embodiment, the CCD memory device also stores audio signals from the microphone 2204. For example, the memory device stores a duration of time, such as the last 15 seconds, of audio signals. When the user takes a picture, a duration of time before taking the picture, such as the previous 15 seconds, audio signals can be coupled to the picture. Another duration of time after taking the picture, such as the next 10 seconds, of audio signals can also be coupled to the picture. In one embodiment, the audio picked up can include environmental sounds present at that time. The audio signals or the digitized version of the audio signals can also be transmitted to the other electronic device with the corresponding picture. In the future, if the user wants to view the picture, the audio signals can be played with the picture at the same time. As another example, the user can provide an auditory annotation to the pictures being taken. Here, the user can leave a specific audio message to be associated with the picture. For example, the user might take a picture of his childhood home and record an audio annotation, “This is where I grew up”.

[000255] In one embodiment, a pair of glasses functions as a headset with a speaker, a microphone and a camera. The pair of glasses can be coupled to another electronic device through a connector of the glasses. Additional electrical components, such as those in the other electronic device, like a portable device, for the glasses can be incorporated in the glasses. For example, the power source can also be in the glasses and the glasses do not have to include a connector. In one embodiment, the glasses include non-volatile memory to store at least a number of pictures. In another embodiment, the glasses further include a connector to receive a memory card, such as a flash memory device. The card can be a standard memory card with a USB connector. Pictures taken can be stored in the removable memory card.

[000256] In yet another embodiment for the glasses with a camera, the glasses do not include a speaker or a microphone. The glasses include a temple that has a CCD controller coupled to a CCD chip, a CCD memory device and a lens. The temple also

includes an on/off switch with a connector. The connector is for connecting, for example, to a portable device that includes at least a power source for the camera.

[000257] In still another embodiment, an auditory feedback by a speaker is provided or coupled to a pair of glasses. For example, a clicking or "snapshot" sound can be output when a picture is taken (such as when a user initiates the picture taking).

[000258] Additional disclosure on camera in glasses can be found in U.S. Provisional Application No. 60/583,169, filed on June 22, 2004, which is hereby incorporated by reference.

[000259] A number of electrical components have been described. They can be on circuit boards, which can be made of flexible materials. They can be on a substrate. They can also be integrated into one or more integrated circuits.

[000260] FIG. 23A is a diagram of a pair of glasses (i.e., eyeglass frame) 2300 having a camera according to one embodiment of the invention. The eyeglass frame 2300 illustrated in FIG. 23A includes a lens holder 2302 holding a lens 2304 and a lens holder 2306 holding a lens 2308. The eyeglass frame 2300 also includes temples 2309 and 2310. In the embodiment shown in FIG. 23A, the temple 2310 includes a camera 2312, supporting electronics 2314 and a switch (e.g., button) 2316. In one embodiment, the camera 2312 includes a CCD chip. The camera 2312 can also include a lens and buffer memory. In one embodiment, the electronics 2314 illustrated in FIG. 23A can be embedded within the temple 2310. The electronics 2314 can include at least a microcontroller (e.g., an image processor), a memory, and a battery. These electronics 2314 can support the camera 2312. The eyeglass frame 2300 can further include various other electrical components. For example, the eyeglass frame 2300 can further include one or more of: a microphone, an earphone, a removable memory, a display, a clock, and a Global Positioning System (GPS). These electrical components can be used in conjunction with the camera 2312 or separately from the camera 2312. The button 2316 enables a wearer of the eyeglass frame 2300 to turn the camera 2312 on/off and/or to cause a picture to be taken (recorded). For example, by pushing the button 2316 for more

than a few seconds, the camera will be turned off. However, by pushing and releasing the button 2316, the camera takes a picture.

[000261] Still further, in the embodiment of the eyeglass frame 2300 shown in FIG. 23A, the eyeglass frame 2300 further includes a view finder 2318 and an angled surface 2320. Other embodiments of eyeglass frames need not include such features. Nevertheless, the view finder 2318 can assist a wearer (i.e., user) of the eyeglass frame 2300 in understanding the frame of the image (picture) being captured by the camera 2312. In this example, the view finder 2318 is provided on the lens 2304 in a visible, yet non-distracting manner. As shown in FIG. 23A, the view finder 2318 can be positioned such the wearer can direct the image (picture) to be captured. For example, the wearer would orient their head (using the view finder 2318) to direct the camera 2312 towards the desired subject. Also, the angled surface 2320 allows mounting the camera 2312 in an angled manner. As a result, the direction of the camera 2312 is not straight forward but out towards the side. This facilitates the wearer in directing the camera 2312 using a single eye via the lens 2304, and more particularly via the view finder 2318 if provided. The outward angle from straight forward being utilized by the camera 2312 can vary with implementation. For example, the outward angle can be in the range of 10-70 degrees or more particularly in the range of 15-60 degrees, or more particularly in the range of 20-40 degrees from the perpendicular direction of the plane of a front surface of the eyeglass frame 2300. In one embodiment, with the camera positioned at an angle, the lens holder 2302 would not block the field of view of the camera even with the camera being positioned at a distance behind the lens holder 2302.

[000262] Although the camera 2312 is provided on the left side of the pair of glasses 2300 as shown in FIG. 23A, it should be understood that the camera could alternatively or additionally be provided on the right side of the glasses.

[000263] FIG. 23B is a diagram of a pair of glasses (i.e., eyeglass frame) 2300' according to another embodiment. In this embodiment, the eyeglass frame 2300' is similar to the eyeglass frame 2300 illustrated in FIG. 23A. However, the eyeglass frame 2300' further includes a connector 2322 and a memory card 2324. More particularly, the temple 2310 includes a region 2326 larger than the temple region shown in FIG. 23A. The larger

or enlarged region can provide additional space for the connector 2322 and the memory card 2324. The memory card 2324 can be operatively connected electrically to the electronics 2314 within the temple 2310 via the connector 2322. The connector 2322 also can serve to provide a physical connection of the memory card 2324 to the eyeglass frame 2300. In one embodiment, such physical connection is removable so that the memory card 2324 can be connected to or removed from the temple 2310. Accordingly, the memory card 2324 can facilitate porting of data or information (e.g., pictures) from the eyeglass frame 2300' to another electronic device (e.g., computer). As an example, the connector 2322 can be a USB connector or other peripheral type connector.

[000264] The eyeglass frame having a camera according to one embodiment of the invention can further include one or more sensors. For example, the one or more sensors can include one or more of a "being worn" sensor, a motion sensor, and a light sensor. These sensors can be used to influence operation of the camera provided with the eyeglass frame. For example, a "being worn" sensor can be used to determine whether the eyeglass frame is being worn by a user. If the eyeglass frame is not being worn, then the camera can be deactivated to prevent unnecessary battery consumption and/or to prevent pictures from being taken. As an example, if the camera is operated to automatically, periodically take a picture, then if the eyeglasses are not being worn, the automatic picture taking process could be stopped. In one embodiment, a motion sensor can be used in a variety of ways. A motion indication can indicate a rate of activity of the user. For example, the rate of activity could be used to avoid taking pictures during periods of high activity, such as rapid movements of the eyeglass frame (or the corresponding user), or to influence image processing, such as exposure rate. As another example, the rate of activity can be used to control the rate pictures are taken such as in the automatic picture taking example. In one embodiment, a light sensor can indicate the degree of light in the vicinity of the camera. The light indication can influence the image processing, such as exposure rate of the camera.

[000265] In one embodiment, in an automatic picture taking example, the location, time or device resources (e.g., available memory) can also be used to control the rate pictures are taken. Also, the ability of the eyeglass frame to know or acquire time and/or

location information (such as the location of the eyeglass frame or the corresponding user) can enable pictures taken by the camera to be stored along with time and/or location indications.

[000266] The eyeglass frame having a camera according to one embodiment of the invention can further include a global positioning system (GPS). The information from the GPS can be used to alter configuration settings and/or influence operation of the camera. For example, the configuration settings can be different at night versus during daytime or can be different depending on time or location. As another example, the camera can take pictures depending on location. In one implementation, the camera can automatically take pictures dependent on a change in location. For example, after taking a picture, the camera can take a subsequent picture when the change in location exceeds a predetermined threshold.

[000267] In one embodiment, the camera utilized in the various embodiments is a digital camera, namely, a digital image capture device. The camera can be a still camera or a motion camera (i.e., video camera). The camera can be designed for manual focusing, auto-focusing, or predetermined fixed focusing. The camera can also support a wide angle or panoramic view.

[000268] FIG. 24 is a side view of a pair of eyeglasses (i.e., eyeglass frame) 2400 according to another embodiment of the invention. The eyeglasses 2400 include a lens holder 2402 for a lens 2404. The lens holder 2402 is for the left side of the eyeglasses 2400. A bridge 2406 couples the lens holder 2402 to another lens holder for the right side of the eyeglasses. In this embodiment, the lens 2404 and the lens holder 2402 extend substantially around the side and are sometimes referred to as “wrap-around” type frames. The eyeglasses 2400 include a temple having a forward temple portion 2408 and a rearward temple portion 2410. Typically, the lens holder 2402, the temple 2406, the forward temple portion 2408 and the rearward temple portion 2410 are integrally formed as a single structure. The eyeglasses 2400 also support audio output to a wearer of the eyeglasses 2400. To support audio, the eyeglasses 2400 include an ear bud 2412, which serves as a speaker, and an extension arm 2414. In this embodiment, the extension arm 2414 couples the ear bud 2412 to the forward temple portion 2408. The extension arm

2414 can be pliable so that the wearer can adjust the position of the ear bud 2412. In further support of audio, the eyeglasses 2400 couple to a cable 2416. The cable 2416 provides audio signals to the ear bud 2412 via at least one electrical conductor extending through the cable 2416 and the extension arm 2414 to the ear bud 2412. In one implementation, one end of the cable 2416 has a connector 2418 and the other end is integral with or connected to the forward temple portion 2408. The connector 2418 can connect to a media output device, such as a portable media player (e.g., radio, MP3 player, CD player, etc.). In another implementation, the cable 2416 can have a connector, such as a plug, that connects to a jack 2420 embedded in the forward temple portion 2408, thereby allowing the cable 2416 to detach from the eyeglasses 2400. Alternatively, the cable 2416 can directly connect to the media output device without the use of the connector 2418. Optionally, the eyeglasses 2400 can also support audio input by providing a microphone with the eyeglasses 2400. In one embodiment, with a microphone, the eyeglasses 2400 serve as a headset for a phone.

[000269] Regardless of the electrical components being utilized with the eyeglass frames, it may be desirable for the eyeglass frames to be substantially balanced in weight. In the event that electrical components are attached and/or at least partially embedded in one of the temples of the eyeglass frame, the other of the temples can include other electrical components or even a counter weight so that the eyeglass frame can be substantially balanced.

[000270] A number of embodiments have been described regarding electrical components in a temple of a pair of glasses. All of the electronic components can be self-contained inside the temple of the glasses. The components can be coupled to a printed circuit board. In other embodiments, some of the components are embedded fully or partially in other areas of the glasses, such as the lens holders or the bridge of the glasses. Or, one or more electrical components can be in a shield of the glasses. In one embodiment, one embedded electrical component can include a circuit board. The circuit board can be a rigid or a flexible circuit board. In a number of embodiments, electrical components have been described to be fully or partially embedded in a temple of glasses,

or in a temple arrangement. In other embodiments, the component(s) can be in other parts of the glasses, such as the lens holders, the nose pads, the bridges or the shields.

[000271] Additional embodiments pertain to improved approaches for users of electronic devices to communicate with one another. The electronic devices have audio and/or textual output capabilities. The improved approaches can enable users to communicate in different ways depending on device configuration, user preferences, prior history, time or other criteria. In one embodiment, the communication between users is achieved by short audio or textual messages.

[000272] The electronic device can be any computing device having communication capabilities. Such computing devices can be referred to as communication devices. Examples of electronic devices include personal computers, personal digital assistants, pagers or mobile telephones.

[000273] FIG. 25 is a communication system 3100 according to one embodiment. The communication system 3100 can support different communication devices, including mobile telephones 3102, computers 3104 (e.g., personal computers) and/or wireless personal digital assistants (PDAs) 3106. Users of the communication devices 3102-3106 can communicate with like or different communication devices. Each communication device 3102-3106 offers one or both of audio or textual communication capabilities. These communication devices 3102-3106 can inter-communicate with one another through a network 3108. The network 3108 can include one or more of voice networks and data networks. For example, one network is a data network providing a slow speed data channel for transmission of Short Message Service (SMS) messages (which are typically limited to 160 text characters) to a Short Message Service Center (SMSC) and then forwarded on to the destination. Besides short messages (e.g., SMS messages), the network 3108 can also support other messaging protocols for sending and receiving enhanced messages (EMS), multimedia messages (MMS), email and fax messages. Other networks support faster data channels and voice channels, such as GPRS, UMTS, G4, GSM, CDMA and various protocols, such as UDP, TCP, WAP, PDP other protocols.

[000274] According to one embodiment of the invention, one of the communication devices 3102-3106 can send a short message to another of the communication devices 3102-3106. The short message can be text-based or audio-based. The sending communication device allows its user to create the short message as the user desires and/or as the device permits. For example, the user might interact with a keypad or keyboard to enter the short message, or the user might record audio inputs (e.g., speech) for the short message. The short message can then be sent to the receiving communication device. The sending of the short message may involve converting the short message from an audio message to a text message, or vice versa. Also, the receiving communication device can further convert the short message from audio-to-text or from text-to-audio. In any case, the short message is presented (e.g., displayed or played) to the user of the receiving communication device. The presentation can vary as the user desires or as the device permits.

[000275] A first aspect of the invention pertains to improved approaches to respond to incoming voice calls. The improved approaches enable a called party (i.e., a party being called) to provide some information to a calling party without directly engaging in a voice call with the calling party. The called party can choose not to take the voice call from the calling party. Instead, the called party can provide the calling party with some limited information. The limited information can be provided in an audio or textual format. In one embodiment, the limited information provides the calling party with feedback as to why the voice call was not taken.

[000276] FIG. 26 is a flow diagram of a personal call response process 3200 according to one embodiment of the invention. The personal call response process 3200 is performed by an electronic device, such as a mobile communication device (e.g., mobile telephone). The personal call response process 3200 begins with a decision 3202 that determines whether there is an incoming voice call. When the decision 3202 determines that there is no incoming voice call, then the personal call response process 3200 awaits such a call. Once the decision 3202 determines that there is an incoming voice call, a decision 3204 determines whether the incoming voice call is to be answered. Typically, the user of the electronic device would signal the electronic device as to

whether or not to answer the incoming voice call. Alternatively, the electronic device could automatically decide whether to answer the call.

[000277] When the decision 3204 determines that the user desires the incoming voice call to be answered, the incoming voice call is answered 3206 and the user engages 3208 in a voice call with the calling party. A decision 3210 then determines whether the call has ended. When the decision 3210 determines that the call has not yet ended, then the personal call response process 3200 can return to repeat the block 3208 while the voice call continues. Once the decision 3210 determines that the voice call has ended, then the personal call response process 3200 ends.

[000278] When the decision 3204 determines that the user does not desire to answer the incoming voice call, a decision 3212 determines whether the user desires to provide an audio message to the calling party. When the decision 3212 determines that the user does desire to provide an audio message to the calling party, an audio message is obtained and sent 3214 to the calling party (caller).

[000279] Alternatively, when the decision 3212 determines that the user does not desire to provide an audio message, a decision 3216 determines whether the user desires to provide a text message to the calling party. When the decision 3216 determines that the user desires to provide a text message to the calling party, a text message is obtained and sent 3218 to the calling party.

[000280] Still further, when the decision 3216 determines that the user does not desire to provide a text message to the calling party, a decision 3220 determines whether the incoming voice call is to be directed to voice mail. When the decision 3220 determines that the incoming voice call should be directed to voice mail, then the incoming voice call is directed 3222 to voice mail. On the other hand, when the decision 3220 determines that the incoming voice call is not to be directed to voice mail, the incoming voice call is dropped 3224. Following the blocks 3214, 3218, 3222 and 3224, the personal call response process 3200 is complete and ends.

[000281] In another embodiment, a personal call response process could announce the calling party to the called party (user). In announcing the calling party, the personal

call response process would present the called party with information pertaining to the calling party (e.g., display or audio sound). Such information could, for example, help the called party to decide whether to answer the incoming voice call. The information can, for example, include one or more of name (individual or business), telephone number, or other caller identification. The information could also include status information of the calling party, such as position, health, mood, etc. As an example, the information could be presented to the user prior to the decision 3204 of the personal call response process 3200 shown in FIG. 26.

[000282] In still another embodiment, an automated decision process to decide whether to answer a call can be based on time (e.g., decision 3204). For example, the called party can previously set a rule, such as that from midnight to 6 am, the party does not want to answer voice calls. Then, during this time period, the electronic device can automatically decide not to answer incoming calls. In one implementation, when the electronic device decides not to answer incoming calls, no indication of incoming calls will be provided to the called party. For example, from midnight to 6 am, the device would not produce any ring tone. Additionally, if desired, the called party can also configure the electronic device to automatically provide an audio message or a text message to the calling party (e.g., I'm asleep call me tomorrow").

[000283] FIG. 27 is a flow diagram of an audio message response process 3300 according to one embodiment of the invention. The audio message response process 3300 is, for example, suitable for use as the processing carried out by block 3214 illustrated in FIG. 26.

[000284] The audio message response process 3300 initially answers 3302 the incoming voice call. In this operation, the incoming voice call is answered 3302 but not in a traditional way. Instead, the electronic circuitry associated with a mobile communication device (e.g., mobile telephone) that receives the incoming voice call operates to answer the incoming voice call for purposes of an audio message response. For example, a voice channel is established between the calling party and the mobile communication device, but the speaker and microphone of the mobile communication device are disabled. In

effect, in such an embodiment, neither the called party nor the calling party perceives that the voice calling has been answered.

[000285] Next, one or more predetermined audio messages can be presented 3304 by the mobile communication device. The presentation 3304 of the one or more predetermined audio messages can, for example, be achieved by audio or visual means. For example, the predetermined audio messages can be audio output to a speaker associated with the mobile communication device for the called party or can be visual output (e.g., text) to a display of the mobile communication device for the called party (e.g., user of the mobile communication device).

[000286] A decision 3306 then determines whether a predetermined audio message has been selected. Here, the decision 3306 determines whether the user (i.e., called party) of the mobile communication device has selected one or more of the predetermined audio messages. When the decision 3306 determines that a predetermined audio message has been selected, then the selected audio message is played 3308 for the calling party. Here, the mobile communication device can output the selected audio message to the calling party over the voice channel. Typically, the mobile communication device of the called party would not produce an audible output at the mobile communication device, so that the called party would not be disturbed by the sending of the audio response. The predetermined audio messages are normally short messages (e.g., not more than 160 characters) so that the duration of time the voice channel is needed and/or the amount of network bandwidth consumed is minimal.

[000287] On the other hand, when the decision 3306 determines that none of the predetermined audio messages have been selected, then a decision 3310 determines whether a custom audio message is requested. A custom audio message is an audio message that is specifically provided for the calling party. When the decision 3310 determines that a custom audio message is not being requested, then the audio message response process 3300 returns to repeat the decision 3306 and subsequent operations. Alternatively, when the decision 3310 determines that a custom audio message is requested, then a custom audio message is recorded 3312. Thereafter, the custom audio message that has been recorded can be played 3314 for the calling party (caller). Here,

typically, the custom audio message would be output by the mobile communication device of the called party over the voice channel to the calling party. Typically, the mobile communication device of the called party would not produce an audible output at the mobile communication device, so that the called party would not be disturbed by the sending of the audio response. The custom audio messages are also normally short messages (e.g., not more than 160 characters) so that the duration of time the voice channel is needed and/or the amount of network bandwidth consumed is minimal.

[000288] Following the operations 3308 and 3314, the incoming voice call is closed 3316. In other words, after the selected audio message or the custom audio message is played 3308, 3314, the incoming voice call can be closed 3316. Following the block 3316, the audio message response process 3300 is complete and ends.

[000289] The predetermined audio messages that are presented 3304 to a called party can be determined in a static or dynamic manner. A static determination would, for example, be when the called party has previously set or recorded an audio message to be utilized. Typically, with static determination, the list of audio messages remains the same (i.e., static) until changed (e.g., by the called party). A dynamic determination would allow the audio messages in the list (or the ordering of the audio messages in the list) to change without specific action by the user or the called party. For example, the list or ordering of the audio messages can depend on preference settings, configuration information, or prior usage. Prior usage can include biasing the list of audio messages such that those messages being most often selected appear higher in the list. The list or ordering of the audio messages can also depend on the calling party, type of calling party, location of calling party or called party, and the like. The list of audio messages can be represented by text and/or graphics (e.g., icons).

[000290] The audio message response process 3300 flexibly enables a user to either select one or more predetermined audio messages or provide a custom audio message to be used as an audio message response to a calling party. However, it should be recognized that, in other embodiments, an audio message response process can alternatively simply pertain to only providing a custom audio message, or only permitting selection of a predetermined audio message. Further, in still other embodiments, an audio

message response process can first determine whether a custom audio message is to be provided before presenting predetermined audio messages. In yet other embodiments, an audio message response process can answer the incoming voice call later in the processing than operation 3302 as shown in FIG. 27 (e.g., before operations 3308 and 3314).

[000291] FIG. 28 is a flow diagram of a text message response process 3400 according to one embodiment of the invention. The text message response process 3400 is, for example, processing performed by the block 3218 illustrated in FIG. 26.

[000292] The text message response process 3400 initially drops 3402 the incoming voice call. Here, the information to be supplied to the calling party is a short text message; therefore, there is no need for a voice channel.

[000293] Next, one or more predetermined text messages are displayed 3404. Here, the one or more predetermined text messages would normally be displayed on a display screen associated with the mobile communication device being utilized by the called party. A decision 3406 then determines whether one (or more) of the predetermined text messages has been selected. When the decision 3406 determines that a predetermined text message has been selected, then the selected text message is transmitted 3408 to the caller (i.e., the calling party).

[000294] On the other hand, when the decision 3406 determines that a predetermined text message has not been selected, then a decision 3410 determines whether a custom text message is requested. When the decision 3410 determines that a custom text message is not requested, then the text message response process 3400 returns to repeat the decision 3406 and subsequent operations. Alternatively, when the decision 3410 determines that a custom text message is requested, then the custom text message is entered 3412. Here, the called party interacts with the mobile communication device to enter the custom text message. Then, the custom text message is transmitted 3414 to the caller. In one embodiment, the transmission 3408, 3414 of the text message can be performed over a communication network, such as a network having a Short Message Service Center (SMSC) supporting Short Message Service (SMS) messages.

Following the transmission 3408 of the selected text message or the transmission 3414 of the custom text message, the text message response process 3400 is complete and ends.

[000295] An alternative embodiment of a text message response process could operate to answer the incoming voice call and announce to the caller that a text message will be forthcoming. Then, the incoming voice call could be promptly dropped. This additional operation could, for example, be used with the text message response process 3400 by providing an additional operation prior to the block 3402 illustrated in FIG. 28.

[000296] The predetermined text messages being displayed 3404 to a called party can be determined in a static or dynamic manner. A static determination would, for example, be a text message the called party has previously set or entered. Typically, with static determination, the list of text messages remains the same (i.e., static) until changed (e.g., by the called party). A dynamic determination would allow the text messages in the list (or the ordering of the text messages in the list) to change automatically, and not by the user. For example, the list or ordering of the text messages can depend on preference settings, configuration information, or prior usage. To illustrate, prior usage can include biasing the list of text messages such that those messages being most often selected appear higher in the list. The list or ordering of the text messages can also depend on the calling party, type of calling party, location of calling party or called party, and the like. The list of text messages can identify each text message with text (e.g., at least a portion of the corresponding text message, or an abbreviation) and/or graphics (e.g., icons).

[000297] The text message response process 3400 flexibly enables a user to either select one or more predetermined text messages or provide a custom text message to be used as a text message response to a calling party. However, it should be recognized that, in other embodiments, a text message response process can alternatively simply pertain to only providing a custom text message, or only permitting selection of a predetermined text message. Further, in still other embodiments, a text message response process can first determine whether a custom text message is to be provided before presenting predetermined text messages.

[000298] FIG. 29 is a flow diagram of an automated call response process 3500 according to one embodiment of the invention. The automatic call response process 3500 is substantially similar in many ways to the personal call response process 3200 illustrated in FIG. 2. However, the automated call response process 3500 operates to reduce user input at the mobile communication device by making use of stored data pertaining to its hardware components, configuration or preferences. In this regard, the automatic call response process 3500 includes a decision 3502 that determines whether a head-set is active. When the decision 3502 determines that a head-set is active, then the automatic call response process 3500 can prefer, suggest or require the user to obtain and send 3214 an audio message to the caller in response to an incoming voice call. Alternatively, when the decision 3502 determines that a head-set is not active, then a decision 3504 can determine whether a display is present. In other words, the decision 3504 can determine whether the mobile communication device has a display. When the decision 3504 determines that the mobile communication device does have a display, then the mobile communication device can operate to obtain and send 3218 a text message to the caller. Of course, this assumes that the caller can support text messages even though they initially called with a voice call. Hence, in another embodiment, the automatic call response process can operate to query or obtain information regarding the caller's communication device capabilities.

[000299] An exemplary scenario of how the previously described automatic call response process could work according to one implementation is as follows:

[000300] 1. From his mobile phone, Bill calls Tom's mobile phone.

[000301] 2. Tom is alerted by his mobile phone of an incoming call. Optionally, caller information (i.e., pertaining to Bill) can be displayed or announced to Tom.

[000302] 3. Tom can choose to answer the incoming call or decline to answer the call.

[000303] 4. In the event that Tom declines to answer the call, Tom can have the opportunity to provide the caller with a brief audio or text message.

[000304] 5. If an audio message is to be provided, then Tom can either record a personalized message or select one of a plurality of predetermined audio messages. In this case, the incoming call is answered by Tom's mobile phone and then the audio message is played for the caller, thereafter the call is dropped. The audio messages are typically brief (i.e., short), and examples of audio messages are: (i) "Will call in 10 minutes," (ii) "Cannot talk now," (iii) "I'm in a meeting," or (iv) "Please don't call anymore."

[000305] 6. On the other hand, if a text message is to be provided, then Tom can either enter a personalized text message or select from a plurality of predetermined text messages. In this case, the incoming call is dropped, and the entered text message or the selected one of the predetermined text messages is sent. Examples of text messages are: (i) "Will call in 10 minutes," (ii) "Cannot talk now," (iii) "I'm in a meeting," or (iv) "Please don't call anymore." The text messages can be English (or other language) words or phrases, or can be condensed text strings (e.g., such as slang or chat language). In one embodiment, the predetermined text messages presented to Tom can be dependent on some criteria (i.e., automatically selected). Alternatively, it is possible that Tom might want to edit the predetermined text message, such can be permitted. As yet another example, the text message can embed dynamic information, such as position, e.g., "I'm in [position] now, so I'll get back to you later." The position can be determined using a GPS receiver in the mobile phone or acquired by a remote computer and provided to the mobile phone. The position may also be further processed (locally or remotely) into a more user-friendly form, such as city, school, restaurant name, or street type addresses. The position could also be used above to assist the user in deciding whether to answer the incoming call or decline to answer the call.

[000306] 7. If hardware components, configuration or preferences are taken into consideration, as illustrated in FIG. 29, the above scenario can be modified. For example, if Tom is using a head-set with his mobile phone, then an audio message may be most convenient, assuming that Tom wants to provide a particular (i.e., customized) message to Bill. The head-set allows Tom to record a brief audio message. Less conveniently, the head-set can be used to present a list of predetermined audio messages and allow Tom's selection therefrom by a button or voice-command.

[000307] 8. If Tom is not using a head-set, then a text message response might be more suitable. This would typically require that Tom's mobile phone have a display and a keypad. Even so, without a head-set, Tom could still record an audio message, though such would likely be less convenient.

[000308] 9. Tom can also not provide an audio message or a text message and simply let the incoming call roll-over into voice mail.

[000309] The exemplary scenario can also be used in a case where the called party is using one line but the mobile device has multi-line capabilities or call waiting. In such case, the mobile phone can enable the called party to provide a brief audio or text message to the calling party as noted above. Alternatively, the mobile phone can itself automatically (i.e., without user input) respond to the calling party via an audio or text message since the mobile phone is aware that the called party is on the other line.

[000310] In this aspect of the invention, the calling party and the called party often use mobile communication devices, such as mobile phones. However, the parties can alternatively use other electronic devices, such as a PDA, a computer, etc. Further, the option to provide a text response could be prevented if the caller's device is known to not support text messages.

[000311] The advantages of the previously described embodiments are numerous. Different embodiments or implementations may yield different advantages. One advantage is that communications for users of electronic devices can be flexibly provided. Another advantage is that communication mode changes can be performed at an electronic device to better suit the needs or condition of the electronic device or user preferences. In still another advantage, a user can provide feedback to a caller without answering a voice call from the caller.

[000312] Another aspect of the invention pertains to improved approaches to respond to an incoming text message. The improved approaches enable a recipient to provide a reply message to an initiator. The incoming text message can be presented to the recipient with an audio or textual presentation. Thereafter, a reply text message can be sent back to the initiator. The recipient can form the reply text message by recording a

brief audio message or entering a text message. In the case in which a brief audio message is used, the audio message can be automatically converted to a text message before being transmitted to the initiator.

[000313] FIG. 30 is a flow diagram of a message presentation process 3600 according to one embodiment of the invention. The message presentation process 3600 is performed by an electronic device, such as a mobile communication device.

[000314] The message presentation process 600 begins with a decision 3602 that determines whether an incoming text message is present. Typically, the incoming text message would be transmitted to the mobile communication device from another communication device. When the decision 3602 determines that an incoming text message is not present, then the message presentation process 3600 awaits such message. Once the decision 3602 determines that an incoming text message has been received, a decision 3604 determines whether an audio or text presentation is to be utilized. The decision 3604 can be performed in a variety of different ways. For example, the determination of whether to utilize an audio or text presentation can be based on user input or can be automatically determined through a use of configuration or preference information or hardware components (e.g., display, speaker, head-set).

[000315] When the decision 3604 determines that an audio presentation is to be utilized, the incoming text message is converted 3606 to an audio message. For example, a text-to-speech conversion can be performed. In one embodiment, a user of the electronic device can be permitted to choose speech characteristics, such as a voice, tone, pace, accent, or mood, for the resulting speech. For example, a user could choose speech characteristics by preference settings. In another embodiment, the incoming text message can include or reference speech characteristics so that the initiator can control or influence speech characteristics. In still another embodiment, if the text to be converted contains condensed text (e.g., such as slang or chat language), the resulting speech can pertain to an uncondensed form of the text. The ability to convert from condensed text to resulting speech for uncondensed text can be facilitated by pattern matching. For example, in chat language “LOL” can be converted to an audio message for “lots of love.” In one implementation, a table can store audio messages corresponding to chat terms or

phrases. In another implementation, a first table would store uncompressed terms or phrases corresponding to chat terms or phrases, and a second table would store audio messages corresponding to the uncompressed terms or phrases.

[000316] After the incoming text message is converted to the audio message, the audio message is played 3608. Typically, the audio message is played 3608 by the mobile communication device for the user. For example, the audio message can be output to a speaker of the mobile communication device or a headset used therewith. As a result, the user of the mobile wireless communication device receives an audio message even though the incoming message was a text message.

[000317] On the other hand, when the decision 3604 determines that a text presentation is to be utilized, the incoming text message is displayed 3610. Here, the incoming text message would be displayed 3610 on a display associated with the mobile communication device. Following the blocks 3608 and 3610, the message presentation process 3600 ends.

[000318] As discussed above, text-to-speech conversion can be invoked and performed on an electronic device, which may be a mobile communication device. While text-to-speech conversion, particularly if high quality is desired, requires substantial processing capabilities, mobile electronic devices, such as mobile communication devices, given their small form factor and price competition, tend to have limited processing capability. Accordingly, in one embodiment, text-to-speech conversion can be off-loaded from the mobile device. For example, a remote server computer can be provided the text message and produce the resulting audio message, and then supply the audio message to the mobile device. The remote server computer can be a networked server coupled to the network 108. One example of a networked server is a gateway computer for a wireless electronic device, such as a mobile telephone.

[000319] FIG. 31 is a flow diagram of a reply message process 3700 according to one embodiment of the invention. The reply message process 3700 is performed by an electronic device, such as a mobile communication device.

[000320] The reply message process 3700 begins with a decision 3702 that determines whether a reply message is to be sent. Typically, the reply message process 3700 follows the presentation of an incoming text message to a user of a mobile communication device. Hence, the reply message to be sent is a reply to the incoming text message. However, in other embodiments, the reply message to be sent can be merely an initial message as opposed to a response to an earlier message.

[000321] In any case, when the decision 3702 determines that a reply message is not to be sent, then the reply message process 3700 ends or simply awaits the need to send a reply message. On the other hand, when the decision 3702 determines that a reply message is to be sent, then a decision 3704 determines whether an audio or text message is to be formed. The decision 3704 can be performed in a variety of different ways. For example, the determination of whether to send an audio or text message can be based on user input or can be automatically determined through a use of configuration or preference information or hardware components (e.g., display, speaker, head-set).

[000322] When the decision 3704 determines that an audio message is to be formed, then the reply message process 3700 prompts 3706 for an audio message. Here, the prompt 3706 can be directed to the user of the mobile communication device. The prompt can be an audio or textual indication. Next, a decision 3708 determines whether an audio message has been recorded. When the decision 3708 determines that the audio message has not been recorded, then the reply message process 3700 awaits the audio message. Once the decision 3708 determines that the audio message has been recorded, then the audio message is converted 3710 to a text message. In one embodiment, if the audio message recorded is greater than a maximum text message size (e.g., 150 or 160 characters), then the audio message can be shortened so that the resulting text message does not exceed the maximum text message size. One way to shorten the text message is to use abbreviations. For example, the words “For example” can be changed to “e.g.”. Such conversion can be again be performed by matching entries in tables. Another way to shorten is to remove non-essential text. Still another way to shorten is to clip off or truncate the text message at the maximum text message size. In another embodiment, the resulting text message might provide an indication that it was

converted from an audio message. Following the block 3710, the text message is transmitted 3712 over a wireless network.

[000323] Alternatively, when the decision 3704 determines that a text message is to be formed, then a text entry screen is displayed 3714. Next, a decision 3716 determines whether a text message has been entered. When the decision 3716 determines that a text message has not yet been entered, then the reply message process 3700 awaits entry of the text message. Once the text message has been entered, the text message is transmitted 3712 over the wireless network. Following the block 3712, the reply message process 3700 ends.

[000324] Although the reply message process 3700 provides for the user to enter a custom text or audio message, it should be understood that the reply message can alternatively be formed through use of semi-custom or predetermined reply messages from which the user of the mobile communication device can choose. The use of semi-custom or predetermined reply messages can be achieved as noted above in a number of embodiments, and can serve to simplify the conversion process.

[000325] An exemplary scenario of how message presentation and reply message processes could work according to one implementation of the second aspect is as follows:

[000326] 1. From his mobile phone, Bill prepares and sends a text message to Tom's mobile phone.

[000327] 2. Tom is alerted by his mobile phone of an incoming text message, such as by displaying at least a portion of the text message and/or otherwise notifying Tom of the text message.

[000328] 3. Tom's mobile phone can decide whether to present the text message on a display screen of Tom's mobile phone, or to first convert the text message to an audio message and then present the audio message to Tom (e.g., play the audio message). Of course, Tom can interact with Tom's mobile phone to assist in making the determination on how to present the message.

[000329] 4. Thereafter, if desired, Tom can prepare and send a reply message back to Bill. This reply message can be prepared initially as a text message or an audio message. Tom's mobile phone and/or Tom can determine whether the reply message is initially prepared as a text message or as an audio message. If an audio message is initially created, such audio message must be converted to a text message prior to transmission. Eventually, the reply message is sent to Bill as a text message. Tom's mobile phone can assist with the creation of the reply message through use of custom, semi-custom or predetermined reply message from which Tom and/or Tom's mobile phone can choose.

[000330] 5. If Tom is using a head-set with his mobile phone, then an audio message may be more convenient, assuming that Tom wants to provide a particular (i.e., customized) message to Bill. The head-set allows Tom to easily record a brief audio message. Less conveniently, the head-set can be used to present a list of predetermined audio messages and allow Tom's selection therefrom by a button or voice-command.

[000331] 6. If Tom is not using a head-set, then a text message response might be more suitable. This would typically require that Tom's mobile phone have a display and a keypad. Even so, without a head-set, Tom could still record an audio message, though such would likely be less convenient.

[000332] 7. Tom can also not provide a reply message and simply not respond to the incoming text message. Alternatively, Tom can configure his mobile phone to automatically produce and send a reply message based on user settings or preferences, position, configuration, status, etc.

[000333] In this aspect of the invention, the calling party and the called party often use mobile communication devices, such as mobile phones. However, the parties can alternatively use other electronic devices, such as a PDA, a computer, etc.

[000334] The advantages of the different embodiments exemplified by FIGs. 30-31 are numerous. Different embodiments or implementations may yield different advantages. One advantage is that communications for users of electronic devices can be flexibly provided. Another advantage is that communication mode changes can be

performed at an electronic device to better suit the needs or condition of the electronic device or user preferences. Still another advantage is that conversion of an audio message to a text message facilitates use a low cost network (such as the SMS network). Another advantage is reduced network bandwidth load. Yet still another advantage is that the sender can get back a message in the same format as they sent the original message, though the recipient may use the message in a different format or mode (e.g., recipient hears the text message as an audio message).

[000335] Moreover, it should be noted that with regards to any of the embodiments in which a voice call or a text message is incoming to an electronic device, not only can the user of the mobile device take an action (e.g., button press or voice-command) to decline the call/message but also the electronic device itself can automatically decline the call/message such that the user is not disturbed. For example, an electronic device can be configured through user settings (e.g., preferences) to decline calls/messages matching certain criteria. Also, an auto reply message can be configured to be automatically sent in response to the call/message. For a known, undesired marketing caller/message sender, the electronic device can automatically send a reply message demanding the sender not to call or send messages anymore, and to remove your information from their database.

[000336] Text messages received or sent can optionally embed indications of speech characteristics to be used, should the text message be converted to an audio format. The speech characteristics can pertain to voice, tone, pace, accent, and/or mood. The speech characteristics for the resulting speech can be set in preference or configuration information, set on a per message basis by users, or set by evaluation of monitored data pertaining to the user.

[000337] Additionally, the messages being transmitted can be encrypted for security purposes.

[000338] In one embodiment, an electronic device performing communications using audio and/or text messages according to the invention can further integrate (or have tethered thereto) one or more electrical components for enhancing the hearing of the user

of the electronic device. The electronic device will normally include a microphone and a speaker. In any case, additional details on hearing enhancement are further described, for example, in U.S. Provisional Patent Application No. 60/620,238, filed October 18, 2004, and entitled "EYEGLASSES WITH HEARING ENHANCED AND OTHER AUDIO SIGNAL-GENERATING CAPABILITIES," which is hereby incorporated herein by reference;

[000339] A number of embodiments described herein can be considered an automated secretary for a user of an electronic device. The automated secretary can completely or partially respond to an incoming call/message so as to reduce disturbances to the user. The user can personalize the automated secretary through user settings (e.g., preferences), or the automated secretary can learn over time how to handle different incoming calls/messages. Besides handling or assisting the user with incoming calls/messages, the automated secretary can also assist with other activities, such as making calendar entries (e.g., meetings) in a calendar or responding to incoming callers/messages with relevant information pertaining to the user's schedule as maintained by the calendar (though the user could restrict such access to certain information and/or inquiring parties). For example, if an incoming text message asks "available for lunch today?", the automated secretary can check the user's availability for lunch by way of the user's calendar, then if the user is not available the automated secretary can quickly informing the inquiring party of same or propose another date. On the other hand, if the lunch time period is available in the user's calendar, then the automated secretary can either directly respond to the inquiring party of acceptance or propose a response to the user for review, modification and/or transmission.

[000340] Furthermore, the embodiments implementations and features described in: (i) U.S. Provisional Patent Application 60/509,631, filed October 9, 2003, and entitled "TETHERED ELECTRICAL COMPONENTS FOR EYEGLASSES," which is hereby incorporated herein by reference; and (ii) U.S. Provisional Patent Application 60/462,591, filed April 15, 2003, and entitled "EYEGLASSES FOR WIRELESS COMMUNICATION," which is hereby incorporated herein by reference; (iii) U.S. Patent Application No. 10/964,011, filed October 12, 2004, and entitled "TETHERED ELECTRICAL

COMPONENTS FOR EYEGLASSES," which is hereby incorporated herein by reference; and (iv) U.S. Patent Application 10/822,218, filed April 12, 2004, and entitled "EYEGLASSES FOR WIRELESS COMMUNICATIONS," which is hereby incorporated herein by reference, can be used with the various embodiments, implementations, features and aspects of the invention noted above. For example some or all of the processing noted above with respect to FIGs. 25-31 can be performed in electrical components integral or tethered to eyeglasses. However, the electrical components integral or tethered to eyeglasses can also interact and/or share processing tasks with an electrical device (e.g., mobile telephone, PDA, etc.) located proximate thereto.

[000341] It should be obvious to those skilled in the art that a number of embodiments performing communications using voice as well as audio and/or text messages can be implemented using voice over Internet Protocol technologies, with signals delivered over the Web. For example, a calling party's communication or mobile device can include an adapter to convert voice signals to data packets before sending them over the Internet. A service provider can convert the packets back into voice signals before sending the voice signals to the called party's communication device. Similarly, embodiments can be implemented using voice over wireless protocols, such as Wi-Fi or Wi-Max networks. Using such technologies, computing devices can become communication devices.

[000342] As explained, in a number of embodiments, the glasses include a switch, which typically is at least partially embedded in the glasses. For example, the switch can be used to turn the speaker on, or to tune the frequency of a radio. If the glasses have two speakers, such as one on each of the temples, there can be two switches, one on each temple to control the corresponding speaker. The two speakers can be for generating stereo audio signals for the user. There can also be one control switch for both speakers.

[000343] The switch in the glasses can have different attributes. It can be activated by different type of forces, including mechanical, radiation, magnetic, electrical, and temperature. The switch can also be activated remotely by a remote device. The switch can be based on one or more detectors. The switch can have different degrees or ranges of control, such as binary, multiple discrete steps or incremental control. The switch can

be placed at different position on the glasses, such as on the side or top surface of a temple or at a joint. The control can take perception into consideration, such as based on texture, height and lateral position of multiple switches.

[000344] FIG. 32 illustrates a number of forces 4150 activating the switch according to different embodiments of the invention. They can be based on, for example, mechanical 4152, radiation 4154, magnetic 4156, electrical 4158, and temperature 4160.

[000345] FIG. 33 illustrates a number of mechanical forces 4152 activating the switch according to different embodiments of the invention. The mechanical switch or sensor can be a conductive-elastomer switch 4202, a membrane switch 4204, a dome switch 4206, a relatively simple wire switch 4208, and a roller switch 4210, such as a switch including a wheel. Another type of mechanical force can be based on stress 4211, such as a switch based on piezoelectric force or a piezoelectric device.

[000346] In yet another embodiment, the mechanical switch is made so that the electrical circuitry in the glasses can be activated but not deactivated by the user. In other words, once activated, the switch is designed not to be deactivated by the user, and the circuit will remain on till the power source inside the glasses is depleted. One approach to implement such a switch is based on a piece of insulating material 4216 between a terminal of, for example, a battery and its contact with the circuit embedded in the glasses. When the battery is installed, at least one of its terminals is separated from its circuit contact. There can be a thin, flexible, insulating material, 4216, such as a ribbon, positioned between the terminal and the contact. Though the circuit is embedded in the glasses, the insulating material 4216 extends outwardly from inside the glasses through a hole, such as a small hole, in the side wall of, for example, a temple of the glasses. In one embodiment, the hole or slot is located above or below the terminal and the contact, or the hole is not directly inline with the terminal and the contact. By pulling the insulating material out from the glasses, the terminal will establish electrical connection with the contact, activating the circuit and turning the speaker on.

[000347] In another embodiment of a switch based on mechanical force 4152, the mechanical force is the force that is used to insert 4218 a battery into the glasses. Once

the battery is inserted, the speaker in the glasses will be activated. The speaker will remain on until the battery is removed, or until the power in the battery is drained.

[000348] The switch can also be activated by radiation 4154, or energies in a type of radiation, according to a number of embodiments of the invention. The radiation 4154 can be in the optical, or infrared or ultraviolet range. For example, the switch includes a photodiode or photo sensor in the glasses, and there is an opening above the photodiode. In one embodiment, the diode is activated by light getting to the diode through the opening. In another embodiment, the circuit is activated if the opening is covered to prevent light from getting to the diode.

[000349] The switch can be activated by magnetic forces 4156. For example, there can be a magnetic sensor or a Hall effect detector inside a temple proximate to a joint of a pair of glasses. FIG. 34 shows a section of a pair of glasses 4250 with such a detector 4254. The detector 4254 is electrically connected to a printed circuit board 4255. When the temple 4252 is in its extended position, as when the glasses 4250 are ready to be worn, the detector 4254 will be directly adjacent to a magnet 4256 inside a lens holder 4258 at the corresponding joint 4260. The magnet 4256 would activate the Hall effect detector 4254. In another embodiment, a magnetic switch is activated based on changing the inductance of a coil. For example, the switch includes a steel rod that can be positioned in or out of a coil. The switch's range of control is based on the position of the rod with respect to the coil.

[000350] The switch can be activated depending on electrical forces 4158. In one embodiment, the electrical force depends on capacitive effect. By changing the capacitance, the switch is turned on and off. For example, the capacitance is changed by placing one's finger over a metallic pad. In another example, by changing the amount of overlap between two metallic sheets that are not in contact, the capacitance between the two metallic sheets will change. This then changes the range of control of the switch.

[000351] In another embodiment, the electrical force 4158 is based on resistive effect. For example, the switch is made up of a slide or a rotary potentiometer. By

changing the amount of coupling, the amount of resistance is changed to reflect the range of control of the switch.

[000352] In one embodiment, the switch's activation can depend on temperature 4160. For example, the switch includes a temperature sensor. When the temperature reaches a certain point, the switch is activated.

[000353] In yet another embodiment, the switch is controlled by a remote controller. For example, the glasses include an infrared detector. The remote controller can generate infrared radiation. By aiming the controller at the detector, the infrared radiation can activate the infrared detector and the switch is activated. Or, if the user moves into the vicinity of a corresponding infrared transmitter, circuits in the glasses would be activated.

[000354] The switch can include one or more previously-described sensor or detector of different types of forces. For example, the switch can use two photo sensors. One sensor is exposed to light on the outside surface of the temple and the other is exposed to light on the inside surface of the temple, such as close to the ear. Based on their differential output, the switch is activated. As another example, there are two temperature sensors in the glasses. One is located close to a joint and the other is at the temple close to the ear. Again, the switching action depends on their differential outputs. In yet another embodiment, the glasses include more than one type of switch. There can be one type of switch, such as a mechanical switch, acting as an on/off switch, and another, such as a switch using electrical forces, as an incremental switch to change frequency.

[000355] As described, in a number of embodiments, the switch can provide different degrees or ranges of control. In one embodiment, there are two degrees of control, such as in an on/off switch. In another embodiment, there can be multiple discrete degrees, steps or positions. For example, the switch is a roller with discrete notches to indicate different discrete positions. Or, there can be two mechanical switches, placed side-by-side. Pushing one switch will increment one step, and pushing the other will decrement one step.

[000356] In yet another embodiment, the change from one degree to the next is gradual and not noticeably discrete. This can be achieved with 2 sensors arranged in quadrature. FIGs. 35A-35C show examples of different embodiments of such a switch based on two photodiodes or photo detectors.

[000357] FIG. 35A shows an embodiment 4300 with a wheel 4302 (roller) having clear strips, 4304, 4306 and 4308, alternating with black strips, 4310, 4312 and 4314, and two photodiodes, 4316 and 4318. Most of the wheel 4302 and the two diodes, after incorporated into the temple 4320, are covered by a piece of material 4322. The two diodes, 4316 and 4318, are exposed to ambient light through a clear window 4324. A part of the wheel 4302 is extended out of the temple 4320, allowing the wheel 4302 to be turned about its axis 4326. The wheel 4302 can have teeth for friction turning. As the wheel 4302 rotates about the axis 4326, based on the differential outputs from the diodes, the direction of movement of the wheel 4302—clockwise or counterclockwise—is determined. For example, if the wheel 4302 is rotated clockwise, the top diode 4316 senses light before the bottom 4318 senses light. On the other hand, if the wheel 4302 is rotated counterclockwise, the bottom diode 4318 senses light before the top 4316. Based on the signals from the two diodes, one would be able to tell if the wheel is being turned clockwise or counterclockwise. Clockwise can denote increase and counterclockwise can denote decrease. This embodiment can be used, for example, to change frequency. By turning the wheel 4302 clockwise, the frequency of the radio goes up. And, by turning the wheel 4302 counter-clockwise, the frequency goes down. Such a wheel 4302 is also applicable for other purposes, such as controlling the volume of a speaker.

[000358] FIG. 35B shows an embodiment 4350 with a wheel 4352 having black 4354 and reflecting 4356 strips, two photodiodes, 4358 and 4360, and a LED 4362. Again, most of the wheel, the two diodes and the LED are covered by a sheet of material 4364. If a reflecting strip 4356, instead of a black strip 4354, goes over a diode, more light from the LED will be reflected back and received by the diode. If a black strip 4354 goes over a diode, output from the diode will be significantly reduced. Again based on the signals

from the diodes, the direction of rotation can be determined, which, in turn, can be used to indicate incrementing or decrementing outputs.

[000359] FIG. 35C shows an embodiment 4400 again using two photodiodes, 4402 and 4404, but without a wheel. The two diodes, 4402 and 4404, are exposed to ambient light unless they are covered. In this embodiment, whether the finger 4406 or another object is moving from the first diode 4402 to the second diode 4404, or from the second diode 4404 to the first diode 4402 can be determined based on the signals from the diodes. For example, the finger 4406 sliding in a forward direction would trigger a signal from the first diode 4402 before the second diode 4404. On the other hand, sliding the finger in a backward direction would trigger a signal from the second diode before the first diode. Thus, the outputs from the two diodes can show the direction of movement of the finger. One can then, for example, assign forward movement (from the first 4402 to the second 4404) as increment, and backward movement (from the second 4402 to the first 4402) as decrement.

[000360] A switch can be placed at different location on a pair of glasses. In one embodiment, the switch is positioned on one of the side surfaces of one of the temples, such as the side that is not facing the face of the user when the glasses are worn. In another embodiment, the switch is positioned on a top surface of one of the temples. The switch shown in FIG. 1 in paragraph 321 of U.S. Provisional Patent Application No. 60/647,826 falls under this category. In yet another embodiment, the switch is positioned at one of the joints or hinges of the glasses. For example, there is a mechanical switch at a joint. If the corresponding temple is extended, as in the position when the glasses are worn, the switch will be pressed, which can indicate that the switch has been activated.

[000361] In one embodiment, the user can be using a switch when the glasses are worn. Depending on the position and the type of switch, the user may not be able to see the switch when he is manipulating it. In one embodiment, the design of the switch takes into consideration perception. To illustrate, there are two mechanical switches on the glasses. The top surfaces of the two switches have different texture. One switch has a smooth surface and the other has a rough surface. Pushing the rough surface implies

incrementing one step and pushing the smooth surface implies decrementing one step. This type of perception design is based on tactile effect. In another example, the heights of the two switches are different. The taller switch is for one effect and the shorter is for another. In yet another embodiment, the lateral position of the two switches has significance. For example, the two mechanical switches are on the top surface or edge of a temple. By pushing the switch closer to the lens holder, the volume of the speaker in the glasses goes up; and by pushing the switch further away from the lens holder, the volume of the speaker goes down. In another example, the two switches are under the two ends of a piece of materials, such as a rocker-lever, which can be plastic. Rocking the plastic piece forward is an increment motion, and rocking the plastic piece backwards is a decrement motion.

[000362] The present invention provides different embodiments of glasses that can be applied to multiple functions. With a user wearing such a pair of glasses, it would be more difficult for a third party to know the specific function or reason the user is wearing the glasses for. Regarding the locations of the electrical components for the multiple functions, different embodiments range from all of the components in the glasses to the glasses primarily functioning as a headset.

[000363] FIG. 36 shows one embodiment of the invention with a pair of glasses 5100 having speakers. The glasses 5100 include a first lens holder 5102 and a second lens holder 5104. Both lens holders are for receiving lenses. The first lens holder 5102 has a first side and a second side. The second lens holder 5104 also has a first side and a second side. The pair of glasses has a bridge element 5106. The bridge element 5106 is coupled to the first side of the first lens holder 5102 and the second side of the second lens holder 5104. In one embodiment, the lens holders and the bridge element are not separate pieces, but are an integral piece.

[000364] The pair of glasses 5100 also includes a first temple 5108 and a second temple 5110. The first temple 5108 is pivotally secured to the second side of the first lens holder 5102 through a joint. And, the second temple 5110 is pivotally secured to the first side of the second lens holder 5104 through another joint.

[000365] In a number of embodiments, the glasses include one or more electrical components partially or fully embedded in the glasses. An electrical component can be a resistor, capacitor, inductor, transistor or other electrical part, other than just a conductor or a wire allowing current to flow between or among electrical components. An electrical component can also be more complicated such as an electrical circuit or an integrated circuit.

[000366] FIG. 36 shows one embodiment of the glasses 5100 with electrical components that include two speakers, each at least partially embedded in the glasses. The speakers can be used to enhance the hearing of the user wearing the glasses. In one example, each speaker, such as speaker 5112, is in one of the temples, such as temple 5110, of the glasses 5100. Each speaker is closer to one end of the temple than the other end. In the embodiment shown in FIG. 36, each speaker is closer to the end of the temple that is in the vicinity of the lens holder or the hinge or the joint of the glasses, instead of the end that is typically not attached to a hinge. The end of a temple that is typically not attached to a hinge can be known as the free end of that temple. The speakers can be partially embedded in the glasses. For example, the mouth of each speaker, where audio signals propagate from and where sometimes there are small holes on a sheet of material, can be exposed and not totally covered up by the temple.

[000367] In the embodiment shown in FIG. 36, both speakers are embedded in the glasses, and the speakers output audio signals in the outward direction. In another embodiment, the speakers output audio signals in the inward direction. For example, the output of the speakers can be facing inwards, towards the user.

[000368] The speakers can be embedded in the glasses in a number of ways. For example, each speaker can be first assembled onto or electrically coupled to a circuit board, which includes additional electrical components for the glasses. The glasses can be made of plastic (e.g., plastic frames). With the corresponding speaker, each circuit board can be shaped to fit, for example, into a temple of the glasses. Each circuit board with a speaker is placed into a mold. Then, hot, molten plastic is injection molded around each circuit board with the speaker to form the two temple pieces of the glasses. To

reduce weight, the wall of the glasses can be made relatively thin through injection molding techniques.

[000369] In another embodiment, the glasses have metallic frames. For example, the frames can be made of Titanium, which is a relatively light metal. Also, Titanium is relatively non-conductive and strong, and is quite immune to corrosion. Further, Titanium can be anodized or heat colored.

[000370] For glasses with metallic frames, to prevent circuits from being shorted or to reduce leakage current, one embodiment provides an insulating layer between a circuit board in the glasses and the corresponding metallic frame. One example of an insulting layer is a tape to encapsulate the electrical components. The tape is non-conducting so as to provide insulation and, to a certain degree, can also provide mechanical stiffness. One way to make such a temple is to have two sheets of the metal die-stamped to form the two halves, or the two faces of a temple piece. A circuit board with a speaker is made to fit into the space between the faces. Then, two die-cut pieces of tape can cover the top and the bottom surfaces of the circuit board. The board and the speaker with the tape are sandwiched between the faces to form the temple. The tape can be double-sided sticky tapes, with one side sticking to the circuit board, and the other side sticking to the temple. An adhesive can be used to glue the two faces of the temple piece together.

[000371] In yet another embodiment, the frames are made of hard rubber. The frames can be manufactured in an approach similar to injection molding techniques, with circuit boards and/or speakers inserted into the mold along with the rubber at the time of molding.

[000372] Different types of speakers can be used, such as, standard, fixed-magnet/moving coil speakers; speakers with fixed-coil and a steel diaphragm; piezo-electric speakers; and electrostatic speakers.

[000373] In one embodiment, the glasses further include a tube, such as a plastic tube, extending from each speaker, such as tube 5114 from speaker 5112. Each tube serves to guide sound generated by its corresponding speaker to one of the ears of the

user. In one embodiment, each tube extends from its speaker to the opening of an ear canal of the user.

[000374] FIG. 37 shows an embodiment where a tube 5114 is located on the outside of a temple 5110. In another embodiment, the tube can be on the inside of a temple.

[000375] In one embodiment, a tube can be rotated, such as from along the temple (behind a temple if the tube is on the inside of the temple) to being downward at an angle towards one of the ears of the user, such as the position shown in FIG. 37. To increase flexibility, the tube can be attached to a rotating disk 5116, which allows rotation about the corresponding speaker.

[000376] In another embodiment, the tube is malleable. This allows the tube to be placed in different positions.

[000377] In one embodiment, the length of the tube is adjustable. FIG. 38 shows such an embodiment of a pair of glasses with a retractable tube 5118. In the figure, the tube is shown to be in its extended position. As an example, the retractable tube 5118 can be retracted into the corresponding temple. As another example, the retractable tube 5118 can retract on itself (e.g., telescoping).

[000378] In one approach, there also is a plug 5115 at the end of the tube 5114 for inserting into an ear of the user, as shown in FIG. 37. The plug 5115 can be an ear bud. The plug 5115 can provide a cushion of foam rubber or other materials. Such materials give comfort and/or enhance sound coupling to the ear canal.

[000379] In one embodiment, each ear bud is individually made based on an impression of the user's corresponding ear canal. In another embodiment, each ear bud is custom fitted into the corresponding ear of the user.

[000380] In another approach, there is a funnel at the output of a speaker. FIG. 39 shows the cross section of such a funnel from a speaker 5120 at a temple region of the glasses. As shown in FIG. 39, the speaker 5120 sits on a speaker frame 5122, and the speaker 5120 is electrically connected to a circuit board 5124. As sound is generated from the speaker 5120, the sound propagates to a tube 5126 through a structure in the

shape of a funnel 5128. Such a structure can help guide the sound to the tube 5126 (i.e., improved sound coupling). Also, FIG. 39 shows the tube 5126, which can be the tube 5114 shown in FIG. 37, mounted onto the temple region of the glasses with a circular lip 5130. Such a lip 5130 allows the tube 5126 to rotate relative to the glasses. In the embodiment shown in FIG. 39, the speaker 5120 is embedded in the glasses. Also, in FIG. 39, the tube 5126 is at the front side of the speaker 5120. In another embodiment, a tube can extend from the back side of the speaker to couple the sound from the speaker to an ear.

[000381] In the embodiment of the glasses with two speakers, the two speakers can also be electrically connected by a conductor or an electrical wire, with the conductor linking the speakers through the glasses, such as through the lens holders of the glasses. FIGs. 40A-40B show an embodiment of the wire 5130, with FIG. 40A illustrating a hinge 5132 of the glasses in the extended position, and FIG. 40B illustrating the hinge 5132 partially closed. As shown in the two figures, the wire 5130 is embedded in a temple 5134 to connect to the speaker in that temple. The wire 5130 extends from the temple 5134 to a lens holder 5136, and then to the other temple of the glasses to connect to the speaker in the other temple.

[000382] Referring back to FIG. 36, electrical components in the glasses can also include at least one microphone 5098, which can be located at a temple 5110, closer to the hinge than the free end of that temple 5110. The microphone 5098 receives audio signals. For glasses with hearing enhancement capabilities, the audio signals are modified or enhanced (to be further described below), and then sent to the speaker(s) in the glasses for the user to hear. In the embodiments that do not include plugs or ear buds that plug the ear canals of the user, but may still include tubes guiding sound from speakers to each ear, the user can hear both the enhanced sound based on hearing enhanced electrical components and sound directly from the ambient environment.

[000383] In another embodiment, there can be two microphones. Each microphone can, for example, be located close to one hinge of the glasses. The microphone close to the left hinge can be electrically connected to the speaker at the left temple, and the microphone close to the right hinge can be electrically connected to the speaker at the

right temple. The one or more microphones can be directional, more preferential towards signals in specific directions. For example, the microphone close to the left hinge can be more preferential towards signals coming from the left, and the microphone close to the right hinge more preferential towards signals from the right.

[000384] In one embodiment, to reduce the weight of the glasses and/or to enhance the ease of aesthetic design of the glasses, some of the electrical components are not in the glasses. Instead, they are in a base or a portable device carried or worn by the user. A number of embodiments regarding a base have previously been described in U.S. Patent Application No. 10/964,011, entitled "TETHERED ELECTRONIC COMPONENTS FOR EYEGLASSES," and filed October 12, 2004, which is hereby incorporated by reference. In embodiments with the base, the base is tethered, or connected with a wire, to the glasses. In embodiments with the portable device, the portable device is electronically coupled to the glasses or to the base (if there is a base) wirelessly or through a wired connection.

[000385] FIG. 41 shows one embodiment of the invention with a pair of glasses 5150 having speakers. The glasses 5150 can be wirelessly coupled to a portable device 5152. In this embodiment, there can also be one or more microphones 5154 wirelessly coupled to the glasses. As an example, FIG. 41 shows the microphone 5154 in a package that can include a clip 5156 to attach the microphone 5154 to a piece of clothing of the user, such as to one of the lapels on a jacket of the user. In such a wireless embodiment, the glasses 5150 also include a wireless transceiver for connection to the portable device 5152 and/or the microphone 5156.

[000386] FIGS. 42A-42B show examples of different embodiments illustrating some of the electrical components for wireless connections to, or for a wireless transceiver in, a pair of glasses. In FIG. 42A, a high frequency or RF antenna 5170 wirelessly captures high frequency or RF signals for RF transceiver circuits 5172. If the transceiver circuits are for a conventional superheterodyne system, the transceiver circuits 5172 mix the RF signals down to IF signals. Then the IF signals are processed by baseband circuits to form digital outputs. Digital outputs from the baseband circuits are coupled to a processor 5174 for further processing. The baseband circuits can be incorporated in the processor,

or can be separate from and coupled to the processor. Outputs from the processor 5174 are fed to a D-to-A converter 5176 to generate audio signals for a speaker 5178.

[000387] Similarly, audio analog signals from a microphone 5180 can be fed to an A-to-D converter 5182 to generate digital signals for the processor 5174 and then to the baseband circuits and the RF transceiver circuits 5172. The digital signals are then up-converted by the RF transceiver circuits 5172 and wirelessly transmitted by the antenna 5170.

[000388] In another embodiment, digital conversion is moved closer to the antenna. For example, instead of mixing RF into IF signals, the RF transceiver circuits directly perform digital conversion from the RF signals.

[000389] High frequency filters can be used at the front end of the RF transceiver circuits for the RF signals. In one embodiment, to save space, FBAR (film bulk acoustic resonator) duplexer is employed. A set of piezoelectric filters can be used to separate incoming and outgoing signals. For cell phone operation (which will be further described below), such filters can enable a user to hear and speak simultaneously.

[000390] FIG. 42B shows another example of some of the electrical components in or tethered to a pair of glasses for wireless connections. This embodiment does not depend on digitizing signals. A speaker 5190 and a microphone 5192 are connected to an analog interface circuit 5194, which is coupled to a RF transceiver circuit 5196 and an antenna 5198. For the speaker application, the transceiver circuit 5196 converts the RF signals down into IF signals, which are converted by the analog interface circuit 5194 into analog signals for the speaker 5190. Similarly, for the microphone application, its analog signals are converted into the IF signals by the analog interface circuit 5194 to be up converted by the RF transceiver circuits 5196 into RF signals for the antenna 5198. These types of wireless connection circuitry are suitable, such as, for simple radios, analog cell phones, CB radios, walkee-talkees, police radios, intercom systems, or hearing enhancement applications.

[000391] Note that in the above examples shown in FIGs. 41A-41B, signals from the microphones are transmitted by a wired connection, instead of a wireless connection.

[000392] As described above, in different embodiments, some of the electrical components are not in the glasses. Instead, they are in a base or a portable device, which can be carried by the user. The portable device can be electrically coupled to the glasses through a wired connection. In such approaches, the glasses also include at least one connector to receive an electrical wire from the base or the portable device. The connector can be at the free end of one of the temples of the glasses, or the connector can be at another location of the glasses. Different types of standard or non-standard connectors can be used and have previously been described in U.S. Provisional Application No. 60/583,169, filed on June 26, 2004, which is hereby incorporated by reference.

[000393] In one embodiment, a standard cylindrical plug connector is located at one end of a temple. From a different perspective, the temple molds around the end of the plug. FIG. 43 shows one such embodiment. The plug 5220 can be a standard audio connector or a 3-wire or three terminal plug, such as a 3.5 mm male stereo mini-phone plug. The 3 wires for such a plug are typically one for ground, the other two applicable for two signals, such as signals for two speakers to create stereo effects. FIG. 43 also shows the three wires 5222, 5224 and 5226, inside the temple, extended from the plug 5220. These wires are for connection to electrical components in the glasses.

[000394] In one embodiment, the cylindrical plug 5220 shown in FIG. 43 can be covered, such as with a cap or a cover, to protect, encapsulate or shroud the plug 5220. Or, at least a portion of the plug is covered. Such covering can be for esthetic reasons, or can be to prevent the plug 5220 from scratching the face of the user (if the plug has relatively sharp edges) when the user is putting on the pair of glasses.

[000395] Instead of a three terminal plug, other types of standard cylindrical plugs applicable to different embodiments of the present invention include, for example, a serial connector with 3 pins, typically one for ground, one for transmitting data (Tx) and the third for receiving data (Rx); or a 2-wire connector, one served as ground, the other for carrying signals, such as power and modulated signals.

[000396] Instead of a standard connector, a connector can be a non-standard connector. FIG. 36 shows a non-standard connector 5113 at the free end of one of the temples 5110. Instead of having a connector at the free end of a temple, a connector can be at another location of the glasses. FIG. 44 shows an example of a non-standard connector 5230. The connector 5230 includes one or more conductive pads, 5232 and 5234, on the top side of a temple 5236. The connector 5230 is designed to receive another connector 5240 that grabs onto or attaches around the side of the temple. There can be an indentation 5242 on the temple 5236 to receive the other connector 5240. The other connector 5240 can include a top 5244 and a bottom 5246 clip. There are a number of conductive pads or sheets inside the other connector 5240. The indentation 5242 provides alignment for connection. When attachment is at the indentation 5242, the conductive pads, 5232 and 5234, at the temple 5236 will be in contact with the conductive pads or sheets in the other connector 5240. There can also be another indentation 5248 at the temple 5236 to receive the bottom clip 5246. This can further enhance the alignment process and assist with securing the connection.

[000397] In FIG. 44, the other connector 5240 is tethered to a plug 5250, which can be inserted into a portable device 5252. The portable device 5252, for example, can be a cell phone. The portable device can include personal digital assistant (PDA) functionalities. This type of non-standard clip-type connector could be relatively easily applied to the temple with one hand, for example, while the user is driving a car.

[000398] In the wired embodiment shown in FIG. 44, a microphone does not have to be in the glasses. As shown in FIG. 44, a microphone 5254 can be attached to the wire 5256 that connects the glasses to the portable device 5252.

[000399] FIG. 45 shows one embodiment of the invention with a pair of glasses 5260 having a microphone 5262 coupled to a wire. The wire is connected to a portable device 5264 through a plug 5266, and to the glasses 5260 through a jack 5268. The portable device 5264 can be in a shirt pocket as shown. There can also be a clip 5265 to attach the wire to an article of clothing worn by the user.

[000400] In one embodiment, the glasses include electrical components for hearing enhancement functionalities. The electrical components enhance audio signals, such as audio signals received by a microphone at the glasses. Then the enhanced signals are sent to the speakers for the user to hear. In one embodiment, the hearing-enhancing electrical components include a processor. The processor can be the processor 5174 shown in FIG. 42A. In this embodiment, the hearing-enhancing functionalities are performed through digitizing the corresponding audio signals. Then the processor, using digital signal processing techniques, operates on the digitized signals, such as boosting specific frequency bands.

[000401] In another embodiment, the hearing enhancing functionalities are provided by analog filter circuits. For example, analog filter circuits, using analog processing techniques, operate on the audio signals, such as boosting specific frequency bands.

[000402] In one embodiment, one hearing enhancement function includes amplifying the audio signals received in a frequency range between 500 Hz to 8 kHz. Typically, a user's hearing impairment is not the same across all audio frequencies. For example, in English, the user might be able to easily pick up the sound of vowels, but not the sound of consonants, such as "S" and "P". FIG. 46 shows a number of embodiments regarding frequency-dependent amplification of the received audio signals.

[000403] One approach for frequency-dependent amplification focuses on amplifying the higher audio frequency ranges. This approach assumes that hearing degradation typically starts at the higher audio frequencies, such as above 2 to 3 kHz. Hearing may need more assistance at the higher audio frequency range. For example, the audio signals received by a microphone can be amplified by 30 dB in the frequency range from 2 kHz to 4 kHz. Or around the entrance of the ear, the audio signals in that frequency range can be amplified to reach sound pressure level ("SPL") to about 80 dB. For lower audio frequencies, such as below 2 kHz, the amplification can be lower, such as 10 dB. Or for frequencies lower than 500 Hz, the maximum SPL does not have to be higher than 55 dB.

[000404] Another frequency-dependent amplification approach focuses on amplifying an audio frequency range that typically contains most of the information in everyday communication. For example, about 70% of the information in everyday human communication can be within the frequency range of 1 to 2 kHz. The frequency range that is selected to be amplified can be such a frequency range. Other frequency ranges are not selected for amplification.

[000405] There are benefits in embodiments where the ear canal remains open, with no plug inserted into the ear. For example, the user can be hearing the audio signals directly from the sender (i.e., without assistance provided by the hearing enhancement electrical components). If the embodiments further implement frequency-dependent amplification, for frequencies not within the ranges selected for amplification, the user can hear those signals directly from the sender. Lower frequencies, such as those below 2 kHz, are typically louder. Also, frequencies in the range, such as from 2000-3000 Hz, are typically in the natural resonance of the ear canal, which is typically around 2700 Hz. As a result, the intensity of these frequencies would be increased by about 15 dB. Further, with no plug inserted into the ear, there is typically no occlusion effect due to, for example, the user's own voice.

[000406] However, in embodiments with the ear canal not plugged/blocked/covered, signal processing speed of the frequency enhancement electrical components can be important. In such embodiments, the user can be hearing the audio signals both from the sender and the glasses' speakers. To prevent echoing effect, signal processing speed for hearing enhancement cannot be too low. Typically, the user would not be able to distinguish two identical sets of audio signals if the difference in arrival times of the two signals is below a certain delay time, such as 10 milliseconds. In one embodiment, the hearing enhancement signal processing speed is faster than such a delay time.

[000407] In one embodiment, the user has the option of manually changing the amplification of the system. The system can have a general volume controller that allows the user to adjust the output power of the speaker. This adjustment can also be across certain frequency bands. For example, there can be three volume controls, each for a selected frequency band.

[000408] In another approach, amplification across frequencies is tailored to the hearing needs of the user. This tailoring can be performed through calibration. FIG. 47 shows a number of embodiments regarding calibration of a user's hearing, for example, across various frequencies and/or for different amount of amplification. Calibration enables the glasses to determine (e.g., estimate) the hearing sensitivity of the user. Through calibration, the user's hearing profile can be generated.

[000409] The user can perform the calibration by himself/herself. For example, the audio frequencies are separated into different bands. The glasses generate different SPL at each band. The specific power level that the user feels most comfortable would be the power level for that band. Alternatively, the glasses could generate different tones in different frequency bands. The user could compare the tones and rate the perceived loudness. In this process, the glasses can prompt the user and lead him through the process interactively. Based on the measurements, the glasses could create a calibration curve, which becomes the personal hearing profile for that user. After calibration, signals received in different bands, such as by a microphone in the glasses, will be amplified or attenuated according to the hearing profile.

[000410] In another embodiment, calibration can be done through a web site. The web site can guide the user through the calibration process. The user can be sitting in front of a computer terminal that is connected through the Internet to the web site. The terminal includes a headset that produces audio sounds. Alternatively, the user could be wearing the glasses that are connected through a cable to the sound card of the computer. The headset (or the glasses) generates different SPL at different frequency bands to test the user's hearing. The specific power level that the user feels most comfortable would be the power level at that band for the user. After testing is done for all of the bands, based on the power levels for each band, the web site creates and stores the user's personal hearing profile. Alternatively, the calibration procedure could be done off-line, with software provided on a storage device, such as a disc. The software could be installed on the user's computer. After installation, the software can guide the user through the calibration process.

[000411] Note that the different calibration processes can also be done by a third party, such as an audiologist, for the user.

[000412] The user's hearing profile, which typically is represented as digital data, can be stored in the glasses, in a base, or in a portable device. After calibration, the hearing profile can be downloaded, from, for example, the above described terminal, into the glasses wirelessly, such as through Bluetooth, infrared or other wirelessly interconnection technologies, or through a wired connection. The hearing profile can alternatively be stored in a portable media storage device, such as a memory stick. The memory stick could be inserted into the glasses, the base, the portable device, or some other audio generating device, which desires to access the hearing profile and personalizes the amplification across frequencies for the user.

[000413] The glasses (or the base, or the portable device) can also periodically alert the user for re-calibration. The period can be, for example, once a year. Also, the calibration can be done in stages so that it is less onerous and/or less obvious that the user is wearing a hearing enhancing device.

[000414] In another embodiment, there can be many pairs of glasses. Each pair amplifies the received audio signals in a preset frequency range by a preset amount. For example, two pairs amplify two respectively different preset frequency ranges by 20dB. In another set, each pair provides different amount of amplification for the received audio signals in the same preset frequency range. For example, the different amount of amplification ranges from 20 to 40 dB at 5 dB intervals for the preset frequency range of 2500 to 4000 Hz. At a store, a consumer can try out different glasses with different preset amplifications at the same or different preset frequency ranges, before buying the one the consumer prefers.

[000415] In another embodiment, there is an assortment of standard hearing profiles, such as 20 or so. The user would just pick the one that sounds best.

[000416] If the glasses include hearing enhancement capabilities, the hearing enhancement functions might be on continuously for a long duration of time, power consumption can be an issue. In yet another embodiment, the glasses also include

electrical components that are for managing power consumption of other electrical components in the glasses, such as the components to enhance hearing or other functionalities in the glasses. The electrical component can be a power controller, a microprocessor, or the processor 5174 in FIG. 42A. Such glasses can include power management software applications/processes to manage power consumption of the glasses.

[000417] FIG. 48 shows a number of embodiments for managing power consumption of the glasses. One embodiment includes a manual on/off switch, which allows the user to manually turn off the electrical components in the glasses as he desires. The on/off switch may not have to be on the glasses. It can be on a base or a portable device tethered to the glasses.

[000418] The operation of the electrical components can be on-demand. For example, the on/off switch can be voice activated. The glasses are trained to recognize specific recitation, such as specific sentences or phrases, and/or the user's voice. To illustrate, when the user says sentences like any of the following, the hearing enhancement capabilities would be automatically turned from the sleep mode to the active mode: What did you say? Louder. You said what?

[000419] In another embodiment of on-demand power management, the glasses can identify noise (e.g., background noise), as opposed to audio signals with information. To illustrate, if the audio signals across broad audio frequency ranges are flat (not deviate more than a preset threshold amount), the glasses could assume that the received audio signals are noise. In another approach, if the average SPL of the received audio signals is below a certain level, such as 40 dB, the glasses would assume that there are no audio signals worth amplifying. In yet another embodiment, when the amplitude or the power level of the received audio signals is below a certain threshold for a duration of time, at least some of the electrical components in the glasses can be deactivated. This duration of time can be adjustable, and can be, for example, 10 seconds or 10 minutes. In another approach, only when the signal–to-noise ratio of the audio signals in the ambient is above a preset threshold, would the deactivated electrical components be activated (i.e., awakened from the sleep mode, the reduced power mode or the standby mode). In any

case, to deactivate, the glasses or the hearing enhancement capabilities can be placed into a sleep mode, a reduced power mode or a standby mode.

[000420] Another approach to manage power consumption can make use of a directional microphone. This approach can improve the signal-to-noise ratio. The gain at specific directions of such a microphone can be 20 dB higher than omni-directional microphones. The direction of the directional microphone can vary with application. However, in one embodiment, the direction of the directional microphone can be pointing forward or outward away from the user. The assumption is that the user typically faces the sender of the message, and thus it is the audio signals in front of the user that should be enhanced.

[000421] In yet another embodiment of power management, the amplification of the glasses on at least a range of frequencies depends on the ambient power level, or the noise level of the environment of the glasses. One approach to measure the noise level is to measure the average SPL at gaps of the audio signals. For example, a person asks the user the following question, "Have you left your heart in San Francisco?" Typically, there are gaps between every two words or between sentences or phrases. The glasses measure, for example, the root mean square ("rms") value of the power in each of the gaps, and can calculate another average among all of the rms values to determine the noise level. In one embodiment, the glasses increase the amplification so as to ensure that the average power of the output audio signals by its speaker(s) is higher than the noise level by a certain degree. For example, the average SPL of the output audio signals from the glasses is 20 dB above the noise level.

[000422] In another embodiment, if the average power level of the environment or the ambient noise level is higher than a preset threshold value, signal amplification is reduced. This average power level can include all the audio signals received by, such as the microphone(s) of the glasses. The rationale is that if the environment is very noisy, it would be difficult for the user to hear the audio signals from the other person anyway. As a result, the glasses should not keep on amplifying the audio signals independent of the environment. To illustrate, if the average power level of the environment is more than 75 dB, hearing enhancement amplification is reduced, such as to 0 dB.

[000423] In yet another embodiment, the glasses further include automatic activation/deactivation mechanism controlled by a sensor that determines whether the user is wearing the eyeglasses. A number of such being-worn sensor embodiments have previously been described, such as in U.S. Patent Application No. 11/078,855, filed March 11, 2005, entitled, "EYEWEAR WITH RADIATION DETECTION SYSTEM," which is hereby incorporated by reference.

[000424] A number of embodiments have been described on hearing enhancement. In other embodiments, at least one electrical component in the glasses is for generating audio signals that do not originate from signals captured by the microphone(s) in the glasses. These audio signals can be known as other audio signals. FIG. 49 shows different embodiments of the sources of such other audio signals. These signals can originate from relatively private sources or public sources.

[000425] In one example of signals from private sources, the other audio signals originate from a phone call received by the glasses. Such a pair of glasses can include wireless communications electrical components of a phone. The phone can be a mobile telephone, a cordless phone, a speaker phone, a CB radio, a walkee-talkee, an intercom system or other types of phone. The wireless communications electrical components can be located in at least one of the temples of the glasses. Some of the electrical components of the phone can be in a base or in a portable device wired or wirelessly coupled to the glasses. The glasses can pick up signals from a caller, and the speaker(s) in the glasses produce the audio signals, or a representation of the audio signals, from the caller.

[000426] There can be an operation indicator on the frame of the glasses to indicate that there is an incoming call. The indicator can be based on, for example, sound, light or vibration. In one embodiment, the indication is based on light, and is located on the inside of a temple close to the hinge of that temple. Such an operation indicator can be implemented in a variety of ways, such as with a light emitting diode (LED). There can be one LED coupling to more than one optical fiber, with each optical fiber guiding the light from the LED to different areas of the frame. In the case of a LED, the operation indicator is a light source, and can produce light of the color of the LED. In another

embodiment, the operation indicator could represent a small text display, such as a liquid crystal display (LCD). The indicator can also be a signal light.

[000427] In one embodiment, activation/deactivation of the phone is based on whether an incoming call is present. For example, on receiving an incoming call, the glasses can automatically activate (or wake-up) to engage in wireless communication. Activation/deactivation can also be triggered by a button provided on the frame of the glasses. The button can serve to accept or drop a call. One advantage of providing activation/deactivation is that the glasses are able to be power managed so that power consumption is reduced and the life of power sources, such as battery life, is extended.

[000428] FIG. 50 is a flow diagram of call processing 5300 according to one embodiment of the invention. The call processing is performed using glasses disclosed in different embodiments that have wireless communication capabilities. For example, the glasses can be based on the glasses shown in FIGS. 36 or 44.

[000429] The call processing begins with a decision 5302 that determines whether a call is incoming. When the decision determines that a call is not incoming, then the call processing waits for such a call. Once the decision 5302 determines that a call is incoming, the glasses are activated 5308. Here, the wireless communications capability of the glasses is activated (e.g., powered-up, enabled, or woken-up). The user of the glasses is then notified 5310 of the incoming call. In one embodiment, the notification to the user of the incoming call can be achieved by an audio sound, such as a ringer, produced by the glasses (via a speaker). Alternatively, the user of the glasses could be notified by a vibration (such as by a base tethered to the glasses), or a visual (e.g., light) indication provided by the glasses.

[000430] A decision 5312 then determines whether the incoming call is to be answered. For example, the user can push a button to indicate that the user wants to answer the call. When the decision 5312 determines that the incoming call is not to be answered, the glasses can activate a voice message informing the caller to leave a message 5314 or instructing the caller as to the unavailability of the recipient.

[000431] On the other hand, when the decision 5312 determines that the incoming call is to be answered, the call can be answered 5316 at the glasses. The user of the glasses is accordingly able to communicate 5320 with the caller by way of the glasses and, thus, in a hands-free manner.

[000432] A decision 5322 then determines whether the call is over (completed). When the decision 5322 determines that the call is not over, the call processing returns to repeat the operation 5320 and subsequent operations so that the call can continue. On the other hand, when the decision 5322 determines that the call is over, then the glasses can be deactivated 5324, and the call is ended. The deactivation 5324 of the glasses can place the glasses in a reduced-power mode. For example, the deactivation 5324 can power-down, disable, or sleep the wireless communication capabilities (e.g., circuitry) of the glasses. Following the operations, the call processing for the particular call ends.

[000433] In an embodiment where the glasses operate as a wireless headset of a portable device (e.g. a cell phone), a wireless link can be established between the headset and the portable device if the incoming call is to be answered. The wireless link is, for example, a radio communication link such as utilized with Bluetooth or Wi-Fi networks. Thereafter, communication information associated with the call can be exchanged over the wireless link. The portable device receives the incoming call, and communicates wirelessly to the glasses such that communication information is provided to the user via the glasses. When the decision determines that the call is over and the glasses are deactivated, the wireless link is also ended 5326.

[000434] Regarding the hearing enhancing capabilities described, in one embodiment, when there is an incoming call, hearing enhanced capabilities are deactivated, and the glasses receives the incoming call. In another embodiment, when the user wants to receive the incoming call, one or more embodiments of the hearing enhanced capabilities enhance the audio signals from the incoming call.

[000435] One advantage of cell phones is that you can make calls anywhere you can get a signal. However, one disadvantage is that you might be making a call in a noisy

environment. In one embodiment, the glasses also include electrical components for noise cancellation. Such noise cancellation functionalities can be activated during a phone conversation.

[000436] In one approach, noise cancellation is achieved through a first and a second directional microphones. The first one points at the user's mouth, and the second one points away. For example, the first one can be at one of the hinges as shown in FIG. 36, whose directionality favors sound arriving from the user. There can also be a tube from the first microphone to or towards the mouth of the user, to guide the sound from the mouth to the microphone. The second microphone can be in the vicinity of the other hinge, whose directionality favors sound arriving in front of or outside of the user. Signals received from the second microphone are subtracted from signals received from the first microphone before the audio signals are further processed for transmission as the message from the user.

[000437] Referring back to FIG. 49, other examples of audio signals originating from private sources include the other audio signals originating from different types of audio players, such as televisions, stereo systems, media asset players, or radios. The audio players can be in the glasses. In other embodiments, at least some of the electrical components of the audio players can be in a base tethered to the glasses, or in a portable device wired or wirelessly coupled to the glasses. For example, the other audio signals can originate from a portable device, which might produce, receive or play audio content. The audio content is then transmitted to the eyeglasses in a wired or wireless manner. The eyeglasses serve as a receiver of the audio content from the portable device and reproduce the audio signals for the user.

[000438] The glasses with the call processing ability perform two-way communications. In the embodiments of the glasses operating as audio players, the glasses perform one-way communications (or at least substantially one-way communications).

[000439] As an example of audio player being a stereo system, a pair of glasses includes electrical components of a headset for wirelessly receiving audio signals.

Assume the user is working in the backyard and the stereo system is in the living room. The music from the stereo can be wirelessly transmitted to the glasses or to a portable unit carried by the user, which can re-transmit the music to the glasses wired or wirelessly. The speakers in the glasses can generate the music for the user to enjoy. Based on this technique, the user can enjoy the music without the need to crank up the volume of the stereo system.

[000440] In another example of an audio player, a pair of glasses includes a multimedia asset player, such as a MP3 player.

[000441] FIG. 51 shows some of the electrical components for an MP3 player 5340 according to one embodiment of the invention. The player 5340 includes a speaker 5342 and a data bus 5343, which facilitates data transfer among, for example, a processor 5344, a storage device 5345, and a coder/decoder (CODEC) 5346. The processor 5344, which can be a microprocessor or controller, controls the operation of the player 5340. The storage device 5345 stores the multimedia assets, such as MP3 files, or other types of media data that are appropriately formatted. In one example, the MP3 files are digitally encoded songs or other types of audio signals. The storage device 5345 can include a number of separate storage elements. For example, the device 5345 can be a flash memory device, or a minidisk device, and a cache, which can improve the access time and reduce power consumption of the storage device 5345. The storage device 5345 typically also includes a Read-Only Memory (ROM), which stores programs, utilities or processes to be executed in a non-volatile manner. The player 5340 can also include a RAM, such as for the cache.

[000442] Once a media asset, such as a song, is selected to be played, the processor 5344 supplies the asset to the CODEC 5346, which decompresses the asset and produces analog output signals for the speaker 5342. In one embodiment, the bus 5343 is also coupled to an input/output device 5347, which could, for example, allow a user to upload songs in the glasses to an external instrument, such as a computer; or download songs from the instrument to the glasses.

[000443] There are different approaches to select a song. In one embodiment, the media assets/songs can be categorized in the asset player. The categorization can be based on the names of artists, albums and/or songs. The categorization can be hierarchical, with multiple levels in the hierarchy. To illustrate, assume that there are three levels. The top level can be the name of a singer; the second level can be the time periods when the assets were produced, and the third level can be the names of the songs. The entries, such as the name of the singer, can be abbreviated. There can be a small display and a control knob to allow a user to scroll down entries in a level. By pushing the knob, the user selects an entry, which can lead the user to a lower level. There can be an entry for moving up a level also. In another embodiment, the display is a touch-screen display, allowing entries to be entered directly on the display. In yet another embodiment, entries can be selected based on voice recognition.

[000444] All of the electrical components of the asset player, such as the MP3 player, do not have to be fully embedded in the glasses. In one embodiment, at least a portion of the MP3 player can be coupled to the glasses through a connector at the glasses. FIG. 52 shows a card connector 5350 to receive a card 5352, such as a removable media card (e.g., memory card). There can be a cover 5354 to secure the media card in place after it is inserted into the card connector. The cover 5354 can also protect the card once the card is in the card connector. The connector 5350 can be, for example, at a broad side of a temple 5356, as shown in the figure. The card can be for an MP3 player. It can be a memory card for a MP3 player, with the speaker of the player in the temple 5356. The speaker can play the multimedia assets accessed from the card through the connector. In another embodiment, some of the electrical components of the different types of audio players can be in a portable device, wired or wirelessly coupled to the glasses.

[000445] FIG. 36 shows two speakers, one speaker at one of the temples. In embodiments regarding generating other audio signals, the two speakers can provide stereo effects. There can also be more than one speaker at each temple. The glasses can provide four or more speakers to give a high fidelity sound or a surround sound effect. For example, each temple can include one speaker close to the hinge, and one speaker close to the tip of that temple or its temple tip. In one embodiment, a temple tip is

separable from its temple. In other words, the temple tip is a replaceable part. In another embodiment, a temple tip is an integral part of its temple. The different speakers can generate different portions or sections of the sound. Further, if a base or a portable electronic device is coupled to the glasses, the base or the portable electronic device can contain another speaker, such as a base or woofer speaker. Such embodiments enable the glasses to provide a personal high-fidelity sound or a surround-sound environment.

[000446] In one embodiment, the audio player can be a radio. The glasses include the electrical components of a radio. There can also be switches on the glasses to control the operation of the radio. For example, one switch is an on/off switch, which can also change the volume of the radio. This switch can be a roller switch or can be based on two switches (one for moving up and the other moving down). Another switch can be a push button, which when pushed will reset the radio to a specific station, such as 88 MHz. A third switch is another push button, which when pushed will scan up to the next station, relative to the previous station. Different types of control knobs or switches will be further described below.

[000447] In one embodiment, the radio is a personalized radio that is personalized to the user. For example, the radio keeps track of at least one preference of the user regarding audio signals from the radio received by the user. FIG. 53 shows a process 5375 according to one embodiment for a personalized radio. Initially, a pair of glasses according to the invention receives 5377 a piece of music from a radio station. That piece of music is stored 5379 in a buffer or a temporary storage area. This temporary storage area can be in the glasses or tethered/coupled to the glasses. The piece of music is also sent 5381 to a speaker in the glasses.

[000448] Assume that the user likes the music. Based on a preference indicator, the user shows his preference. After the glasses receive 5383 an indication that the user likes the music, the glasses determine 5385 the song corresponding to the indication. That piece of music can then be moved 5387 from the buffer to a permanent storage area, such as into a flash memory. The beginning and the end of the piece of music can be identified based on additional information embedded with the piece of music. There

can be meta data tied to the music keeping such additional information. With the piece of music stored in the permanent storage, the user can subsequently access it as desired.

[000449] There are different ways to determine the song or the content being played by the radio being the one preferred by the user. For example, one way/rule is that when the user pushes a specific button (a preference button) on the glasses or voices his preference, the song (or media asset or media file) that is being played at that point in time is the one the user likes. Since an operating system can be responsible to send the music to the speaker, the operating system knows what song is being played at that time. Based on the rule, the song of preference is determined when the button is pushed. Another rule is that when the user shows his preference, and there is no song being played at that instance, the song immediately preceding the break is the song of preference.

[000450] In another embodiment, the glasses can get 5389 an identification for the song the user likes. For example, the glasses can ask the user to provide an identification for the piece of music. This identification can be the type of music, the name of the singer/artist, the name of the music, the name of the album or other identification. In another embodiment, there can be meta data embedded, such as in the beginning part of the music (or media asset). Having such meta data embedded is not uncommon for music in digital format. The meta data can include identifications for the music. The glasses can get such identification. Based on the identification, the song is categorized 5391 accordingly, such as grouped with other songs having the same identification. Such categorization process would enhance the ease of accessing the song by the user at a later time.

[000451] In one embodiment, when the user activates the different types of audio players, the hearing enhancement mode is deactivated. In another embodiment, when the user activates the different types of audio players, one or more features of the hearing enhancement capabilities operate on the audio signals from the audio players. In other words, different embodiments of the hearing enhancement capabilities previously described can be activated or deactivated on the audio signals from the different types of audio players.

[000452] Referring back to FIG. 49, regarding public use, the audio signals generated by the speakers can originate from a public source. The public source can be a source that generates the audio signals for many people, or for people in a public environment. For example, the user can be at a conference or a theater. In one embodiment, the glasses can be coupled to the conference microphone or the theater speaker wirelessly, and are capable of capturing the audio signals therefrom. Again, the coupling can be through a portable device wired or wirelessly connected to the glasses. Then the glasses re-generate the corresponding audio signals for the user. Again, different embodiments of the hearing enhancement capabilities previously described can be activated or deactivated on the audio signals from the public sources.

[000453] There can be one or more control knobs or switches at the glasses for controlling the operation(s) of the glasses. FIG. 54 shows a number of attributes 5400 regarding control knobs. The knobs can be of different physical structure 5402. For example, a control knob can be a roller, a switch or a push-button. A control knob serving as an up/down controller can use two buttons (one for up and the other for down), or a roller (rolling in one direction being up and the other direction being down).

[000454] A control knob can include additional intelligence 5404. For example, a push-button control knob can serve different purposes depending on the duration the knob is being pushed. If a user pushes it for more than three seconds, the knob serves as an on-off toggle switch for the glasses. In another example, a knob can serve multiple purposes, and the specific purpose depends on the number of times the knob is pushed non-stop.

[000455] A knob can also be programmed by a user. A user can connect the glasses to a computer and program the knob accordingly. For example, one can program a knob such that if the knob is pushed for more than three seconds, the knob would serve as an on/off switch for the glasses.

[000456] The location 5406 of a control knob can vary for different applications. A control knob can be located on the glasses. A control knob can be on the top, the side

or the bottom of a temple of the glasses. A control knob can be located at the inside of a temple facing the user.

[000457] Assume that there are a number of control knobs and all of them are on the edges of a temple, except one. By being at a position substantially different from other control knobs, this knob can serve a specific purpose. For example, it can be an on/off control knob for all of the electrical components in the glasses.

[000458] In yet another embodiment, a control knob can be located in a portable device wired or wirelessly coupled to the glasses, or in a base tethered to the glasses.

[000459] The number 5408 of control knobs can vary depending on operations. For example, there is an on/off control knob and a volume up/down control knob. If the glasses are used for cell phone headset applications, in one embodiment, there is also an answer/hang-up control push-button. If the glasses serve as a radio, in one embodiment, there is also a channel selection control knob, which can be an up/down controller, like two push buttons. If the glasses serve as a CD player, in one embodiment, there is a play control knob, a stop control knob, and a skip forward/backward control knob. If the glasses serve as a multimedia asset player, such as a MP3 player, in one embodiment, there is a skip-forward/backward-song control knob and a select-song-to-play control knob.

[000460] In a number of embodiments described, a pair of glasses can serve different applications. For such embodiments, a switch on the glasses (a base or a portable device coupled to the glasses) can also serve different functions, depending on the application.

[000461] Different types of switches are applicable for different applications. Additional disclosures on switches are in U.S. Provisional Application No. 60/583,169, filed on June 26, 2004, which is hereby incorporated by reference.

[000462] Regarding power sources for electrical components, in one embodiment, the power sources, which can be batteries and/or solar cells, are in the glasses. In another embodiment, one or more batteries can be inserted into the glasses. The batteries can be of various sizes and types. For example, as shown in FIG. 55A, a coin battery 5420 (e.g. CR1025) can be inserted into the tip section or the free end of one of

the temples 5416. FIG. 55B shows the embodiment shown in FIG. 55A with a bigger coin battery 5422 (e.g. CR2032) inserted into the slot. Since the size of the battery is bigger than the size of the slot, a portion of the battery 5422 sticks out of the slot. FIG. 55C shows another embodiment of the glasses that include a slot/cavity to receive a battery adapter 5426. The slot 5418 in FIG. 55A can be the same as the slot 5424 in FIG. 55C. The adapter 5426 can be the same size and shape of the battery shown in FIG. 55A, and with two terminals, just like the battery. However, the adapter, by itself, is not an energy source. The adapter is connected to a cable 5428, with at least two wires inside, one for each terminal of the adapter. The adapter 5426 is inserted into the cavity 5424 of the glasses, and is coupled through the cable 5428 to a case or a capsule 5430 that holds a battery 5432. The two wires in the cable 5428 are for the two terminals of the battery 5432. The size and capacity of the battery held by the capsule can be bigger than the coin battery, and could be less expensive than the coin battery. In one embodiment, the capsule 5430 holds an AA battery. Note that in one approach, the temple in FIG. 55C is the same as the temple in FIG. 55A. In yet another embodiment, the power sources are in a base or a portable device connected to the glasses through a wire connection, and the power sources can be rechargeable.

[000463] In a number of embodiments, some of the electrical components for hearing enhancement and/or for generating other audio signals are in a base tethered to the glasses. In other embodiments, some of the electrical components are in a portable device, wired or wirelessly coupled to the glasses. In yet other embodiments, all of the electrical components are in the glasses.

[000464] In different embodiments, the glasses can be a pair of sunglasses, auxiliary frames, fit-over glasses, prescription glasses, reading glasses, safety glasses, swim masks, or goggles, such as ski goggles.

[000465] In a number of embodiments, the frames of the glasses have more surface area than frames with minimal structure, such as those frames with lenses connected together by wires. For example, the temples of the glasses can have a taper profile. Each of the temples can be wider or broader when it is close to its corresponding joint. In one embodiment, the temple is wider or broader by spanning across a wider or broader area

longitudinally down, creating a bigger surface somewhat parallel to the face of the user. FIG. 36 shows an example of such an embodiment.

[000466] In another embodiment, there can be a shield at least at one of the edges of each of the lens holders of the glasses. These shields can wrap around, or better conform to the profile of, the face of the wearer. The shields can be opaque. There can be transparent or translucent windows on these shields. To illustrate, in fit-over sunglasses, when worn over a pair of prescription glasses, such shields can go over or cover at least a portion of the pair of prescription glasses. Note that in one embodiment, a pair of glasses does not have to include lenses.

[000467] A number of embodiments have been described with electrical components in the temples of the glasses. In yet another embodiment, at least one electrical component is in other parts of the glasses, such as in a shield, the bridge or a lens holder of the eyeglasses.

[000468] A number of embodiments of glasses have been described where the glasses include hearing enhancement capabilities and can generate one or more types of other audio signals. Note that electrical components for such functionalities can be shared. For example, different functionalities can share the same power source, or the same processor/controller.

[000469] Though a number of embodiments of glasses have been described where the glasses with hearing enhancement capabilities also generate other audio signals, different embodiments of the glasses only have hearing enhancement capabilities. In yet other embodiments, the glasses do not have hearing enhancement capabilities, but generate other audio signals.

[000470] In one embodiment, the glasses function as a headset and are adaptable for different applications, such as hearing enhancement, communication (e.g. phone operation) or listening to other audio signals (e.g. MP3 operation). The user initially can use the glasses as the headset for a phone or an MP3 player. Later, as the user's hearing degrades, the user can use the glasses as the headset for hearing enhancement or hearing boosting. In any event, when a person is using the headset, a third party may

not be able to tell whether the person is having his hearing enhanced, or listening to other audio signals.

[000471] With the glasses functioning as a headset, in one embodiment, the glasses can include a connector and two speakers, one at each temple, both electrically connected through a conductor embedded in the glasses. The conductor can be a wire, similar to the embodiments shown in FIGs. 40A-40B. The connector can be located at the free end of one of the temples, such as the embodiment shown in FIG. 43. The connector can be a standard connector, such as a 3-wire or three terminal plug, or a 3.5 or 2.5 mm male stereo mini-phone plug. The three terminals can be for the two speakers and ground, with both speakers sharing the same ground. In one approach, the positive terminal of the left speaker is connected at the first terminal of the plug, the positive terminal of the right speaker is connected to the second terminal of the plug, and the ground terminals of the speakers are connected to the third terminal of the plug.

[000472] The plug at the glasses can be used to receive stereo signals for the two speakers. The stereo signals can be from a separate audio source, such as an MP3 player or a radio. There can be an audio cord that has a male stereo connector at one end and a female stereo connector at the other. The female connector of the cord is for receiving the plug at the glasses, while the male connector of the cord is for inserting into the headset jack of the player or the radio.

[000473] The headset can be used as the headset for a cell phone. Phone calls can be made with the headset using a headset-to-phone cord. FIGs. 56A-56B show two embodiments of such a cord. The cord includes a female stereo mini-phone jack at one end and a male stereo mini-phone plug at the other end. The three terminals at the stereo mini-phone plug can be designated as the m (microphone), s (speaker), and g (ground) terminals.

[000474] FIG. 56A shows one approach 5450 for the wiring connections in a headset-to-phone cord. One end of the cord can have a female stereo mini-phone jack for connection to the plug 5452 at a temple tip 5454 of a pair of glasses. The female jack is not shown in FIG. 56A. The other end of the cord 5450 has a stereo plug 5456, with three

terminals, the m 5460, the s 5464 and the g 5462 terminals. The plug 5456 is for inserting into the headset jack of the phone. In the approach shown in FIG. 56A, the two speakers in the glasses are connected in series, and the microphone 5458 for the phone is attached to the cord, similar to the microphone 5254 shown in FIG. 44.

[000475] Regarding wiring connections in the cord 5450, the microphone 5458 is connected with wires between the m 5460 and the g 5462 terminals for the user to speak into. Note that in this embodiment, the negative terminal of the microphone 5458 is extended through a wire to connect to the ground terminal 5462 within the plug 5456. The positive terminal for one speaker is connected to the s 5464 terminal, and the positive terminal for the other speaker to the g 5462 terminal. The two negative terminals of the two speakers are connected together (such as inside the glasses) to complete the circuit. In this embodiment, both speakers are connected in series and the audio signals of the caller go through both of them.

[000476] FIG. 56B shows another approach 5470 for the wiring connections in a headset-to-phone cord. In this approach, the two speakers in the glasses are connected in parallel. A microphone 5472 is connected between the m 5474 and the g 5478 terminals. The negative terminal of the microphone 5472 is extended through a wire to connect to the g 5478 terminal at a location within the plug 5480. The positive terminals for both speakers are connected to the s 5476 terminal, and the negative terminals of both speakers to the g 5478 terminal. Again, the microphone 5472 is external to the glasses and is attached to the cord 5470.

[000477] Based on such headset-to-phone cords, the glasses can be used as the headset of a telephone, such as a cell phone. Also, based on the headset-to-phone cords, the headset can be used for hearing enhancement, with the microphone in the cord, external to the glasses.

[000478] Note that the audio cord and the headset-to-phone cord can be combined. FIG. 57 shows a combined cord 5490 that can perform both functions. The example shown in FIG. 57 assumes the two speakers in the glasses being connected in parallel. Again the microphone is attached to the cord, external to the glasses.

[000479] As shown in FIG. 57, one end of the cord can have a female mini-phone jack to be connected to the plug 5520 at a temple tip 5522 of a pair of glasses. That female jack is not shown in FIG. 57. The combined cord 5490 includes a switch 5502. One switch position is to connect the speakers to a stereo plug 5510. This is the position where the cord 5490 functions as an audio cord. The other switch position is to connect the speakers to a stereo plug 5516. This is the position where the cord 5490 functions as a headset-to-phone cord.

[000480] With the switch 5502 in the audio cord position, the right 5498 and left 5500 speaker terminals of the plug 5520 are connected to the right 5506 and the left 5508 terminals of the male stereo connector 5510.

[000481] With the switch 5502 in the headset-to-phone cord position, the right 5498 and left 5500 speaker terminals are connected to the s 5514 terminal of the male stereo connector 5516. The microphone 5492 is connected between the m 5494 and the g 5512 terminals of the stereo plug 5516. When the plug 5516 is inserted into a phone jack, the negative terminal of the microphone 5492 is connected to the ground of the phone.

[000482] Instead of having just one connector at the glasses, there can be two connectors. Each connector can be located at one of the temple tip, and each connector can be connected to the speaker at that temple through, for example, a conductor (e.g. a wire) in the temple. In one embodiment, the connectors are standard 2.5 or 3.5 mm male mono mini phone plugs. Such glasses can be used to listen to stereo music based on a mono-plugs-to-stereo-plug adapter cord. FIG. 58 shows one embodiment of the wiring connections of such an adapter cord 5550. At one end of the adapter cord, there are two female mono mini phone plugs. These plugs are not shown in the figure. Each plug connects to two wires, one signal wire and the other the ground wire. For example, a first female plug includes signal wire 5552 and ground wire 5554; and the second female plug includes the signal wire 5556 and ground wire 5558. Each pair of wires can be embedded inside a cable, with both cables forming part of a lanyard. The other side of the cord 5550 is a male stereo mini phone plug 5560. Of the 3 connections at the male stereo mini phone plug 5560, one can be connected to both of the ground wires 5554 and 5558, and for the other two, one to each signal wires 5552 and 5556. The male stereo plug 5560

can be used to receive stereo signals for the two speakers, or can be used as a plug to receive a telephone call, similar to the stereo plugs at the temples shown in FIGS. 56A-56B. In this example, the male stereo plug is not at the glasses, but is external to the glasses, such as at the lanyard.

[000483] In the above examples on cords, the microphone, such as for a phone or for hearing enhancement, is external to the glasses. In other embodiments, the microphone is in the glasses. With the microphone in the glasses, in the embodiments shown in FIGS. 56A-56B, the plugs at the temple tips are five terminal plugs, with the five terminals being the positive or the signal terminal for the left speaker, the positive or the signal terminal for the right speaker, the ground for both speakers, the microphone and the ground for the microphone. In the embodiment shown in FIG. 56A, the ground for the microphone 5458 is connected to the positive terminal of the right speaker 5462 at the g 5462 terminal of the male stereo plug 5456 within the plug 5456. In the embodiment shown in FIG. 56B, the grounds of speakers and the ground of the microphone are all connected together at the g 5478 terminal of the male stereo plug 5480.

[000484] With the microphone in the glasses, as for the embodiment shown in FIG. 58, the plugs at the temple tips are four terminal plugs, with the four terminals being the signal terminal for a speaker, the ground for the speaker, the signal terminal for a microphone and the ground for the microphone. The male stereo plug 5560 is replaced by a five terminal plug, with the five terminals being the signal terminal for the left speaker, the signal terminal for the right speaker, the ground for both speakers, the signal terminal for the microphone and the ground for the microphone.

[000485] In the above examples of the glasses functioning as a headset, one microphone is described. However, there can be more than one microphone. As described, additional microphones can provide additional benefits. For example, two microphones can be used for noise cancellation purposes. In another example, two microphones can be for stereo reception purposes with one microphone on the left side and the other on the right side of the user. For users with significant hearing loss in one of the ears, signals received from that ear can be routed to the speaker in close vicinity to the other ear. In any event, if there are two microphones, with both microphones in the

glasses, and if there is just one connector at the glasses, the connector can have six terminals. The six terminals can be for the signal terminal for each of the speakers and the signal terminals for the two microphones, the ground for both speakers, and the ground for both microphones. If there are two connectors at the glasses, one at each of the temple tips, again with the microphones in the glasses, the two connectors can be four terminal connectors. Each set of the four terminals includes the signal terminal of the microphone and the signal terminal for the speaker at that temple, and their separate grounds. In these embodiments with more than one microphone, again, one can use a combined cord that has a switch so that the glasses with the combined cord are applicable as a headset for, such as, a phone, a hearing booster and an audio player.

[000486] Regarding the locations of the speakers, the speakers can be in the temples, similar to the embodiment shown in FIG. 36. In another embodiment, as shown in FIG. 59, a speaker 5577 can be in one 5575 of the temple tips.

[000487] In a number of embodiments, one or more speakers are embedded or partially embedded in the glasses. In one embodiment, instead of in the main body of the glasses, a speaker is, for example, at the end of a stub or an extension, extended from the main body of the glasses. The stub can extend from one of the temples of the glasses. There can be electrical wires inside the stubs to connect the speakers to other electrical component(s) in the main body of the glasses. The stubs can replace a number of the tube embodiments described by bringing the speakers closer to, or allowing the speakers to be inserted into, the ear canal of the user. In such embodiments, there may not be separate ear buds because the speakers themselves can be in structures that also serve as ear buds. Such ear buds with speakers can also be custom fitted into the ears of the user. Such ear buds can include venting structures to reduce to a certain degree the effects of occlusion.

[000488] In a number of embodiments with speakers embedded in the glasses, each speaker can have a tube extending towards an ear to guide the audio signals. The tubes can be permanently attached to the glasses. In another embodiment, the tubes are detachable from the glasses. There can be an extension 5579 with a hole at the glasses for a speaker 5577, as shown in FIG. 59. An external tube 5581 can be attached to or

inserted into the extension 5579 for sound coupling into an ear. In the embodiment shown in FIG. 59, the external tube 5581 extends from the back of an ear, over the top of the ear, and curls back towards the opening of the ear. Again, there can be an ear bud 5583 at the end of the external tube 5581 to further enhance sound coupling to an ear. Also, in this embodiment, a microphone 5585 can be in the glasses at a position further away from the lens holders of the glasses.

[000489] With ear buds in the ears, it may not be necessary to have temples extend behind the ears. FIG. 60 shows an embodiment with each of the free ends of the temples, such as the temple 5600, having an ear bud 5602. The speaker for the ear bud 5602 can be in the structure of the ear bud 5602. The speaker can be away from the ear bud, such as inside the temple 5600 close to the hinge of the temple 5600, but is audibly coupled to the ear bud. For example, the temple includes a tube or a tubular structure inside the temple 5600 to guide the audio signals from the speaker to the ear bud 5602 for the ear. In this embodiment, a microphone 5604 can be located in one of the temples further away from the free end of that temple. The pair of glasses can also function as a headset. If the headset is connected to a portable device through a cord 5610, the glasses include at least one connector to receive the cord 5610. In one embodiment, the connector 5606 at the glasses is a female connector. The cord 5610 for the portable device ends with a male connector 5608 to be inserted into female connector 5606 at the glasses. When the glasses are worn, both ear buds are inserted into the ears of the users. Together with the bridge (directly or indirectly through the nose pads) on the nose, and the ear buds inserted into the ears of the user, the glasses can be stably held on the head of the user. In the embodiment of a wired headset with one connector, when worn, the cord 5610 can drape behind one of the ears.

[000490] Regarding embodiments with ear buds at the free ends of the temples, in yet another embodiment, the ends of the temples are small and are made of soft materials. If the user chooses to wear such glasses, but does not want to use the speakers, the user has the option to comfortably wear the glasses with the ear buds positioned above his ears.

[000491] In one embodiment, the length of the tubes or the stubs is not fixed, but is adjustable. The tubes or the stubs are retractable and extendable, for example, similar to the embodiment shown in FIG. 38. The positions of the tubes or the stubs also can be changed, for example, similar to the embodiment shown in FIG. 36. Alternatively, the temples can be made of malleable materials to allow some adjustment to fit different users. Glasses with such flexibilities, if applied to the embodiments with ear buds at the free ends of the temples, are even easier to adjust to fit different users, for example, because one may only need to adjust the distance between the ear buds and the lens holders of the glasses.

[000492] In yet in another embodiment, a pair of glasses functioning as a headset with a speaker and a microphone further includes a camera, as shown in FIG. 61. The glasses 5650 include a temple 5652 that has a microphone 5654, a speaker 5656 and a camera 5658 with a connector 5660. The connector 5660 is for connecting, for example, to a portable device that includes at least the power source for the glasses.

[000493] The camera 5658 is preferably a digital camera with an on/off switch 5662. For example, the camera 5658 is a CCD camera with a CCD controller coupled to a CCD chip, a CCD memory device and a lens.

[000494] In one embodiment, with the connector 5660 connected to the portable device, when the switch 5662 is pushed on, the CCD chip takes a picture. The charges in the CCD chip are digitized and transmitted through the connector to the portable device, under the management of the controller. At least some of the charges can be temporarily stored in the CCD memory device, for example, to accommodate the differences in speed in taking pictures and sending the pictures to the portable device through the connector. In this embodiment, images are permanently stored at the portable device.

[000495] In one embodiment, the glasses do not offer focusing capability. The CCD chip can be located, for example, at the focal point of the lens. In another embodiment, there is an image distance control knob. For example, a mechanical lever can be pre-programmed or pre-set to move the lens to one or more different positions. There can be just two positions. One position can be for close-up shots and another for distance shots,

such as close-up being about 2 ft from the lens and the distant being about 6 ft away; or close-up being about 8 inches away and distant being about 2 ft away.

[000496] FIG. 61 shows one embodiment regarding the location of the camera 5658 at the end of the temple or arm 5652 of the glasses next to the hinge of the temple. The lens of the camera faces forward. In this situation, what the user sees is substantially what the captured image would be. In other words, in a general sense, what the user sees through the glasses is what the user gets, without the need for an additional view finder. With such an embodiment, it is relatively easy for a user to take pictures, hands-free, without the need for an additional strap for holding the camera.

[000497] The connector 5660 at the end of the glasses 5650 can be, for example, a 4-terminal connector, one for ground, one for power and the other two for transmit and receive signals. In another embodiment, the connector 5660 can be a 3-terminal connector, with the power line and one of the signal lines sharing one terminal.

[000498] Regarding the embodiment shown in FIG. 61, the speaker 5656 can be in the glasses, with a tube 5666 and an ear bud 5668, to help bring audio signals to the user. In one embodiment, the tube 5666 can be rotated at its end where it connects to the glasses.

[000499] In one embodiment, the CCD with the CCD memory device and the CCD controller are on the same integrated circuit.

[000500] The embodiment shown in FIG. 61 also includes a microphone 5654. In one embodiment, the CCD memory device also stores audio signals from the microphone. For example, the memory device stores the last 15 seconds of audio signals. When the user takes a picture, the previous 15 seconds of audio signals can be coupled to the picture. The next 10 seconds of audio signals can also be coupled to the picture. The audio signals or the digitized version of the audio signals can also be transmitted to the portable device with the corresponding picture. In the future, if the user wants to view the picture, the audio signals can be played with the picture at the same time.

[000501] The electrical components in the portable device for the glasses with a camera can be incorporated in the glasses. For example, the power sources can also be in the glasses and the glasses do not have to include a connector. In one embodiment, the glasses include non-volatile memory to store at least a number of pictures. In another embodiment, the glasses further include a connector to receive a memory card, such as a flash memory device. One embodiment of such a removable card on a pair of glasses is shown in FIG. 52, where the card 5352 can be a removable memory card. The card can be a standard memory card with a USB connector. Pictures taken can be stored in the removable memory card.

[000502] In yet another embodiment for the glasses with a camera, the glasses do not include a speaker or a microphone. The glasses include a temple that has a CCD controller coupled to a CCD chip, a CCD memory device and a lens. The temple also includes an on/off switch with a connector. The connector is for connecting, for example, to a portable device that includes at least the power source for the camera.

[000503] Additional disclosure on camera in glasses can be found in U.S. Provisional Application No. 60/583,169, filed on June 26, 2004, which is hereby incorporated by reference.

[000504] A number of electrical components have been described. They can be on circuit boards, which can be made of flexible materials. They can be on a substrate. They can also be integrated into one or more integrated circuits.

[000505] Although a number of embodiments have been described of glasses with hearing enhanced and/or other audio signal generation capabilities, in one embodiment, the hearing enhanced and/or other audio signal generation capabilities are in another apparatus. When a person is using that apparatus, a third party again would not be able to tell whether the person is having his hearing enhanced, or listening to other audio signals. This again may be able to remove the stigma of wearing a hearing aid.

[000506] The various embodiments, implementations and features of the invention noted above can be combined in various ways or used separately. Those skilled in the art will understand from the description that the invention can be equally applied to or

used in other various different settings with respect to various combinations, embodiments, implementations or features provided in the description herein.

[000507] A number of embodiments in the invention can be implemented in software, hardware or a combination of hardware and software. A number of embodiments of the invention can also be embodied as computer readable code on a computer readable medium. The computer readable medium is any data storage device that can store data which can thereafter be read by a computer system. Examples of the computer readable medium include read-only memory, random-access memory, CD-ROMs, magnetic tape, optical data storage devices, and carrier waves. The computer readable medium can also be distributed over network-coupled computer systems so that the computer readable code is stored and executed in a distributed fashion.

[000508] Numerous specific details are set forth in order to provide a thorough understanding of the present invention. However, it will become obvious to those skilled in the art that the invention may be practiced without these specific details. The description and representation herein are the common meanings used by those experienced or skilled in the art to most effectively convey the substance of their work to others skilled in the art. In other instances, well-known methods, procedures, components, and circuitry have not been described in detail to avoid unnecessarily obscuring aspects of the present invention.

[000509] Also, in this specification, reference to "one embodiment" or "an embodiment" means that a particular feature, structure, or characteristic described in connection with the embodiment can be included in at least one embodiment of the invention. The appearances of the phrase "in one embodiment" in various places in the specification are not necessarily all referring to the same embodiment, nor are separate or alternative embodiments mutually exclusive of other embodiments. Further, the order of blocks in process flowcharts or diagrams representing one or more embodiments of the invention do not inherently indicate any particular order nor imply any limitations in the invention.

[000510] The many features and advantages of the present invention are apparent from the written description and, thus, it is intended by the appended claims to cover all such features and advantages of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation as illustrated and described. Hence, all suitable modifications and equivalents may be resorted to as falling within the scope of the invention.

What is claimed is:

CLAIMS

1. A wireless headset comprising:

a first printed circuit board provided in the headset, the first printed circuit board having at least one electrical component attached thereon, the at least one electrical component being electrically connected to a plurality of other electrical components, each of the plurality of other electrical components being provided at least partially in the headset;

a plurality of speakers in the headset;

a plurality of microphones in the headset;

wireless communication circuitry,

wherein the at least one electrical component or the plurality of other electrical components include at least a controller,

wherein the at least a controller is configured to facilitate modifying power within a certain range of frequencies based on at least one hearing characteristic of the user, to help the user hear audio outputs presented to the user via the plurality of speakers,

wherein the wireless communication circuitry is configured to wirelessly receive a message,

wherein at least if the message is a text message, the at least a controller is configured to have at least a portion of the text message presented to the user,

wherein at least if the message is an audio message, the at least a controller is configured to have at least a portion of the audio message presented to the user,

wherein the plurality of speakers are configured to present at least a portion of the message, if the at least a portion of the message is to be presented in an audio manner, and

wherein at least a microphone in the plurality of microphones is configured to receive an audio response for the message from the user.

2. A wireless headset as recited in claim 1 comprising an accelerometer.

3. A wireless headset as recited in claim 1 comprising a first connector that includes a plurality of conductive pads that are configured to couple with a second connector

external to the headset, wherein each of the conductive pads is configured to be in contact with a corresponding metallic contact of the second connector when the first connector is connected to the second connector.

4. A wireless headset as recited in claim 1, wherein the wireless communication circuitry is configured to couple to at least a Bluetooth network.

5. A wireless headset as recited in claim 1, wherein the at least a controller is configured to facilitate voice recognition, including recognizing at least a spoken term received via the at least a microphone.

6. A wireless headset as recited in claim 1, wherein the at least a controller is configured to facilitate converting the audio response into text to be wirelessly transmitted.

ABSTRACT

In one embodiment, an eyeglass frame includes a lens holder, a first temple with a first end close to the lens holder and a second end, a second temple, an electrical connector and a printed circuit board. The printed circuit board with at least one electrical component can be in the first temple. The connector can be close to the first end of the first temple, facing downward, and electrically connected to the at least one electrical component. In another embodiment, an eyeglass frame includes a first printed circuit board, with at least one electrical component. The first printed circuit board can be connected to an electrical component at the frame via a second printed circuit board. In an embodiment, a pair of glasses can perform hearing enhanced functions to enhance audio signals for the user to hear. One embodiment is configured to be a headset.

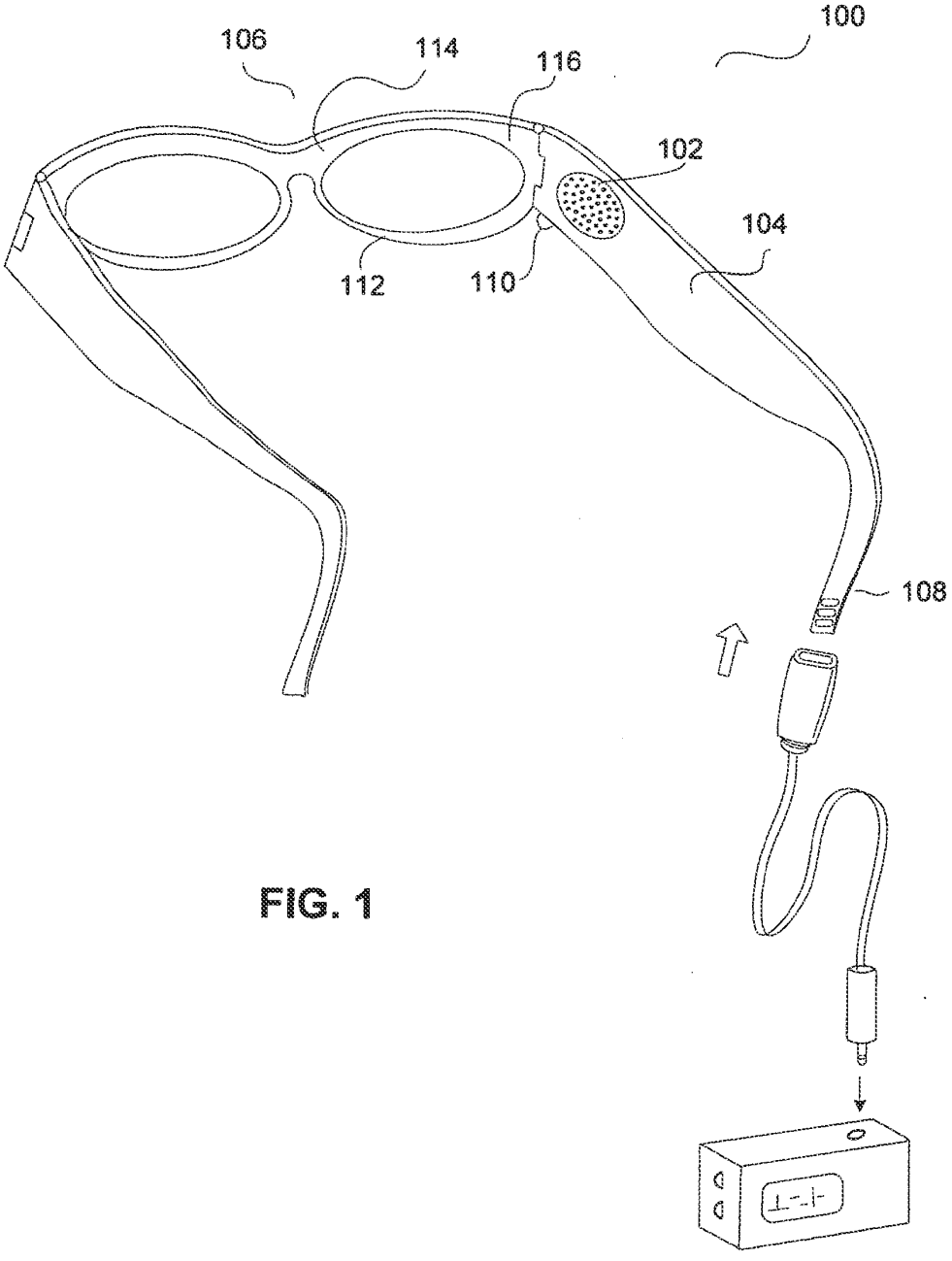


FIG. 1

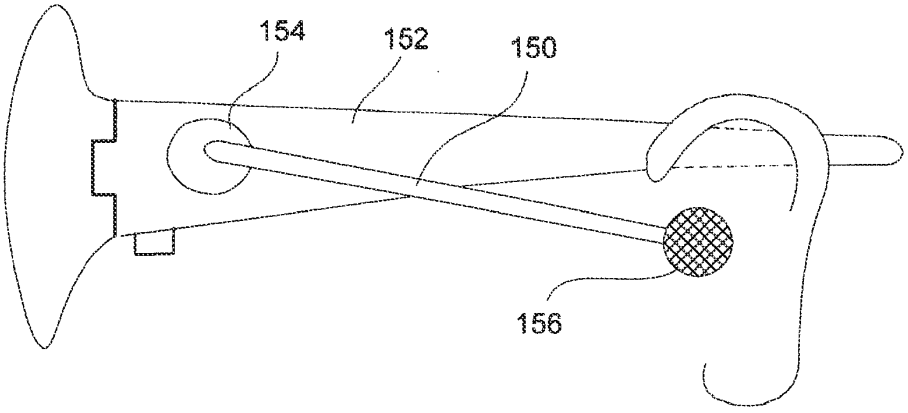


FIG. 2

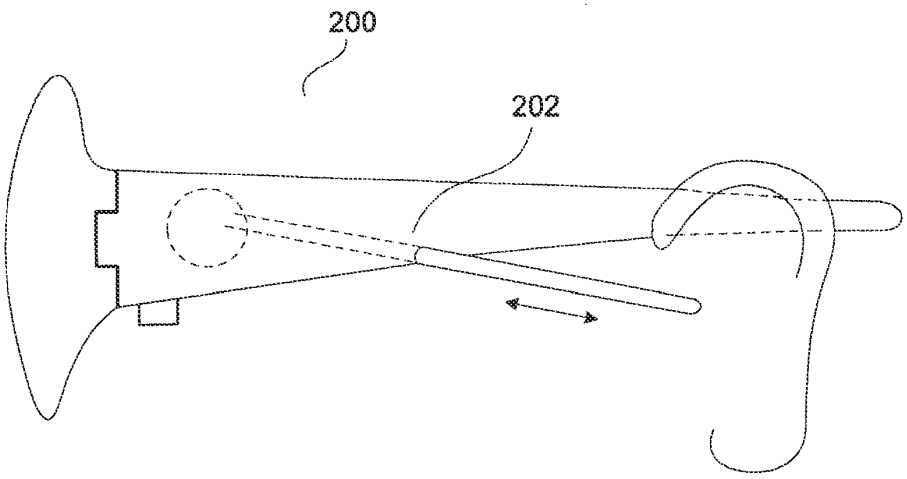


FIG. 3

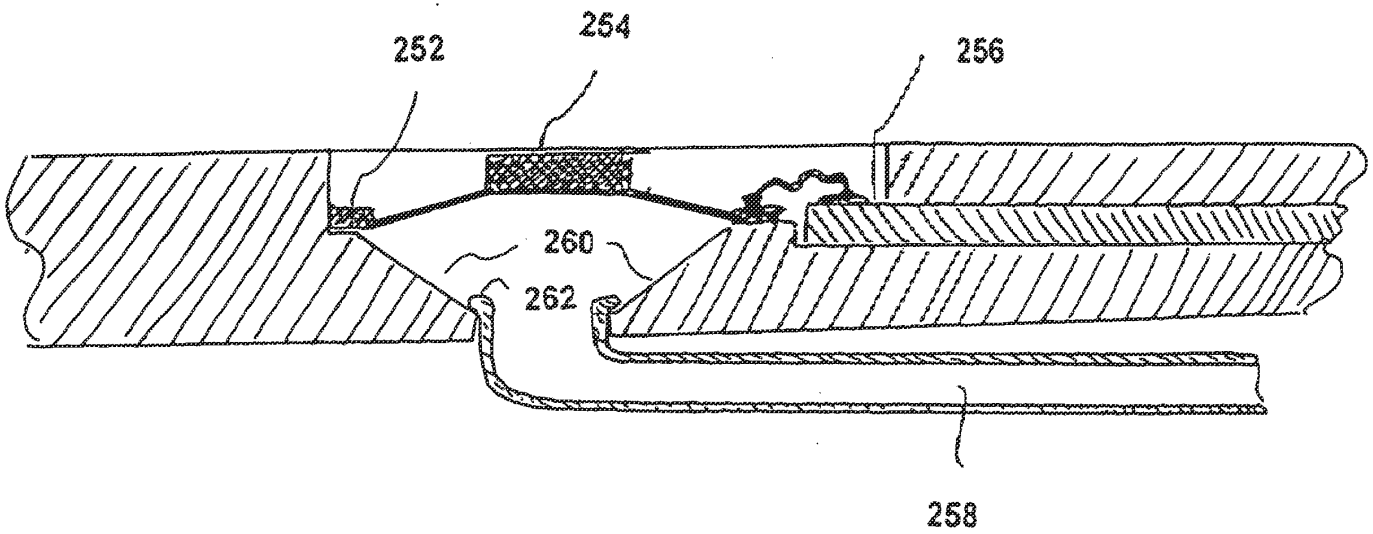


FIG. 4

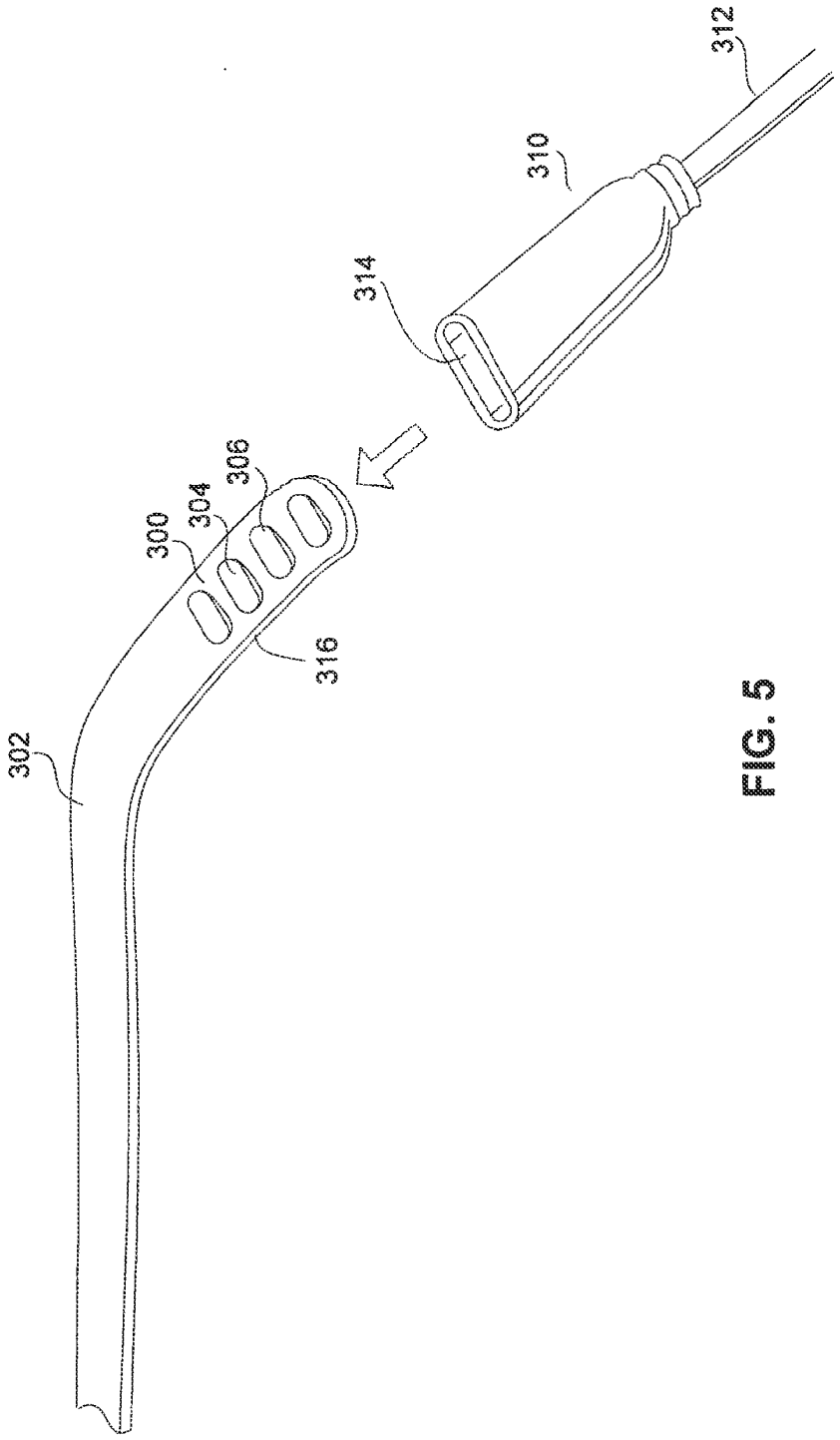


FIG. 5

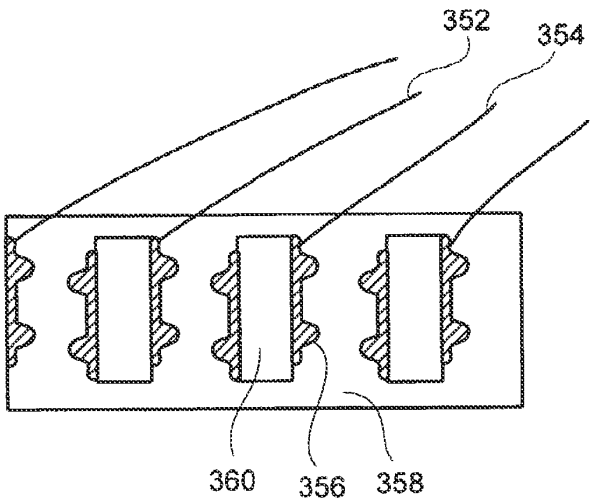


FIG. 6A

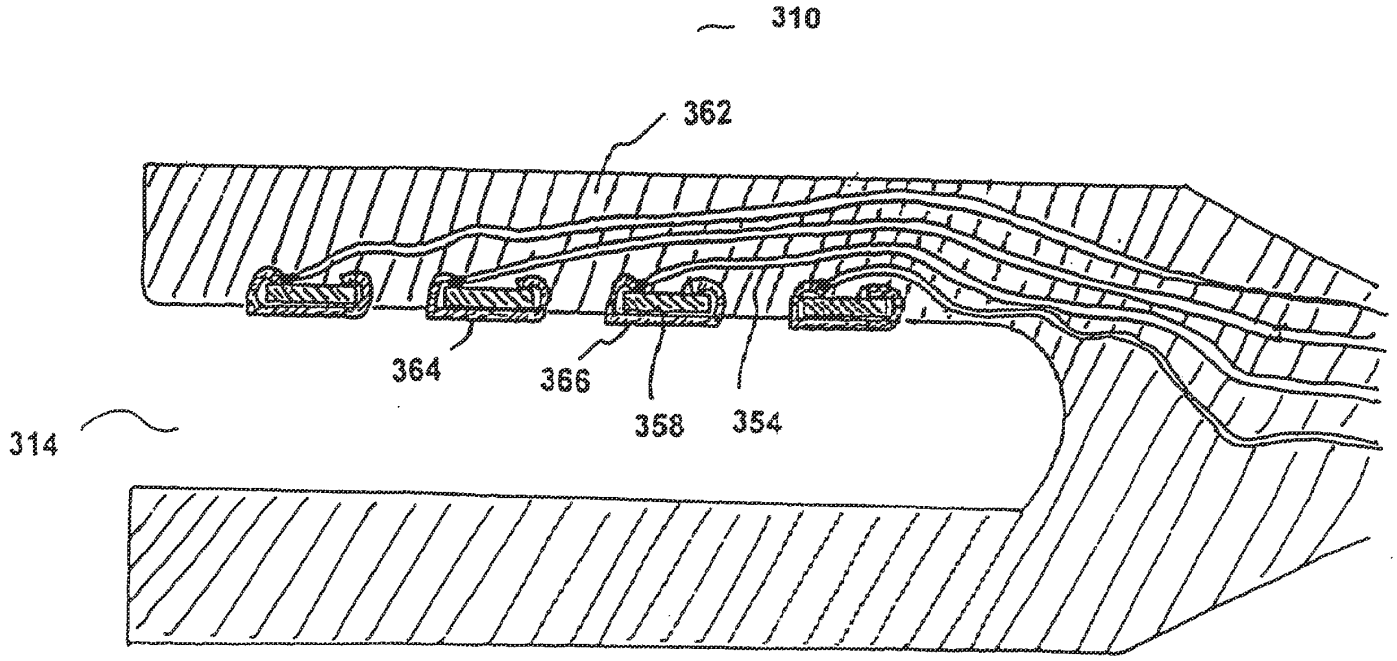


FIG. 6B

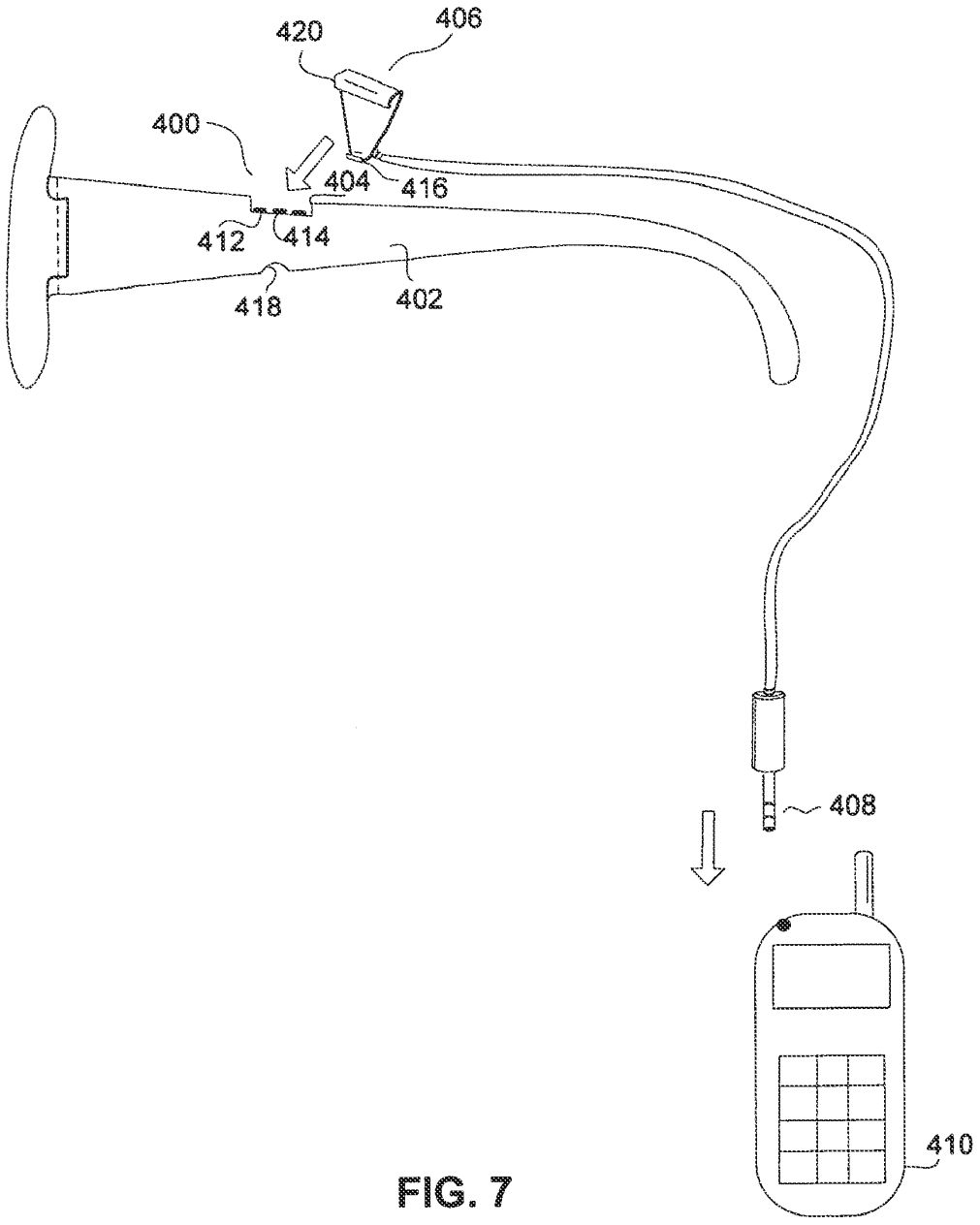


FIG. 7

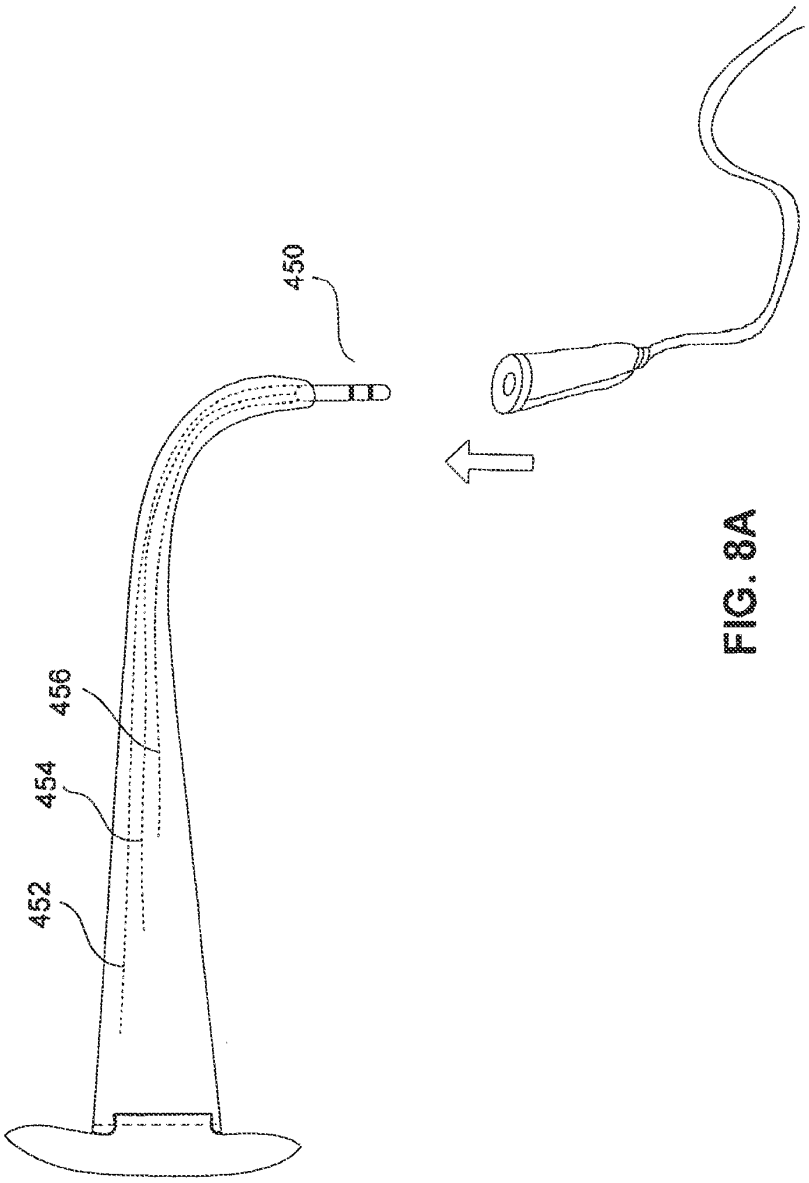


FIG. 8A

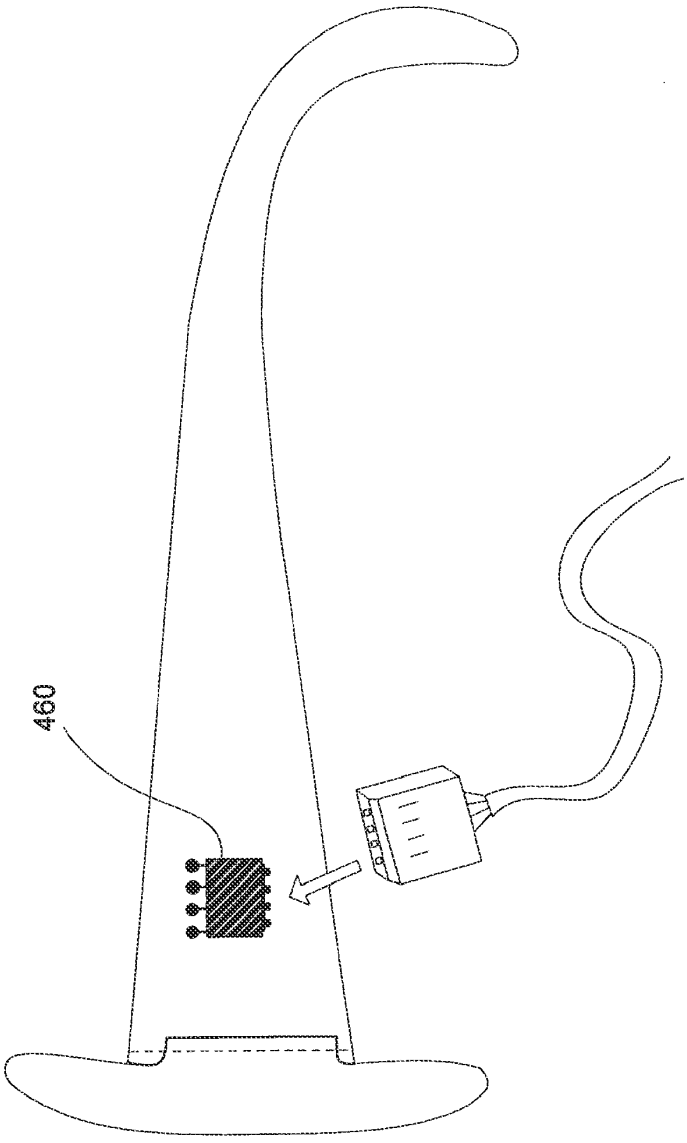


FIG. 8B

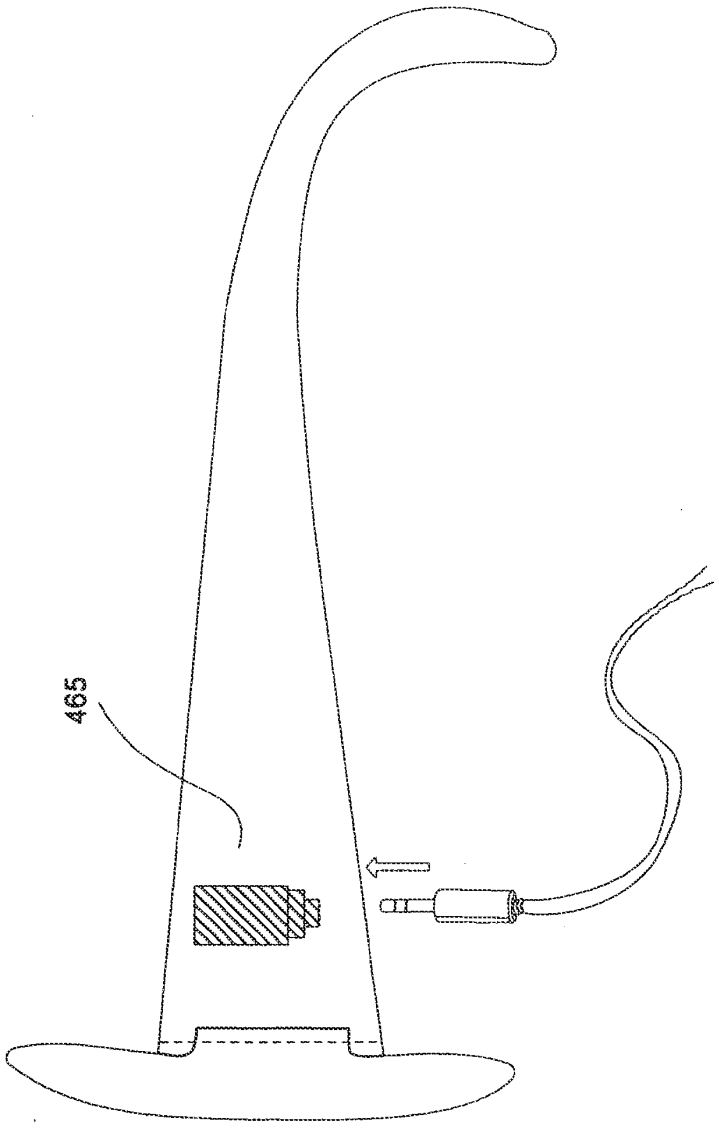


FIG. 8C

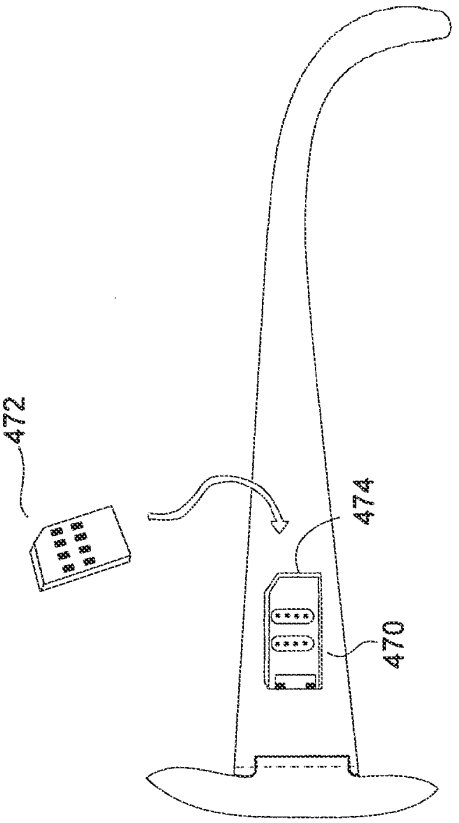


Fig. 8D

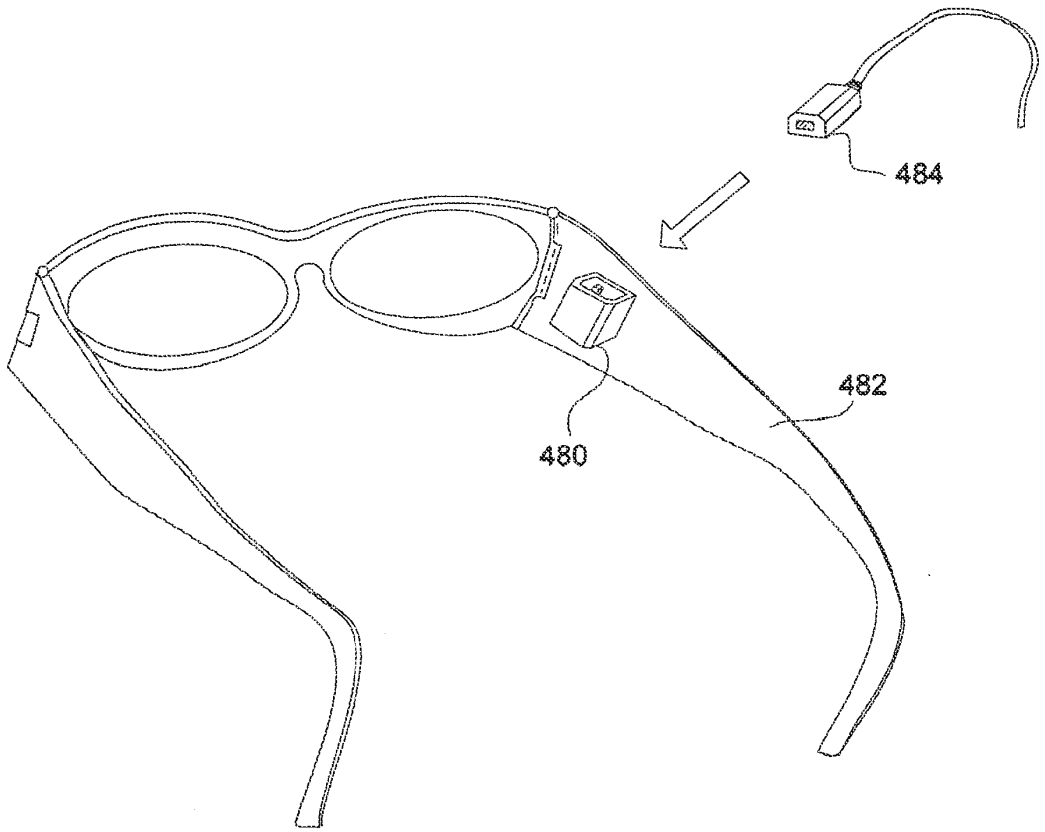


Fig. 8E

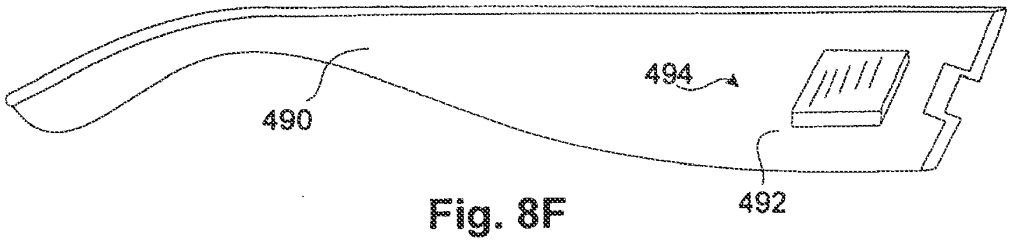


Fig. 8F

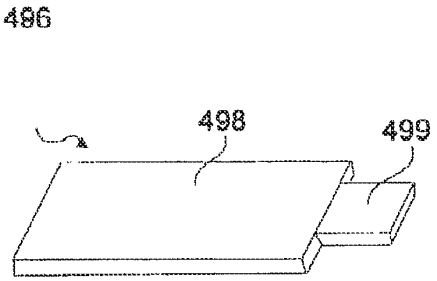


Fig. 8G

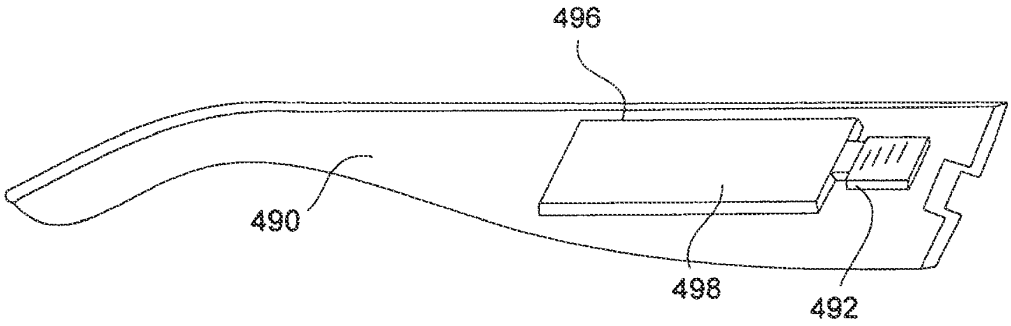


Fig. 8H

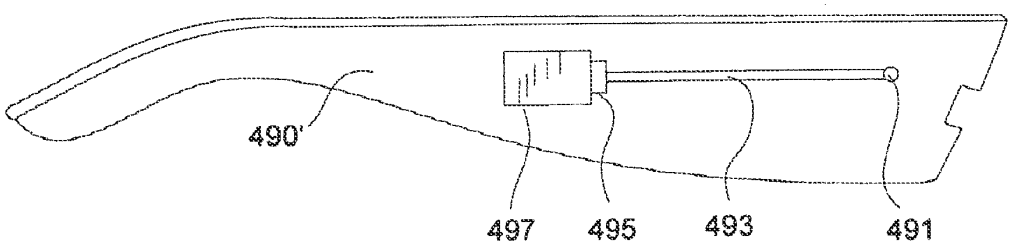


Fig. 8I

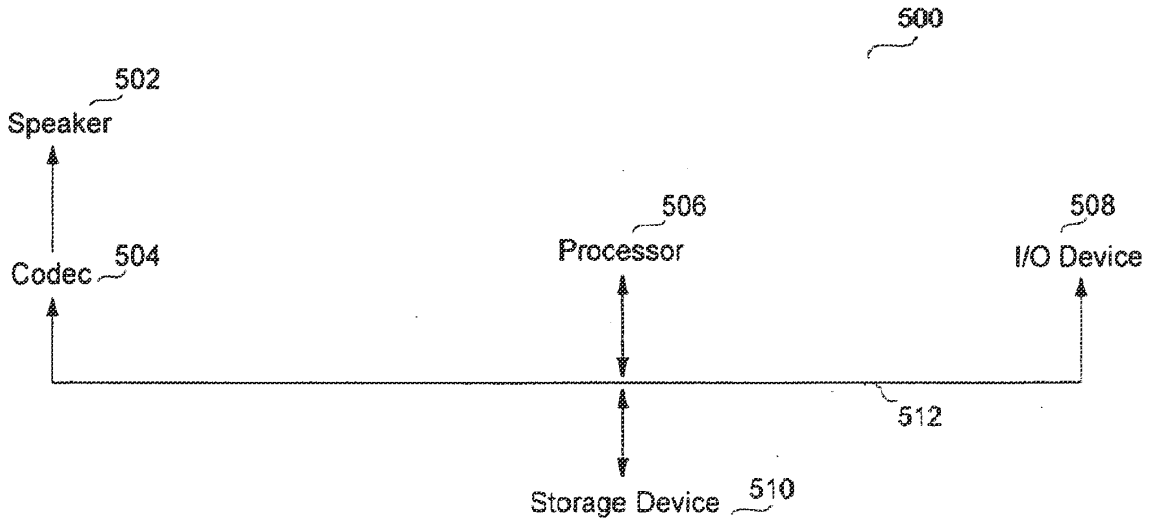

500
502
Speaker
506
Processor
508
I/O Device
Codec
504
512
Storage Device
510

FIG. 9

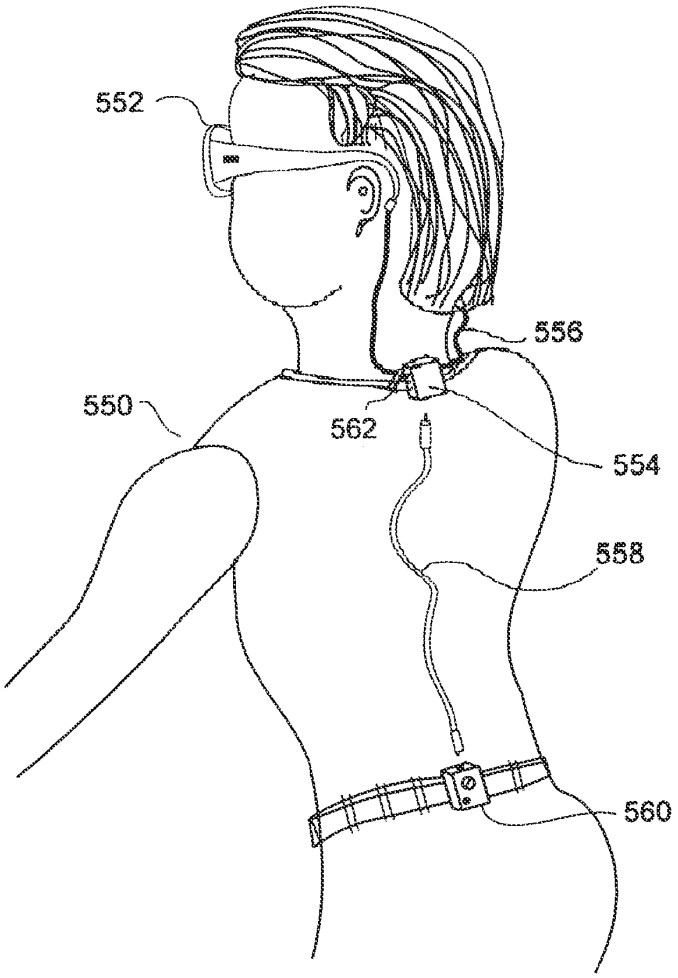


FIG. 10

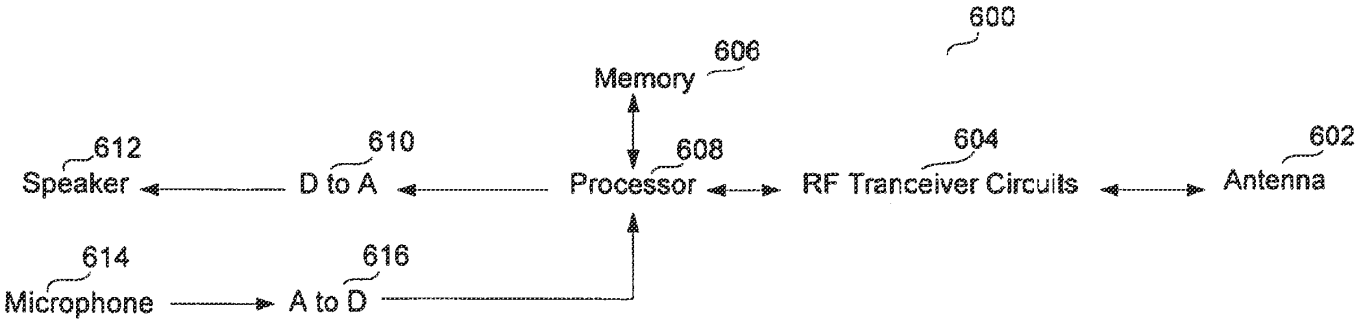


FIG. 11A

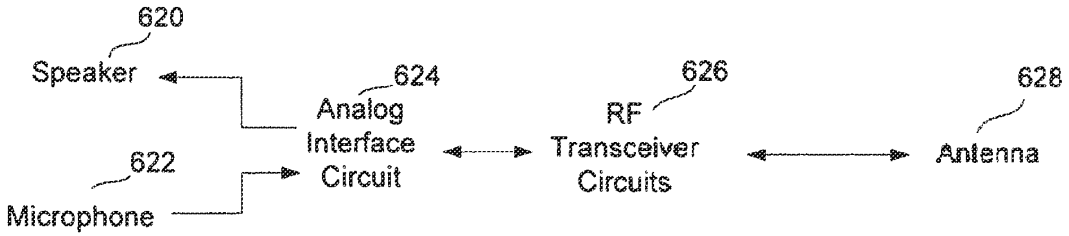


FIG. 11B

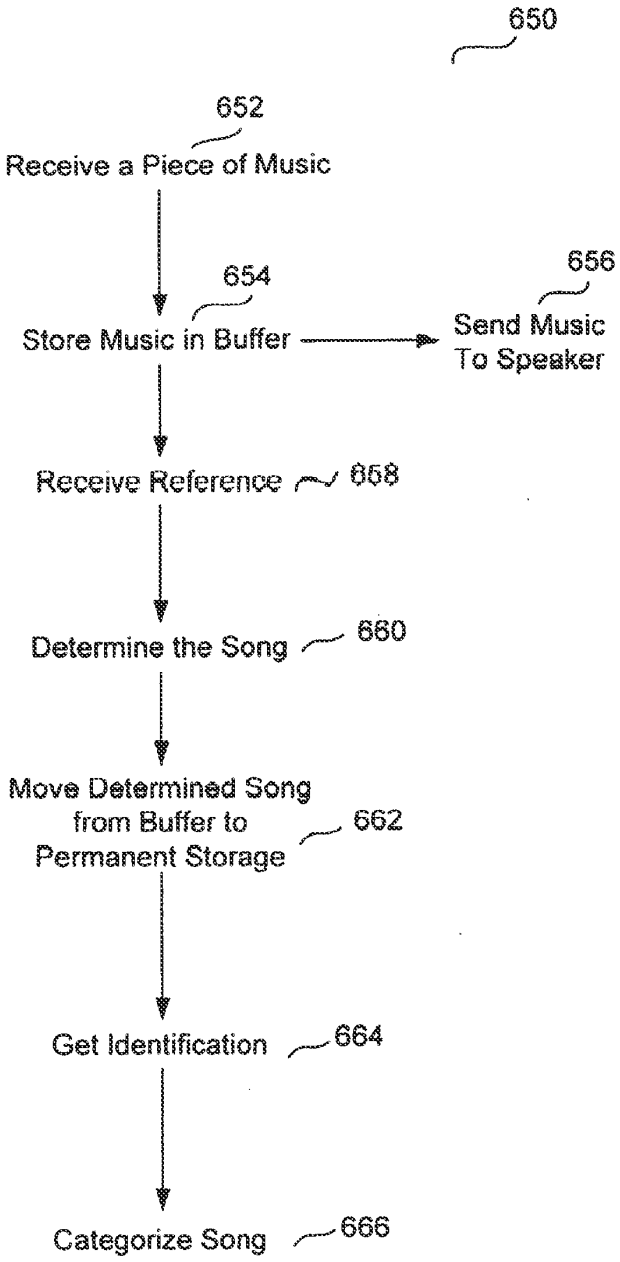

650
652
Receive a Piece of Music
654
Store Music in Buffer
656
Send Music To Speaker
Receive Reference
658
Determine the Song
660
Move Determined Song from Buffer to Permanent Storage
662
Get Identification
664
Categorize Song
666

FIG. 12

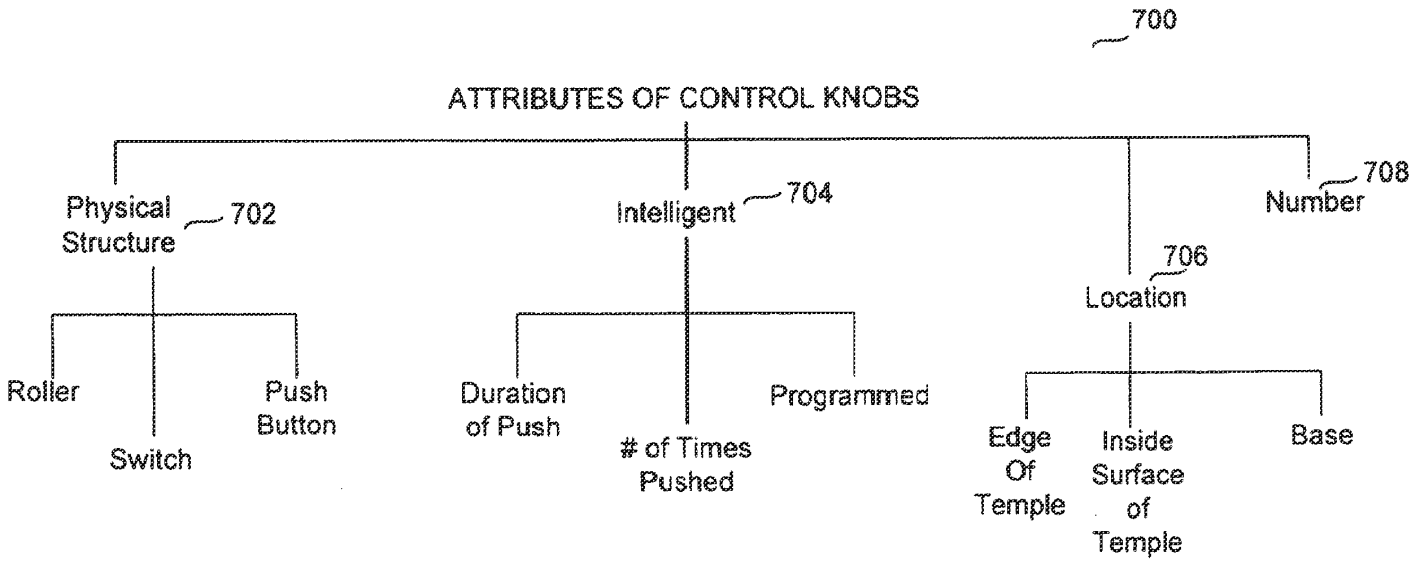

700
ATTRIBUTES OF CONTROL KNOBS
Physical Structure
702
Roller
Switch
Push Button
Intelligent
704
Duration of Push
of Times Pushed
Programmed
Number
708
Location
706
Edge Of Temple
Inside Surface of Temple
Base

FIG. 13

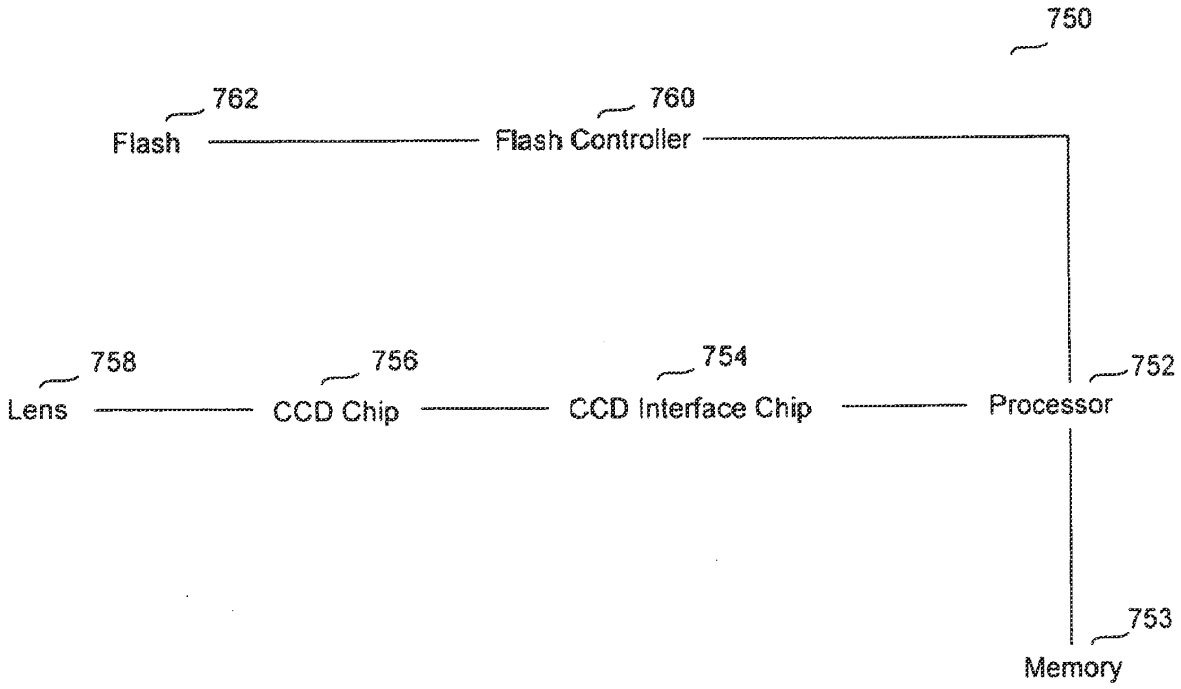

750
762
760
Flash
Flash Controller
758
756
754
752
Lens
CCD Chip
CCD Interface Chip
Processor
753
Memory

FIG. 14

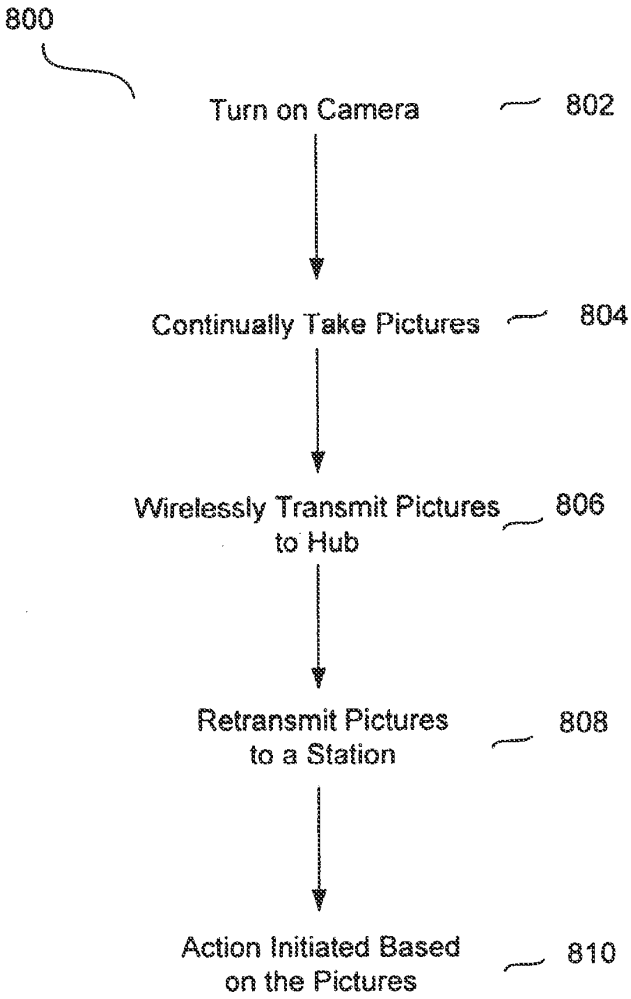

800
Turn on Camera
802
Continually Take Pictures
804
Wirelessly Transmit Pictures to Hub
806
Retransmit Pictures to a Station
808
Action Initiated Based on the Pictures
810

FIG. 15

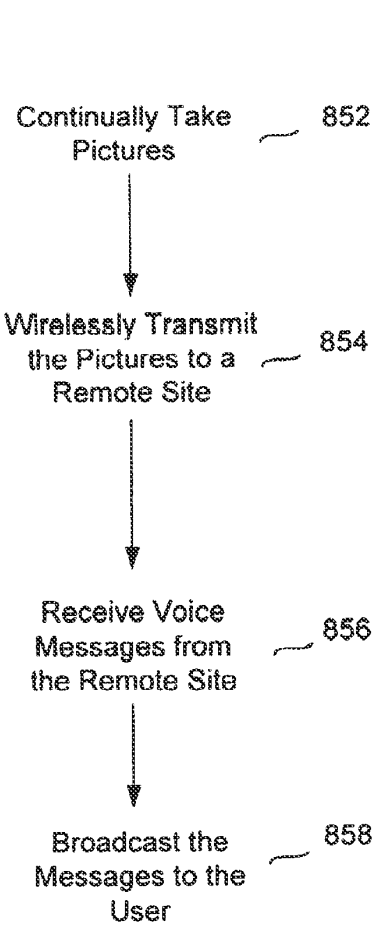

850
Continually Take Pictures
852
Wirelessly Transmit the Pictures to a Remote Site
854
Receive Voice Messages from the Remote Site
856
Broadcast the Messages to the User
858

FIG. 16

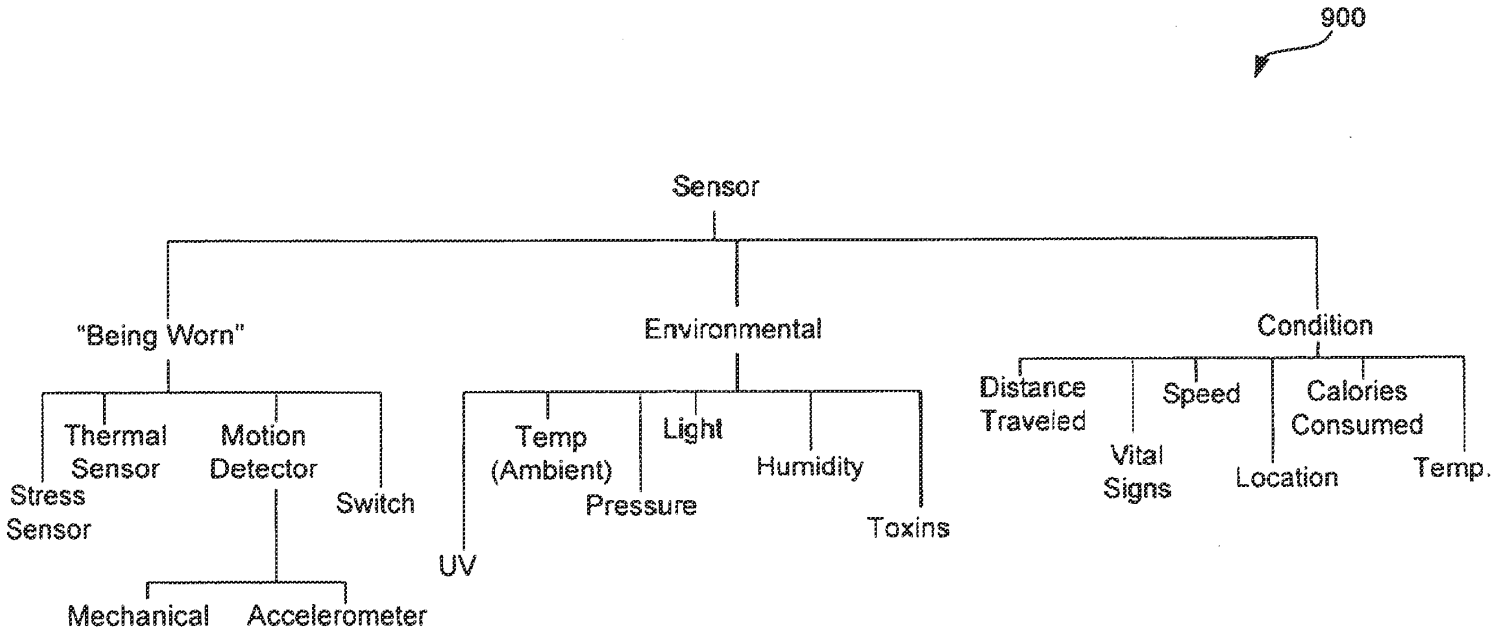

900
Sensor
"Being Worn"
Environmental
Condition
Thermal Sensor
Motion Detector
Stress Sensor
Switch
Mechanical
Accelerometer
Temp (Ambient)
Light
Pressure
Humidity
Toxins
UV
Distance Traveled
Speed
Calories Consumed
Vital Signs
Location
Temp.

FIG. 17A

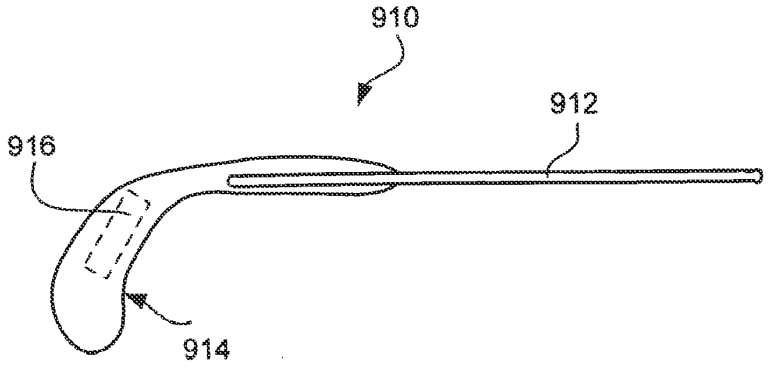


FIG. 17B

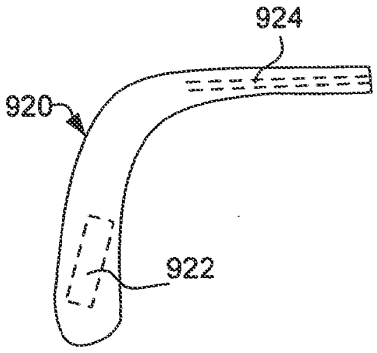


FIG. 17C

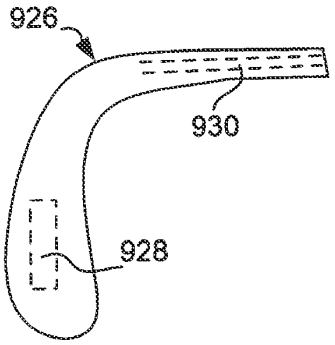


FIG. 17D

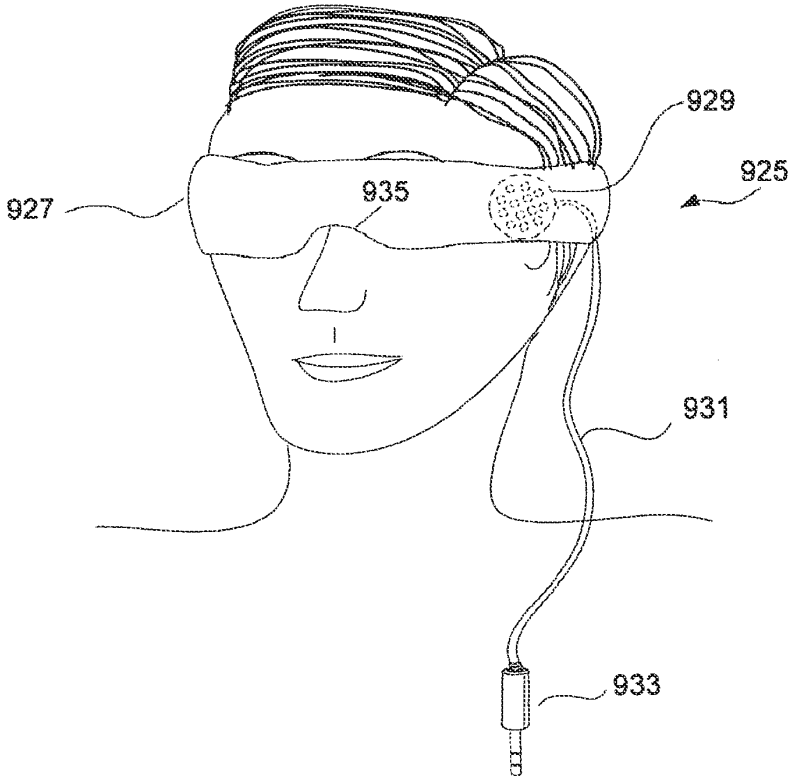


FIG. 18

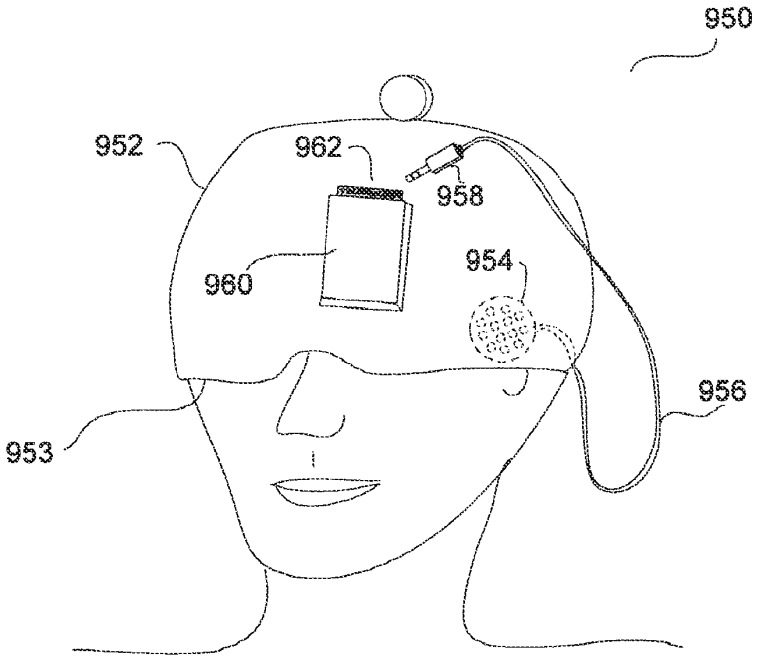


FIG. 19

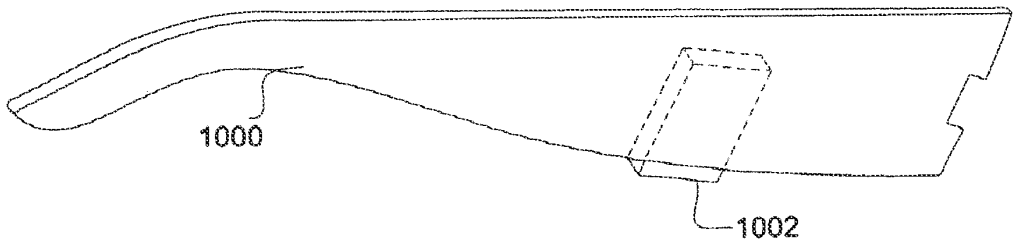


FIG. 20A

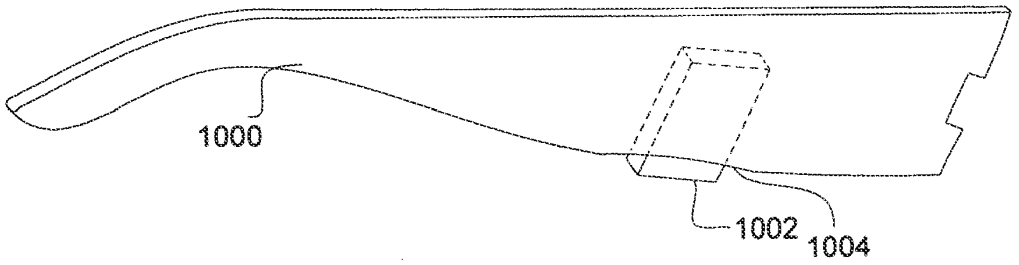


FIG. 20B

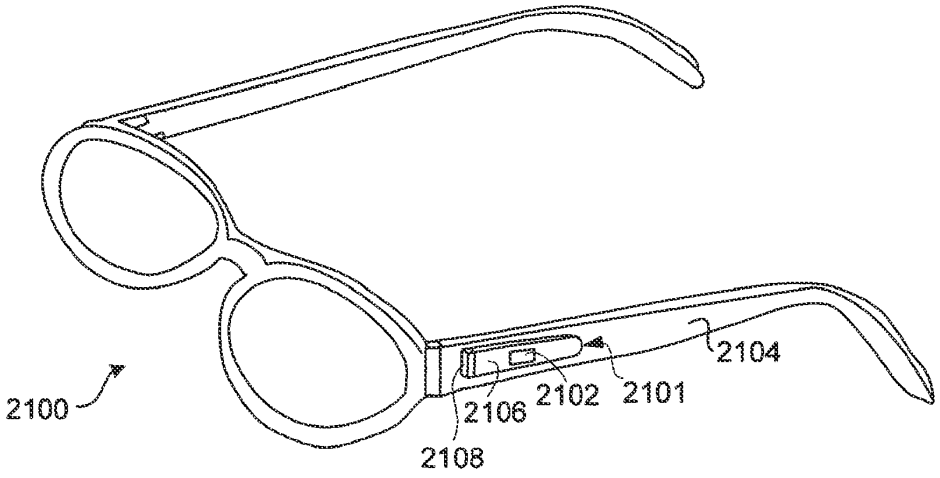


FIG. 21A

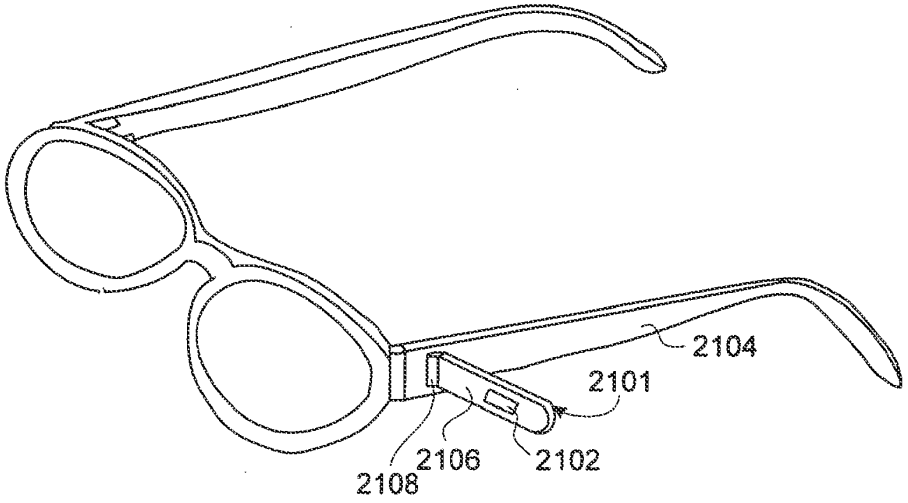


FIG. 21B

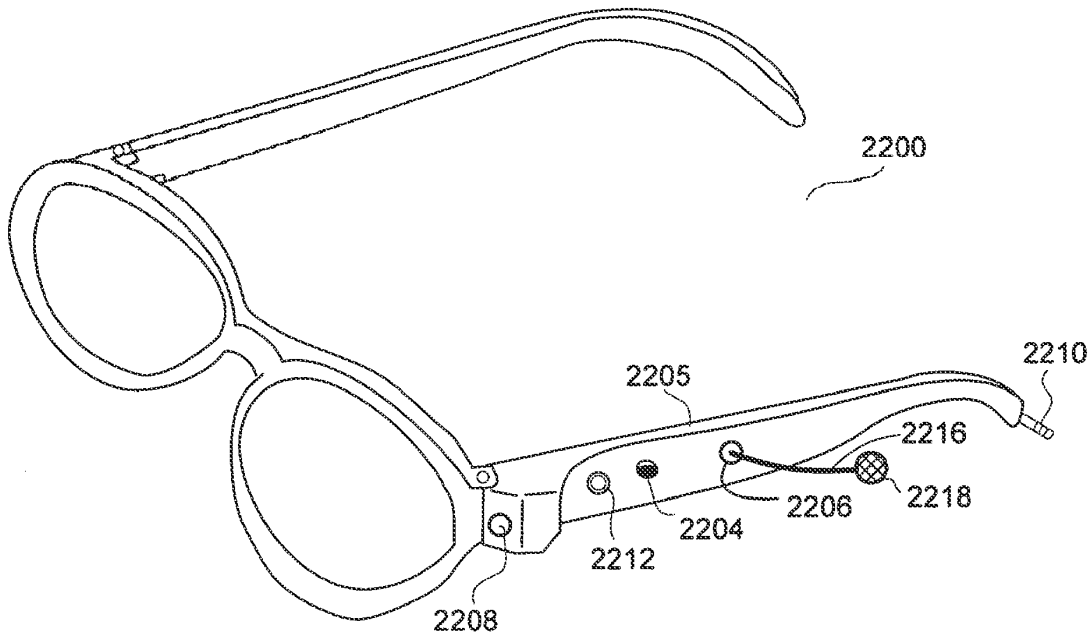


FIG. 22

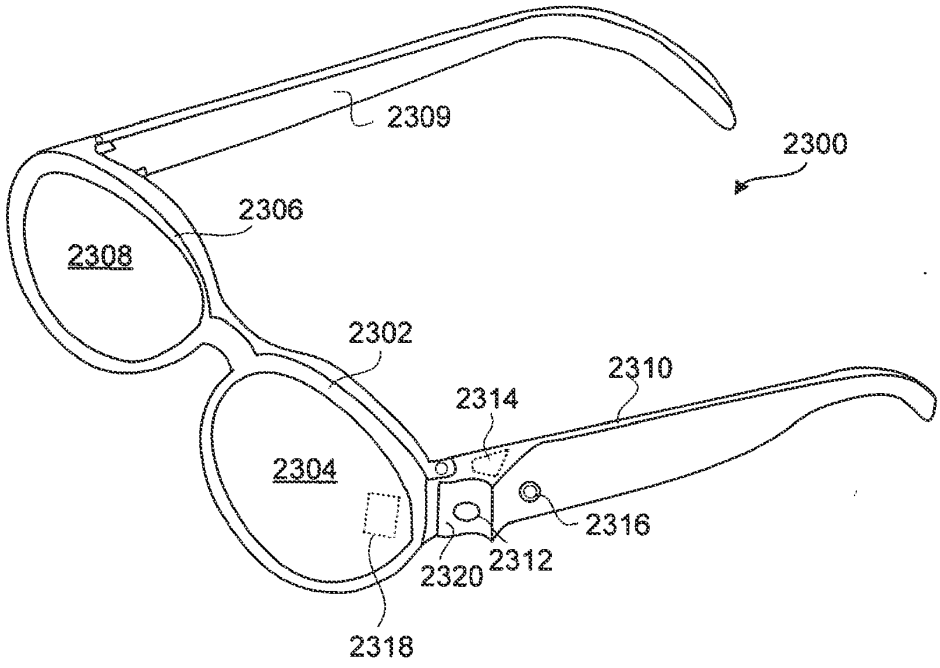


FIG. 23A

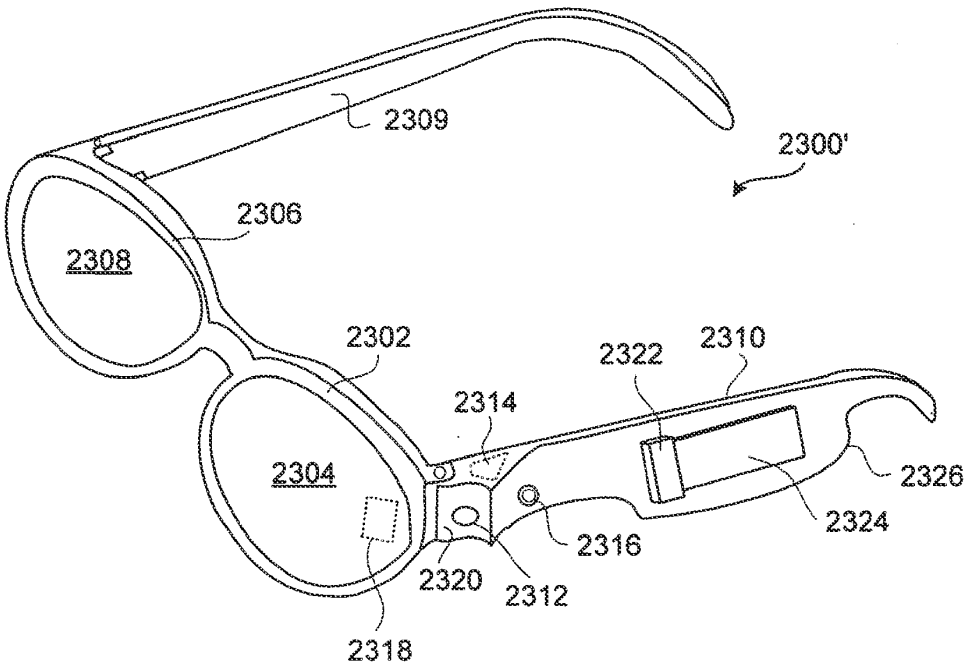

2309
2300'
2306
2308
2302
2322
2310
2314
2304
2326
2324
2316
2320
2312
2318

FIG. 23B

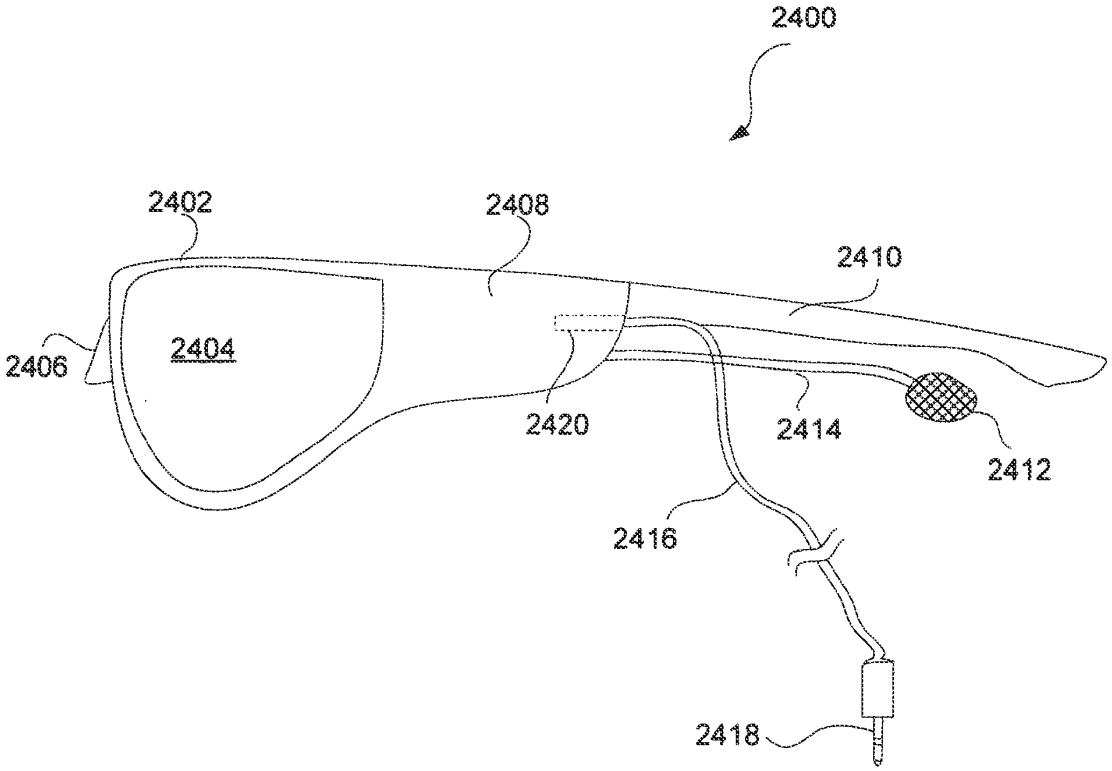


FIG. 24

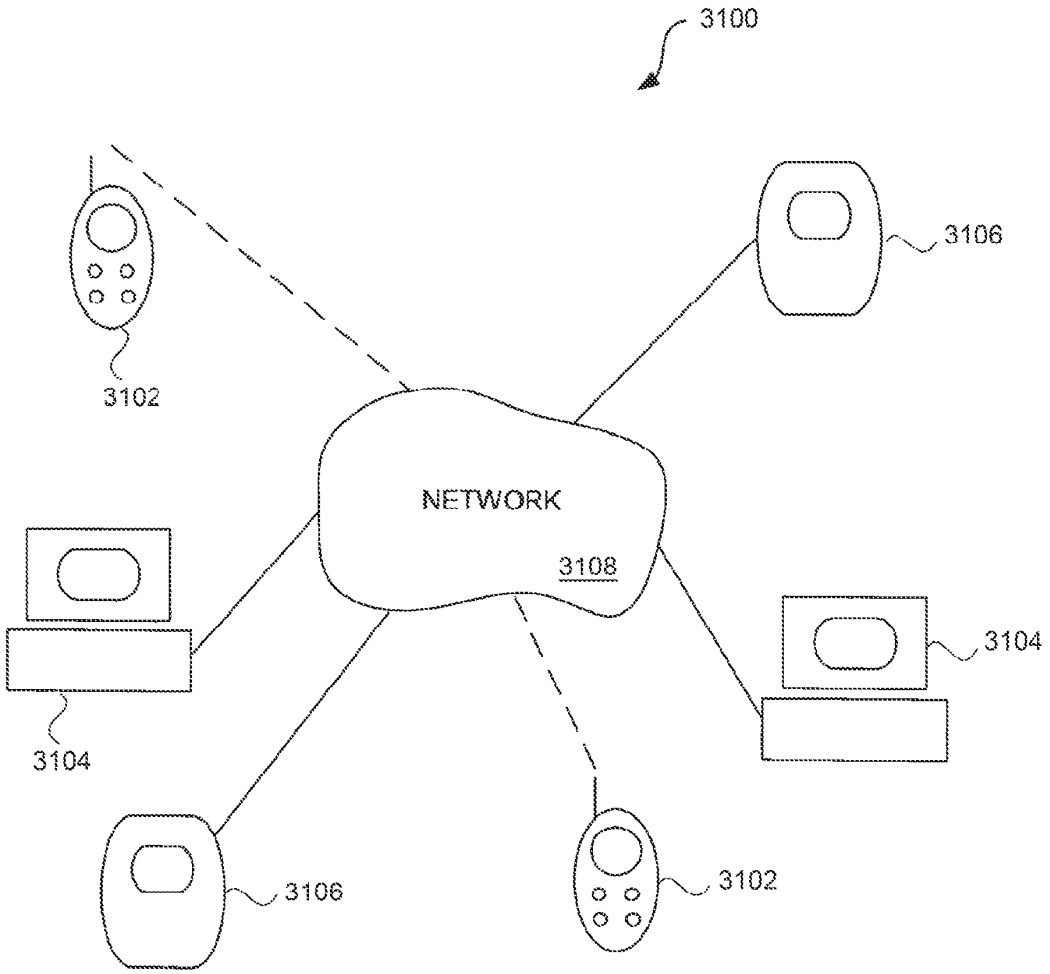


FIG. 25

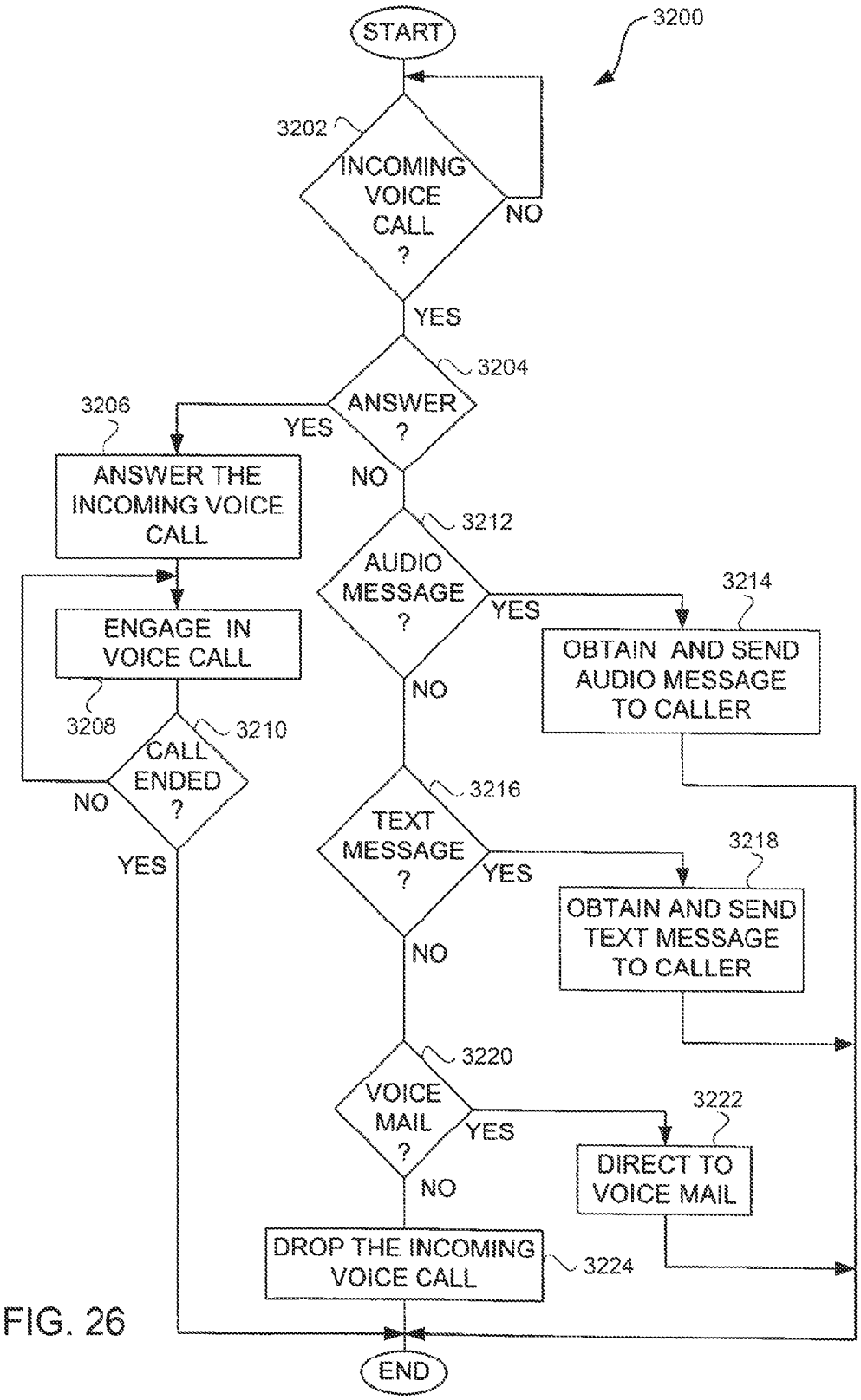

START
3200
3202
INCOMING VOICE CALL ?
NO
YES
3204
ANSWER ?
3206
YES
NO
ANSWER THE INCOMING VOICE CALL
ENGAGE IN VOICE CALL
3208
3210
CALL ENDED ?
NO
YES
3212
AUDIO MESSAGE ?
YES
3214
OBTAIN AND SEND AUDIO MESSAGE TO CALLER
NO
3216
TEXT MESSAGE ?
YES
3218
OBTAIN AND SEND TEXT MESSAGE TO CALLER
NO
3220
VOICE MAIL ?
YES
3222
DIRECT TO VOICE MAIL
NO
DROP THE INCOMING VOICE CALL
3224
END

FIG. 26

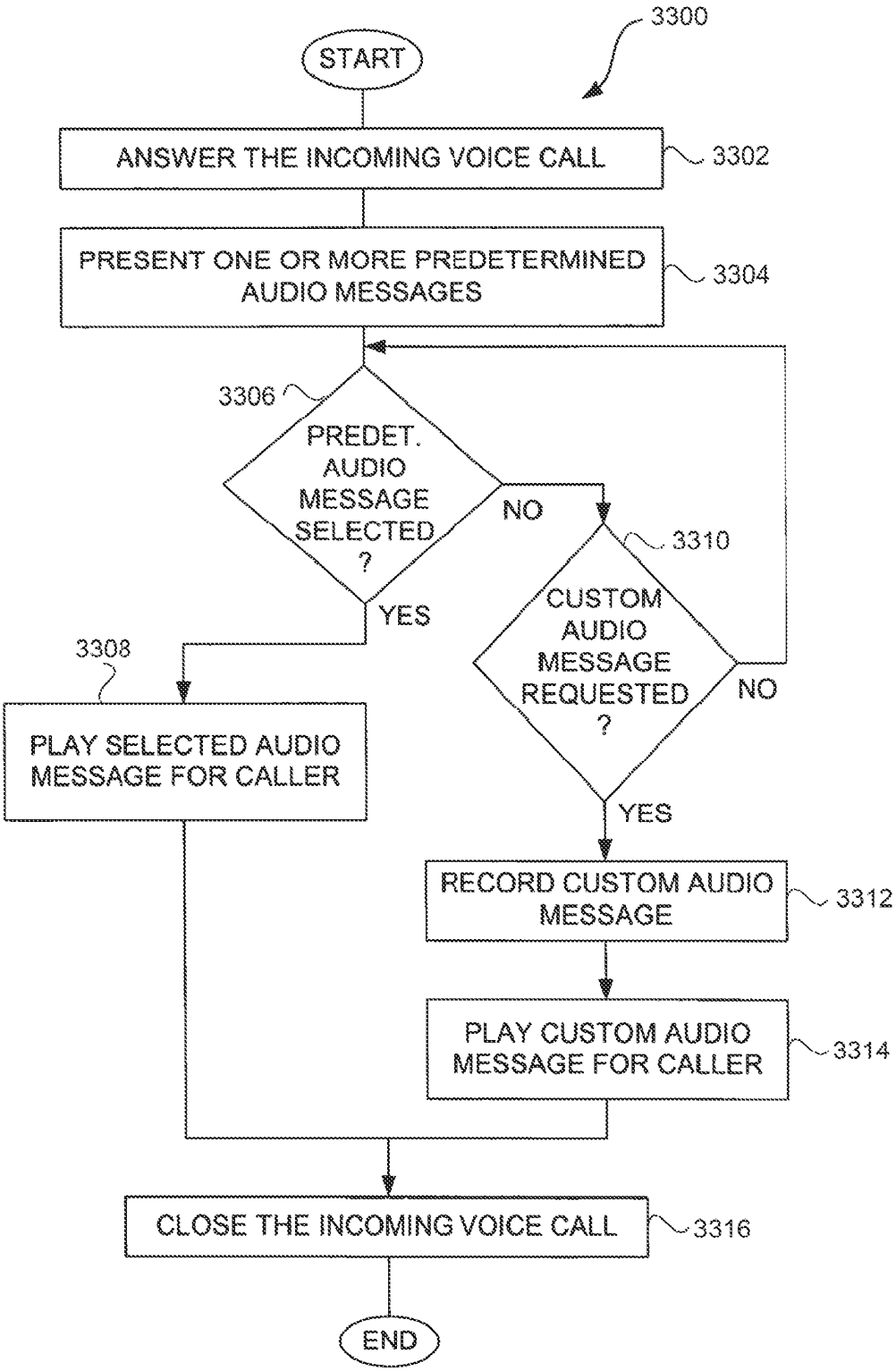

3300
START
ANSWER THE INCOMING VOICE CALL
3302
PRESENT ONE OR MORE PREDETERMINED AUDIO MESSAGES
3304
3306
PREDET. AUDIO MESSAGE SELECTED ?
NO
YES
3310
CUSTOM AUDIO MESSAGE REQUESTED ?
NO
YES
3308
PLAY SELECTED AUDIO MESSAGE FOR CALLER
RECORD CUSTOM AUDIO MESSAGE
3312
PLAY CUSTOM AUDIO MESSAGE FOR CALLER
3314
CLOSE THE INCOMING VOICE CALL
3316
END

FIG. 27

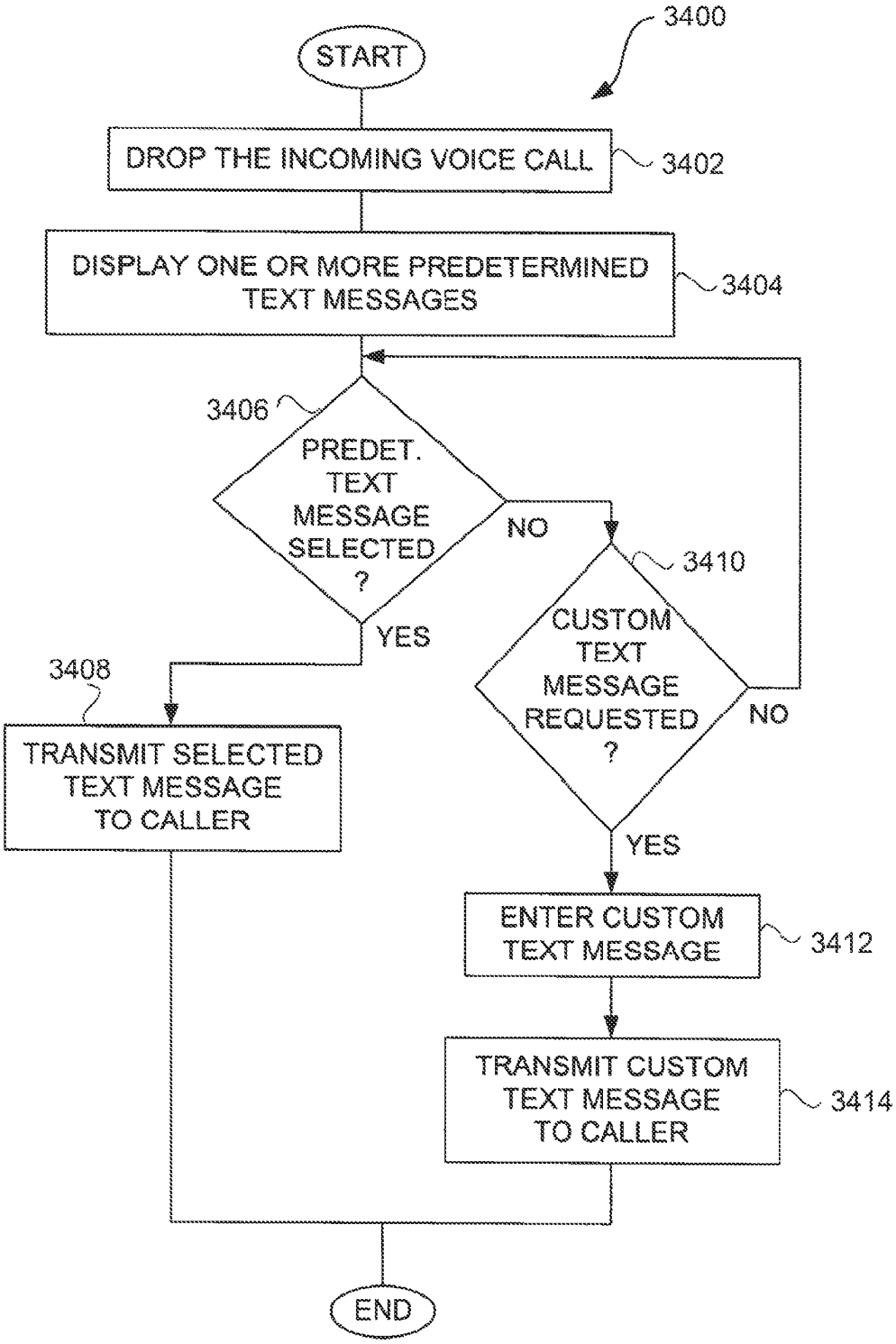

3400
START
DROP THE INCOMING VOICE CALL
3402
DISPLAY ONE OR MORE PREDETERMINED TEXT MESSAGES
3404
3406
PREDET. TEXT MESSAGE SELECTED ?
NO
YES
3410
CUSTOM TEXT MESSAGE REQUESTED ?
NO
YES
3408
TRANSMIT SELECTED TEXT MESSAGE TO CALLER
ENTER CUSTOM TEXT MESSAGE
3412
TRANSMIT CUSTOM TEXT MESSAGE TO CALLER
3414
END

FIG.28

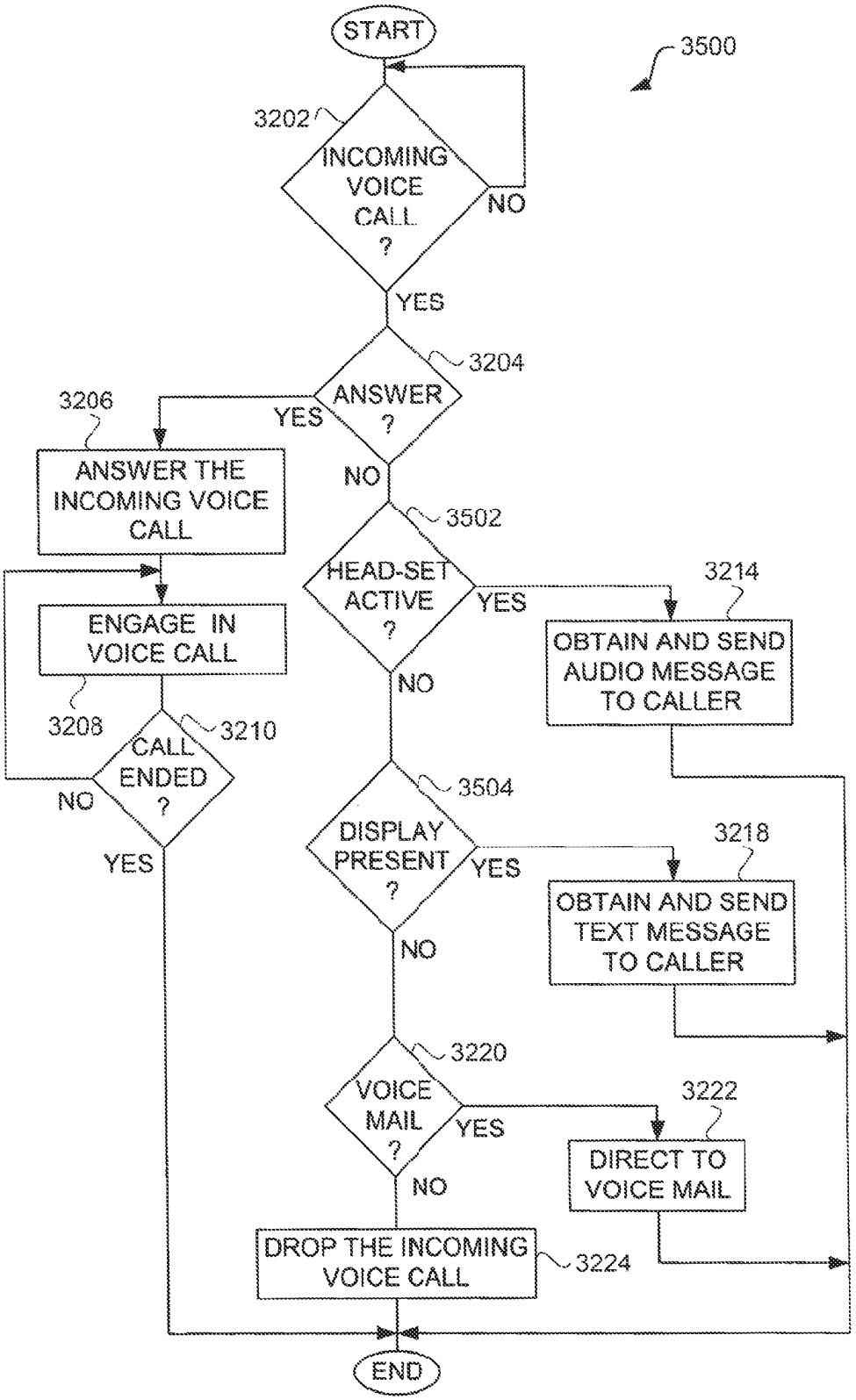

START
3500
3202
INCOMING VOICE CALL ?
NO
YES
3204
ANSWER ?
3206
YES
ANSWER THE INCOMING VOICE CALL
NO
3502
HEAD-SET ACTIVE ?
YES
3214
OBTAIN AND SEND AUDIO MESSAGE TO CALLER
ENGAGE IN VOICE CALL
NO
3208
3210
CALL ENDED ?
NO
YES
3504
DISPLAY PRESENT ?
YES
3218
OBTAIN AND SEND TEXT MESSAGE TO CALLER
NO
3220
VOICE MAIL ?
YES
3222
DIRECT TO VOICE MAIL
NO
DROP THE INCOMING VOICE CALL
3224
END

FIG. 29

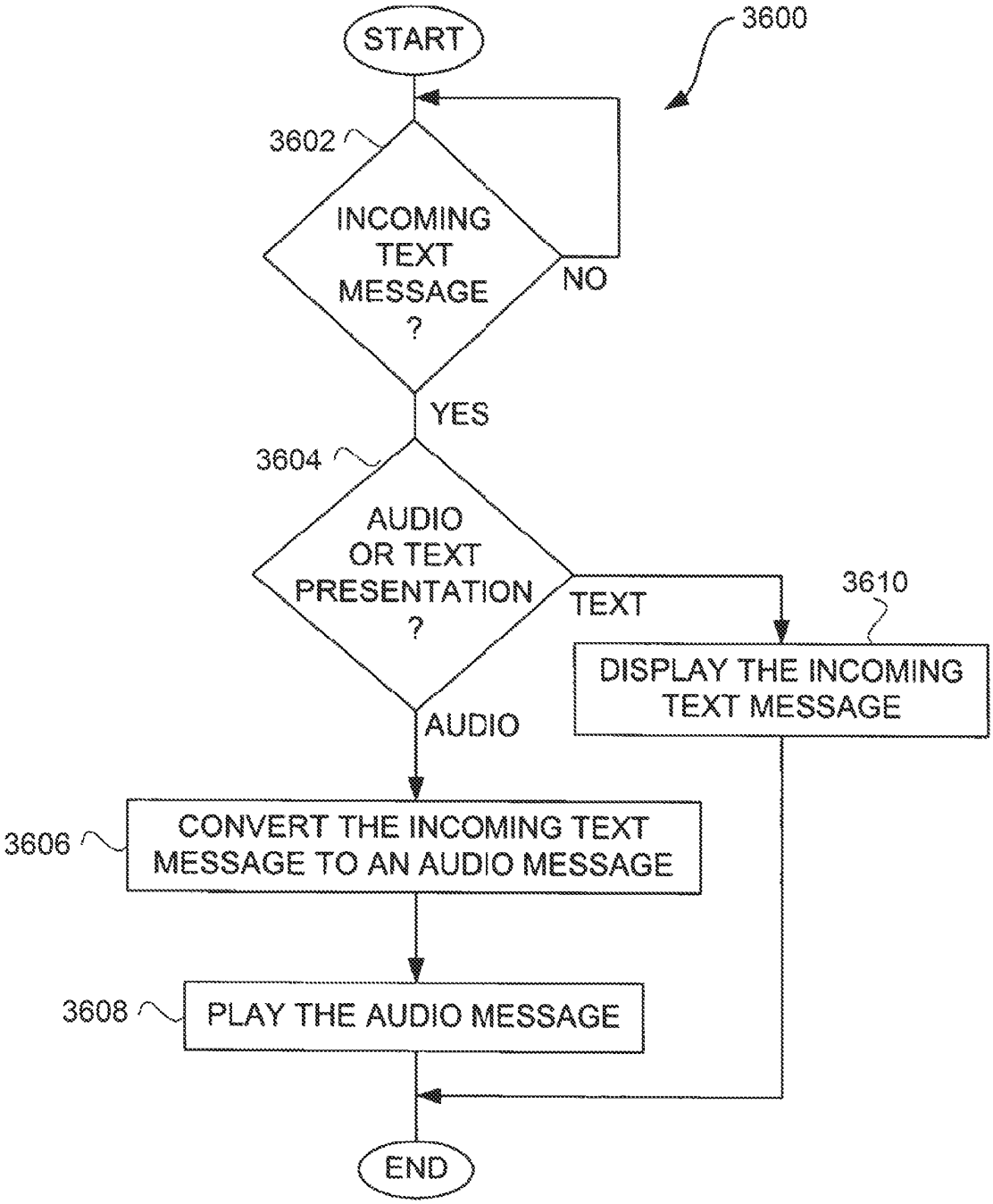

START
3600
3602
INCOMING TEXT MESSAGE ?
NO
YES
3604
AUDIO OR TEXT PRESENTATION ?
TEXT
3610
DISPLAY THE INCOMING TEXT MESSAGE
AUDIO
3606
CONVERT THE INCOMING TEXT MESSAGE TO AN AUDIO MESSAGE
3608
PLAY THE AUDIO MESSAGE
END

FIG. 30

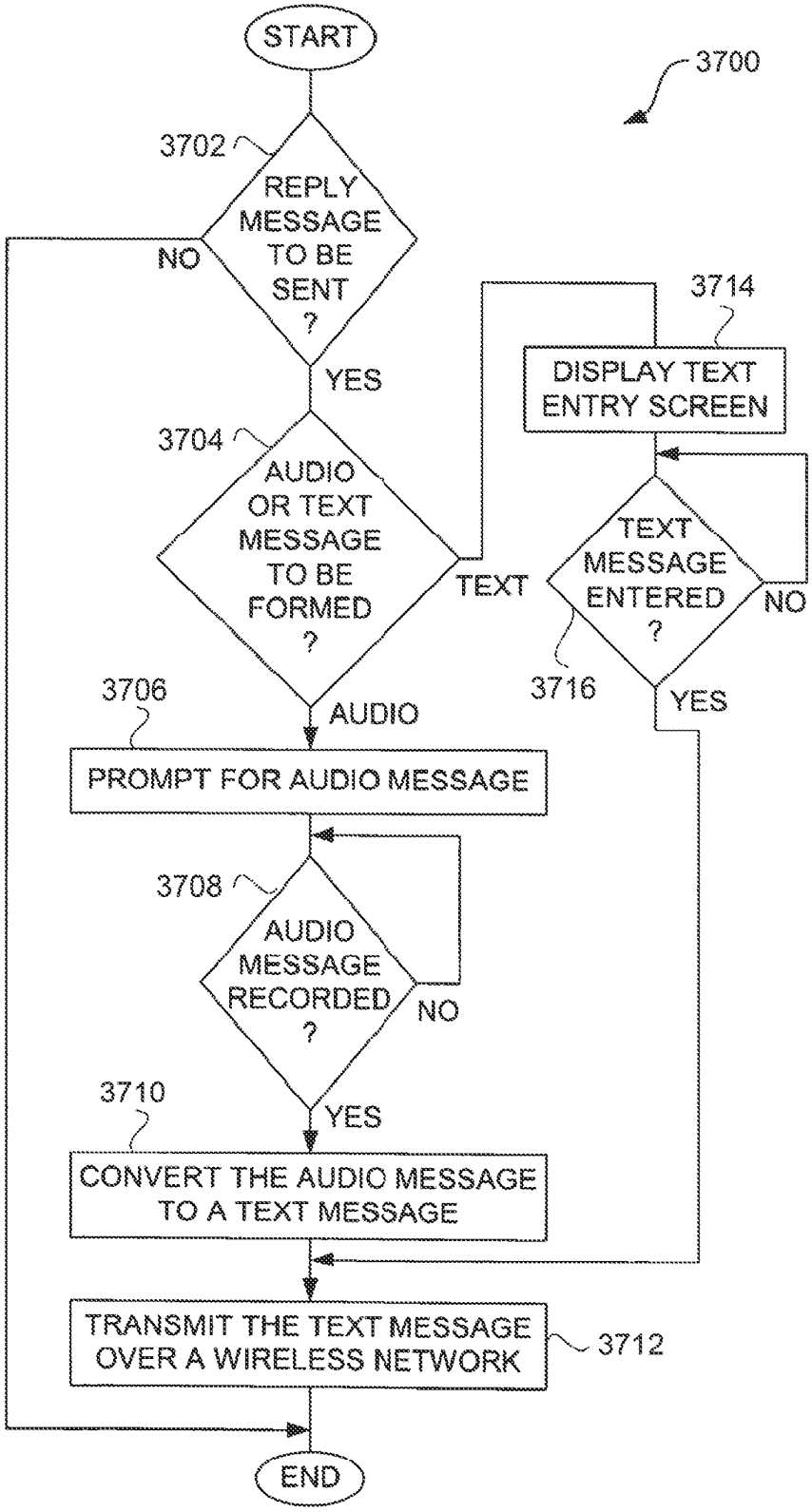

START
3700
3702
REPLY MESSAGE TO BE SENT ?
NO
YES
3704
AUDIO OR TEXT MESSAGE TO BE FORMED ?
TEXT
3714
DISPLAY TEXT ENTRY SCREEN
TEXT MESSAGE ENTERED ?
NO
3716
YES
3706
AUDIO
PROMPT FOR AUDIO MESSAGE
3708
AUDIO MESSAGE RECORDED ?
NO
YES
3710
CONVERT THE AUDIO MESSAGE TO A TEXT MESSAGE
TRANSMIT THE TEXT MESSAGE OVER A WIRELESS NETWORK
3712
END

FIG. 31

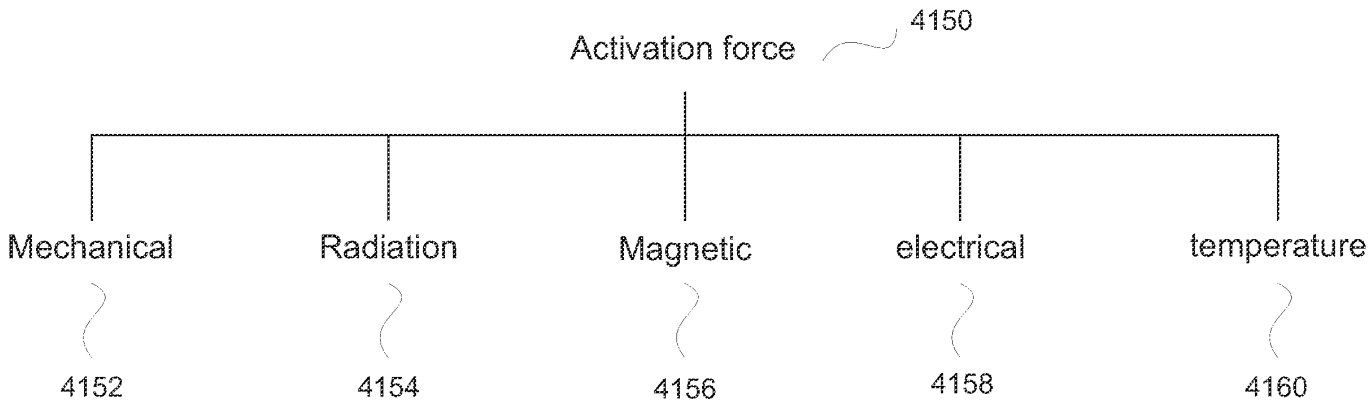

Activation force
4150
Mechanical
Radiation
Magnetic
electrical
temperature
4152
4154
4156
4158
4160

Fig. 32

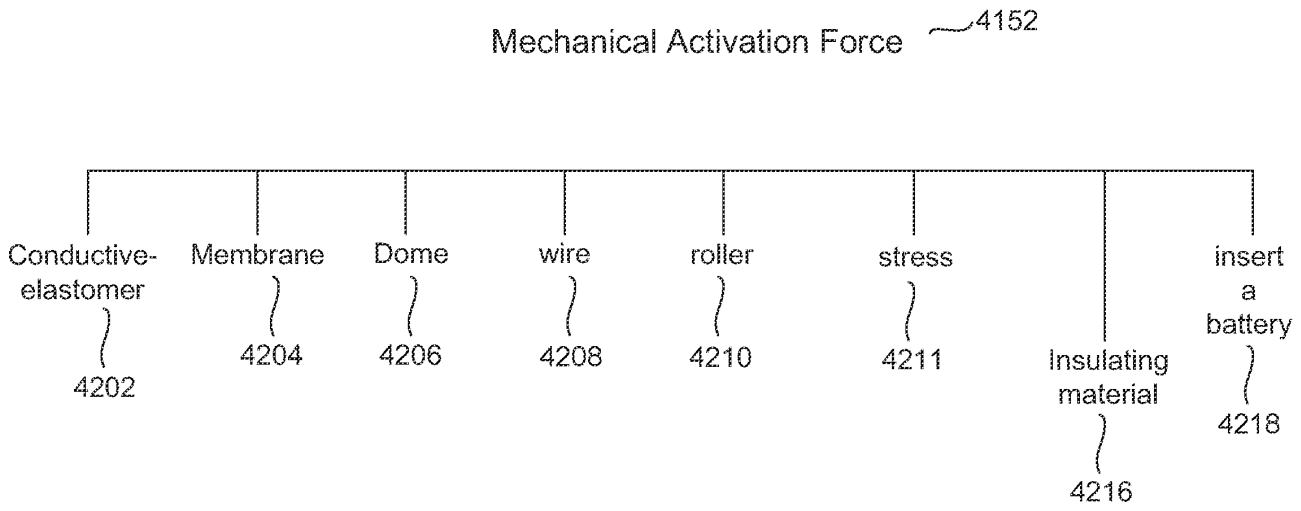

Mechanical Activation Force
4152
Conductive-elastomer
4202
Membrane
4204
Dome
4206
wire
4208
roller
4210
stress
4211
Insulating material
4216
insert a battery
4218

Fig. 33

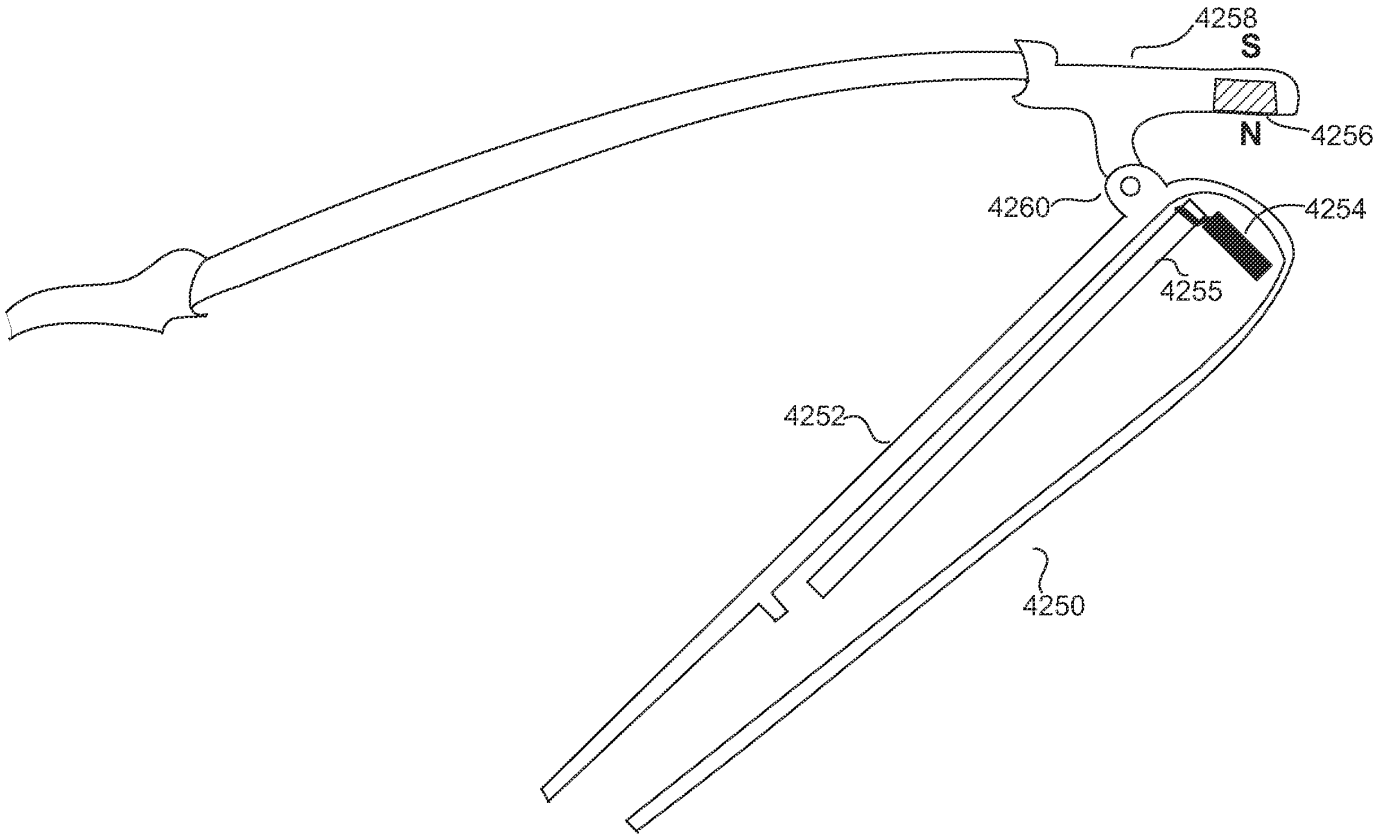


Fig. 34

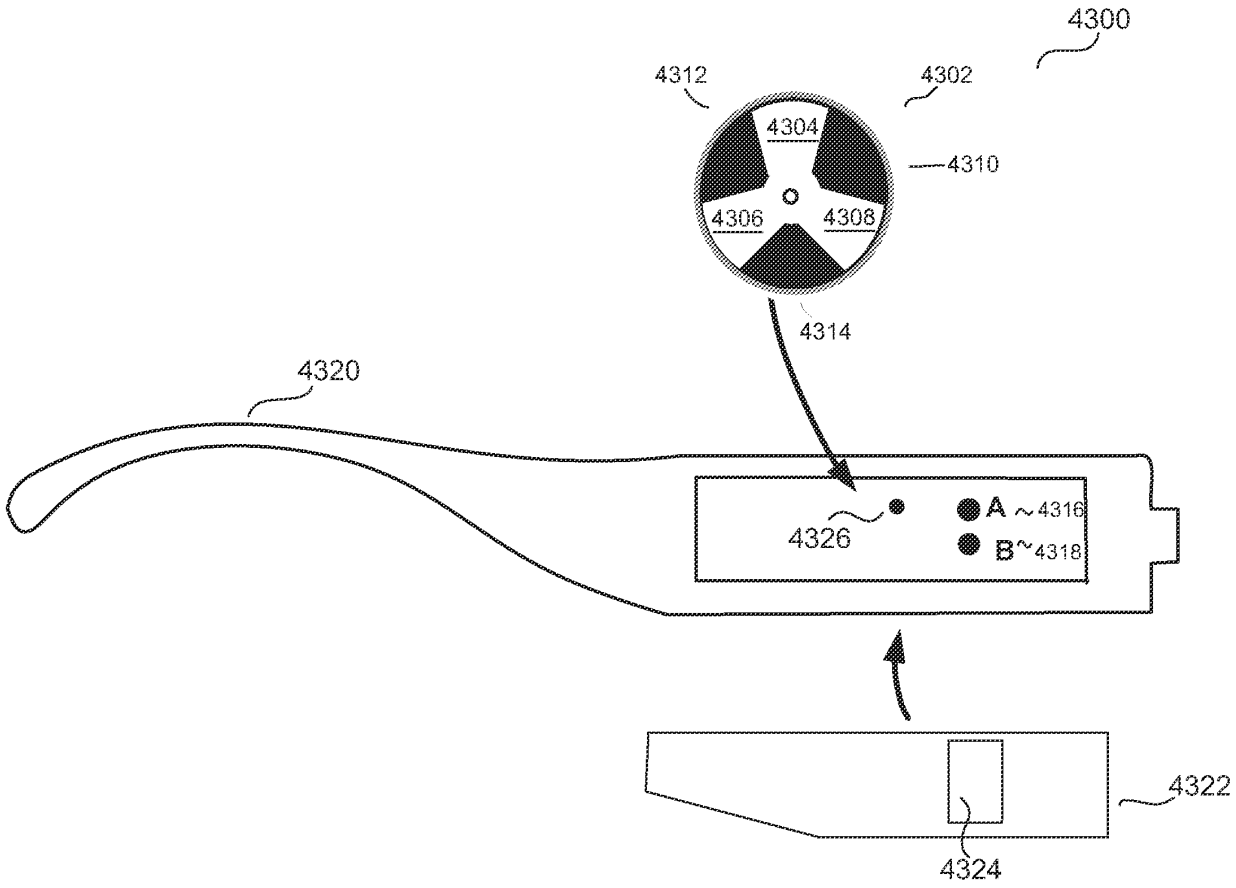

4300
4312
4302
4304
4310
4306
4308
4314
4320
4326
A ~4316
B~4318
4322
4324

Fig. 35A

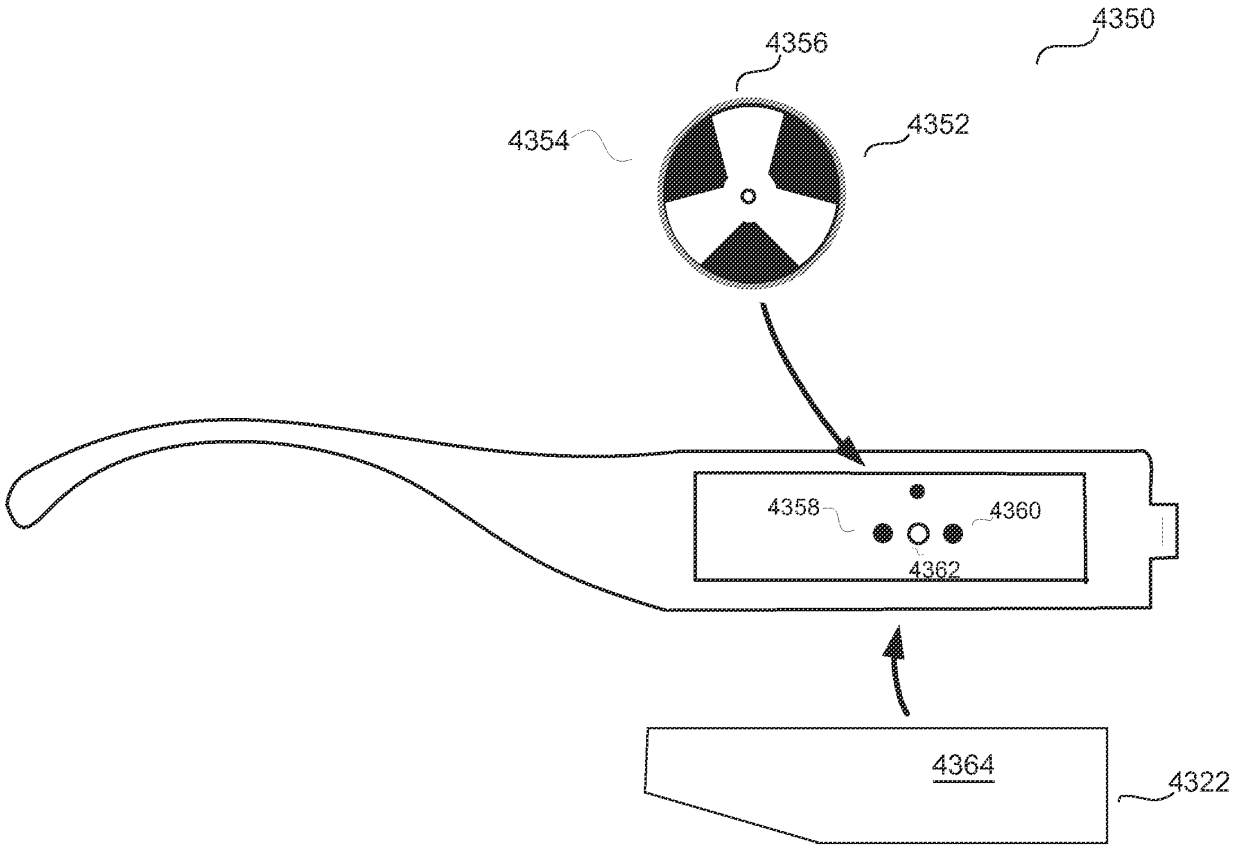


Fig. 35B

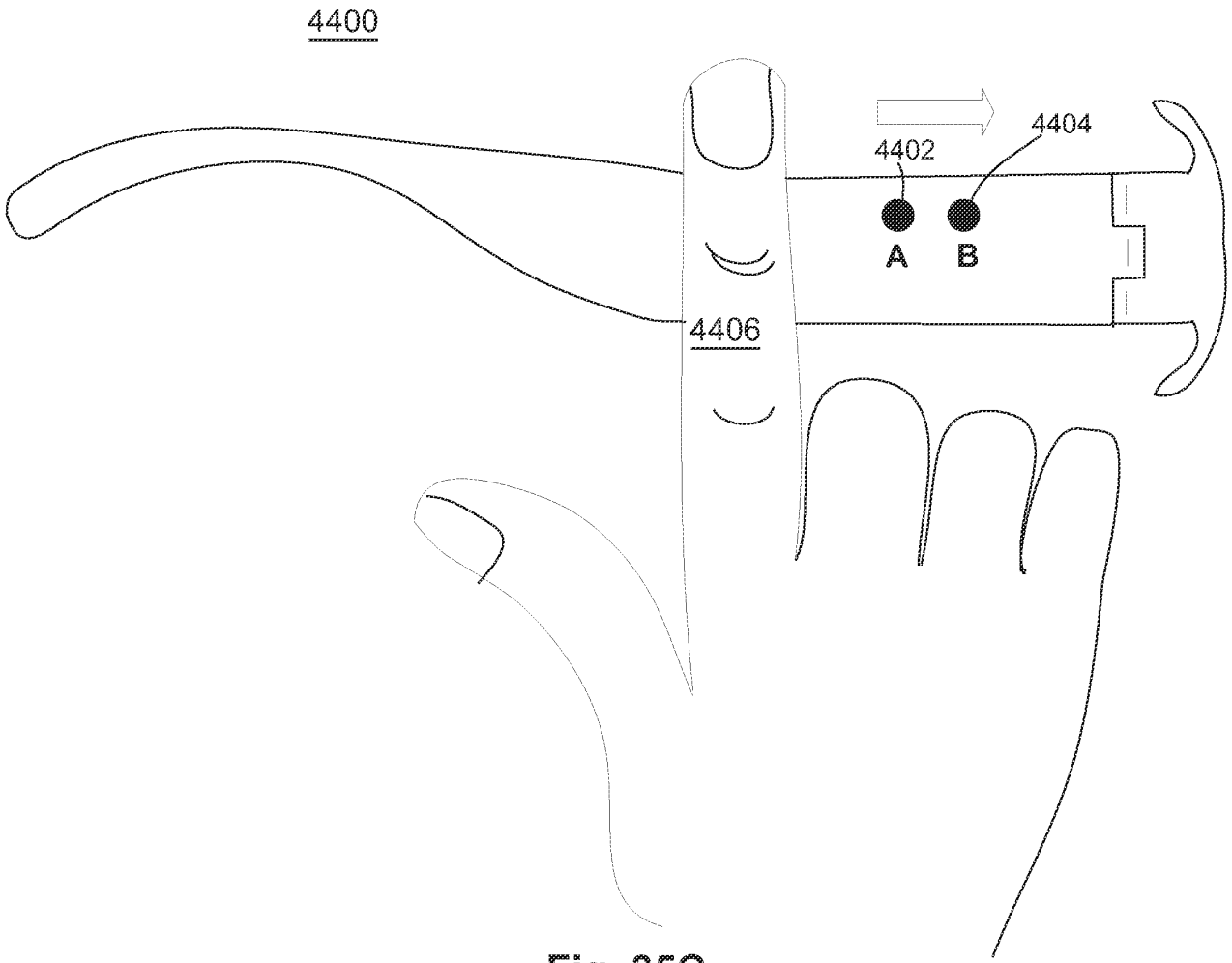


Fig. 35C

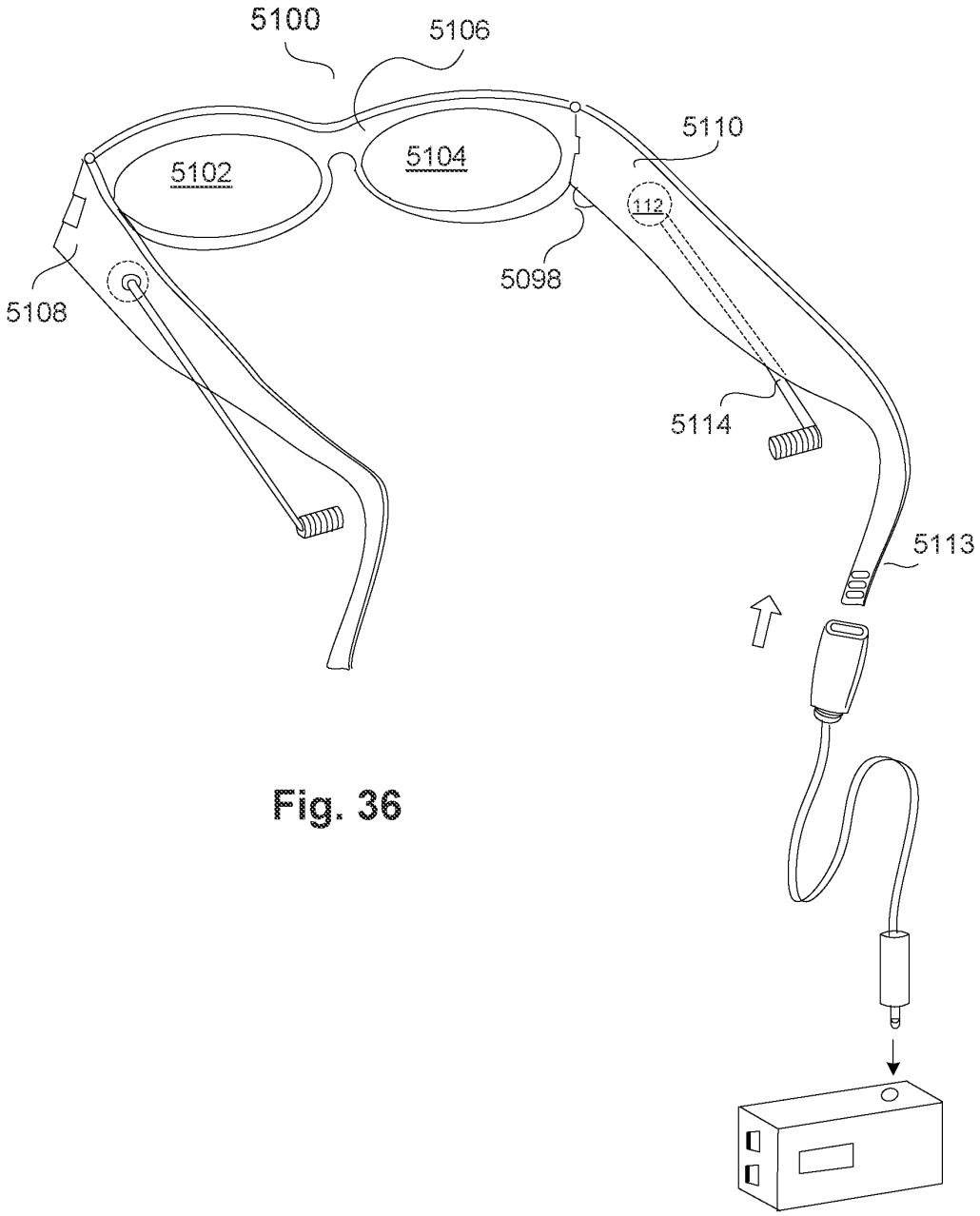


Fig. 36

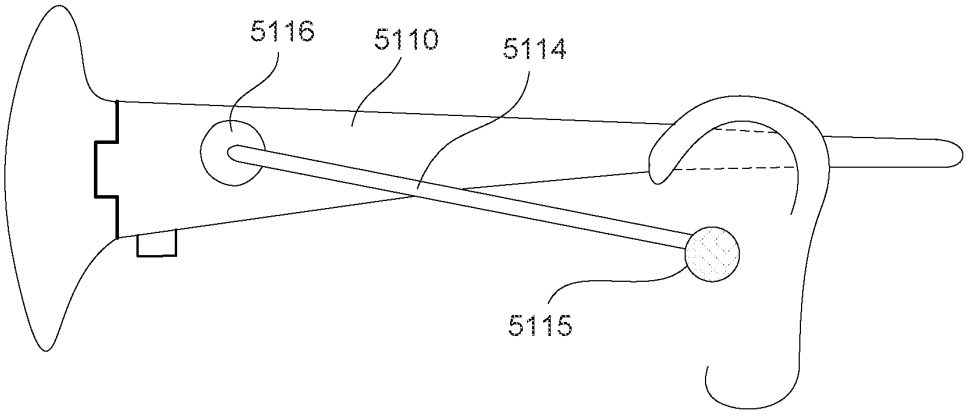


Fig. 37

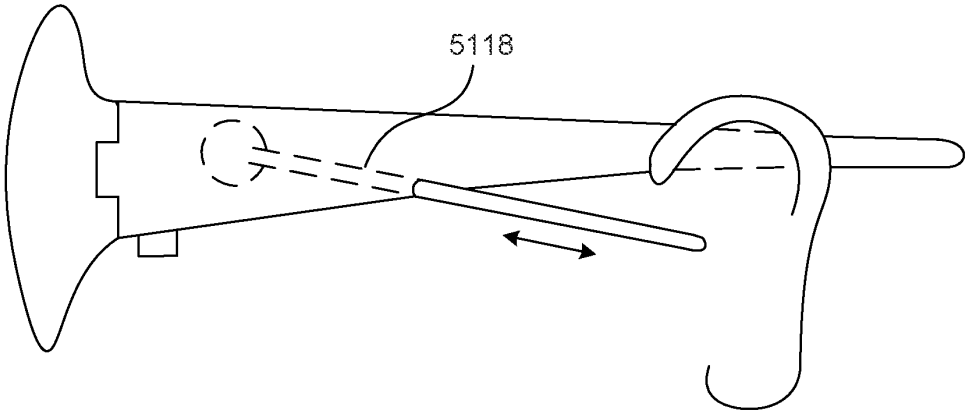


Fig. 38

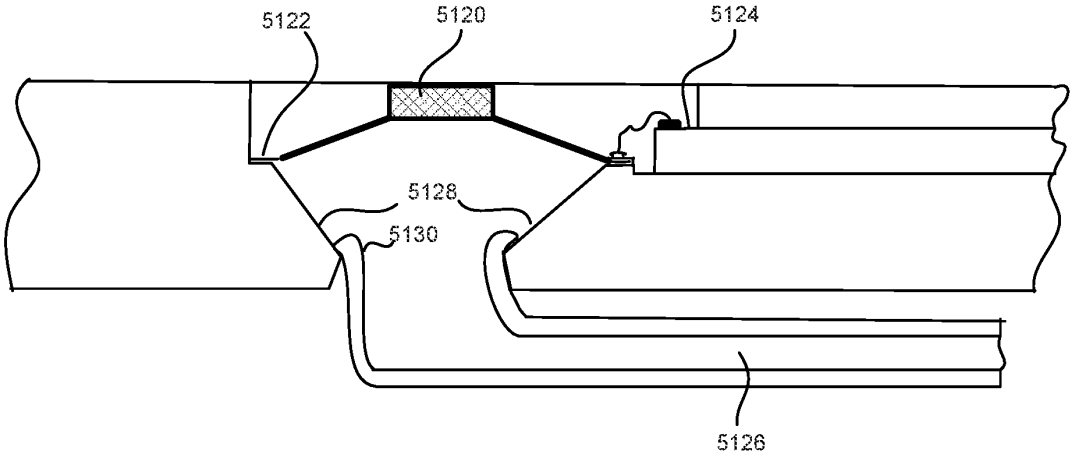


Fig. 39

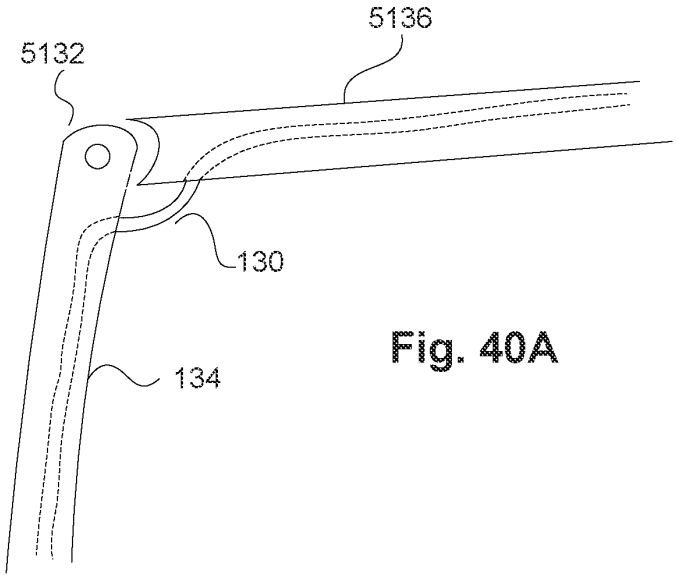


Fig. 40A

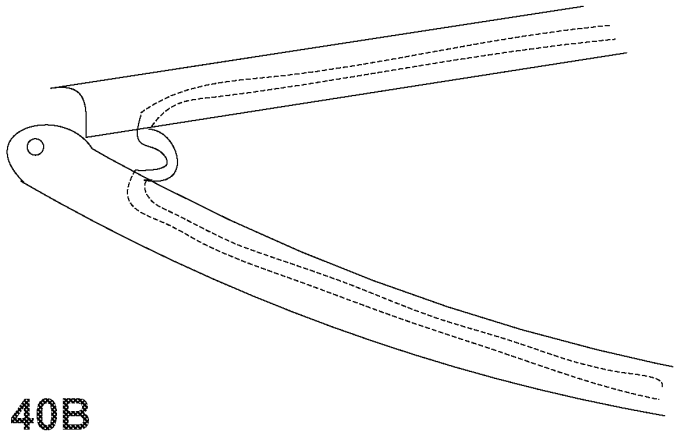


Fig. 40B

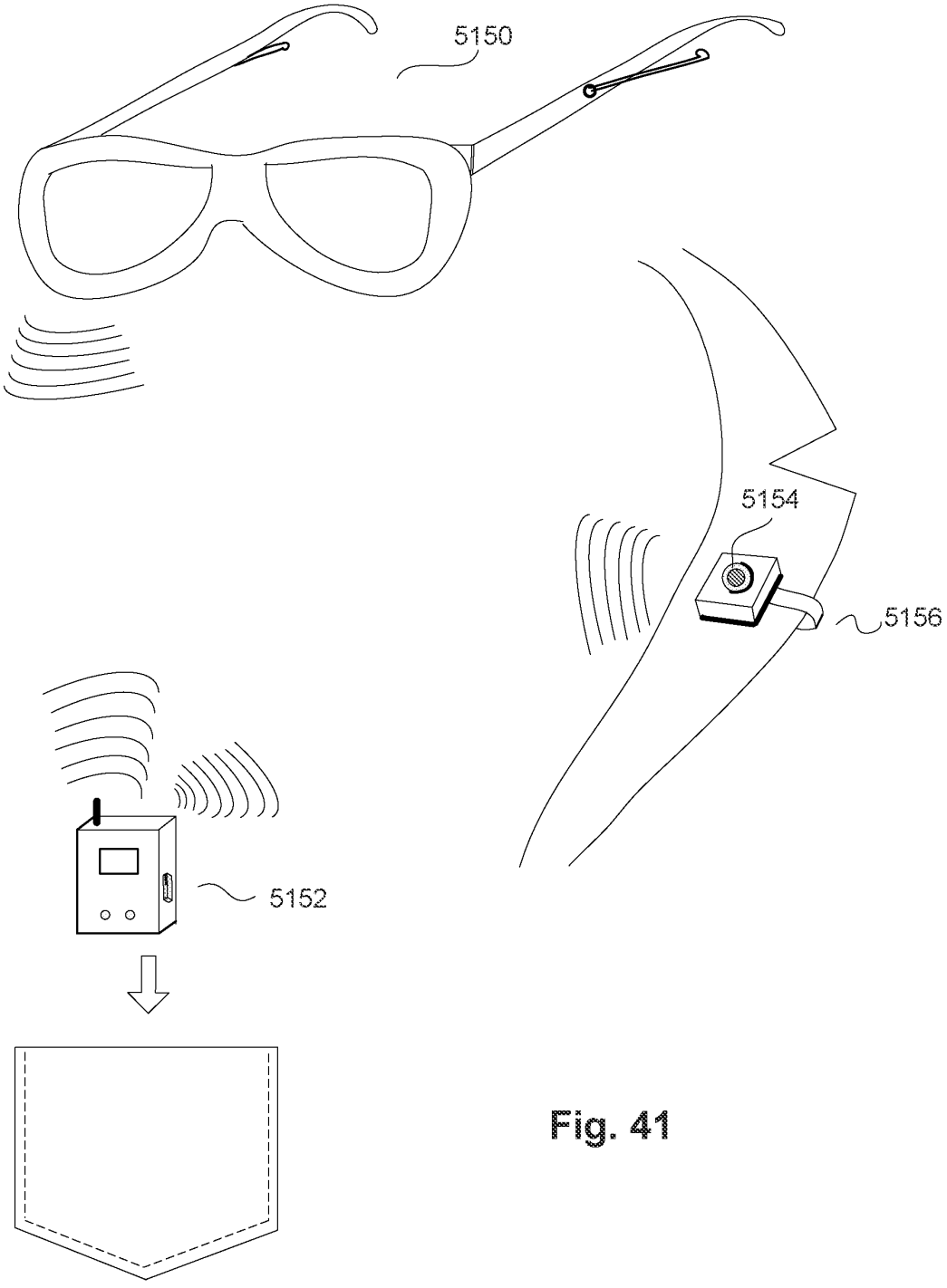


Fig. 41

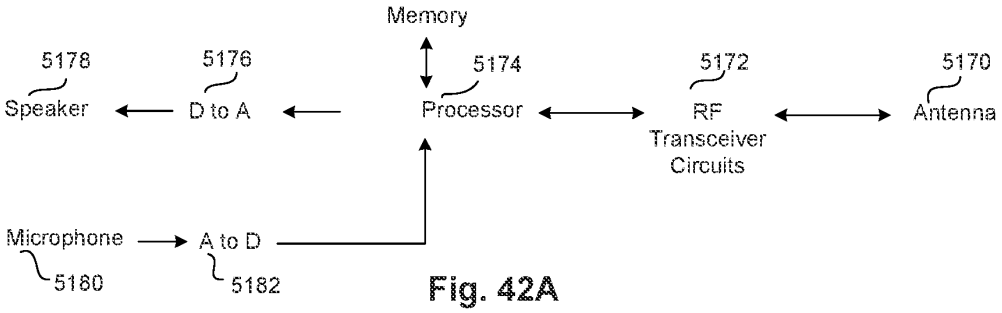


Fig. 42A



Fig. 42B

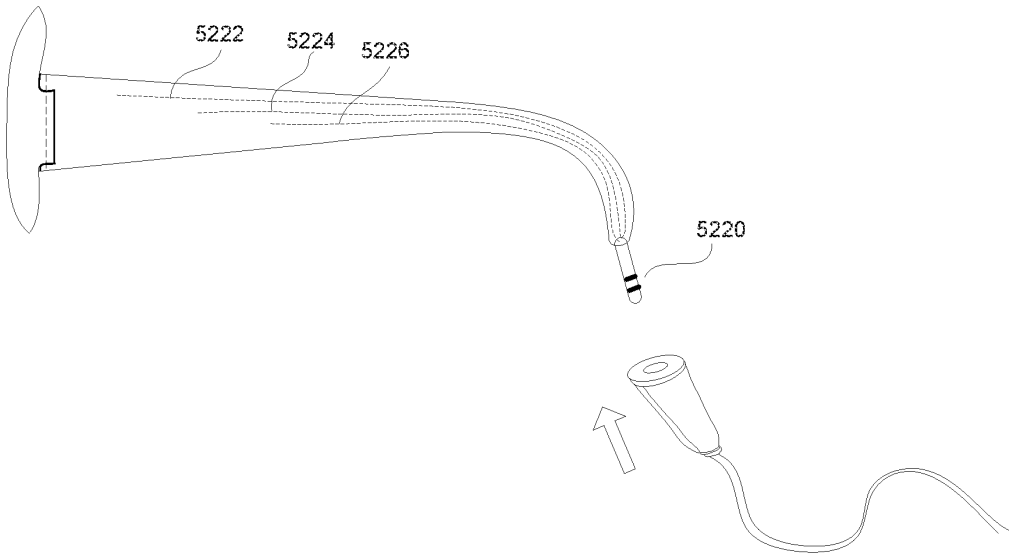


Fig. 43

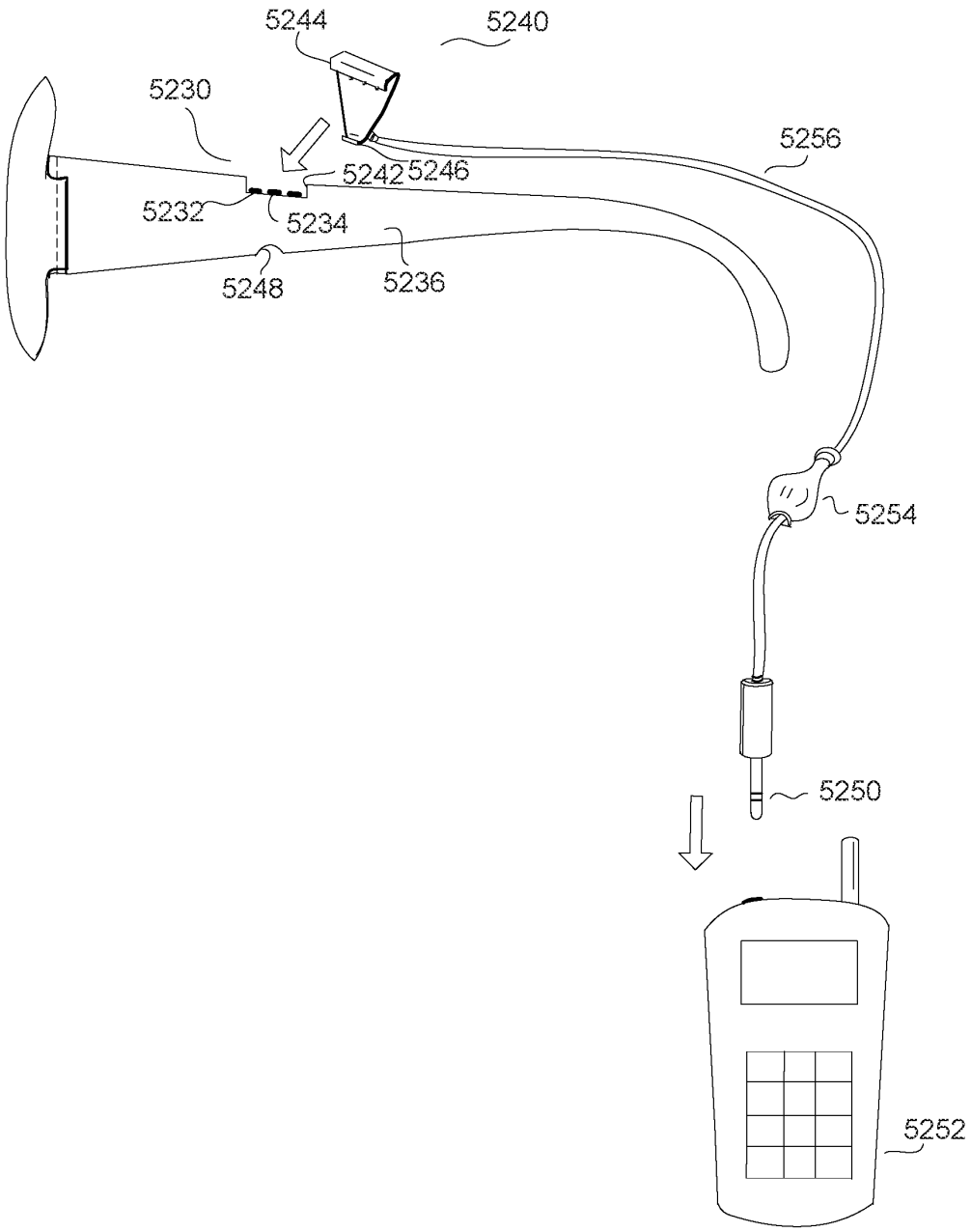

5244
5240
5230
5256
5242
5246
5232
5234
5248
5236
5254
5250
5252

Fig. 44

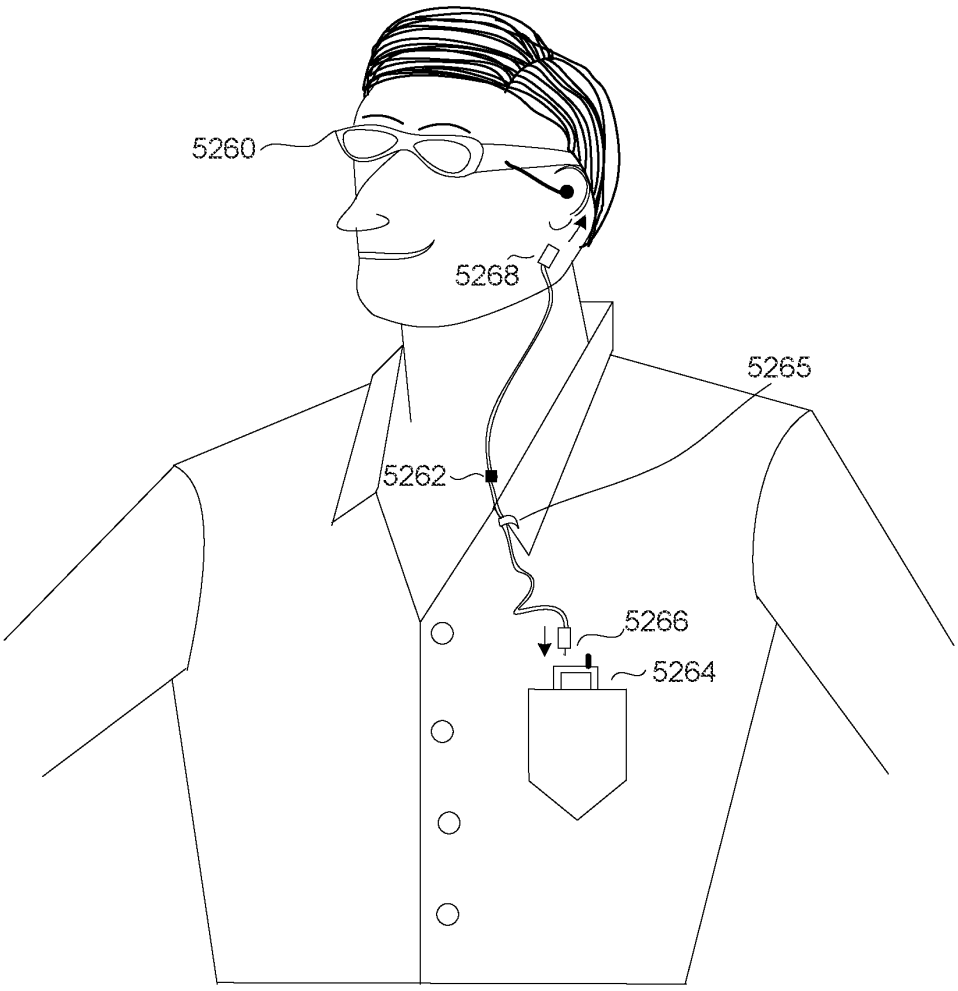


Fig. 45

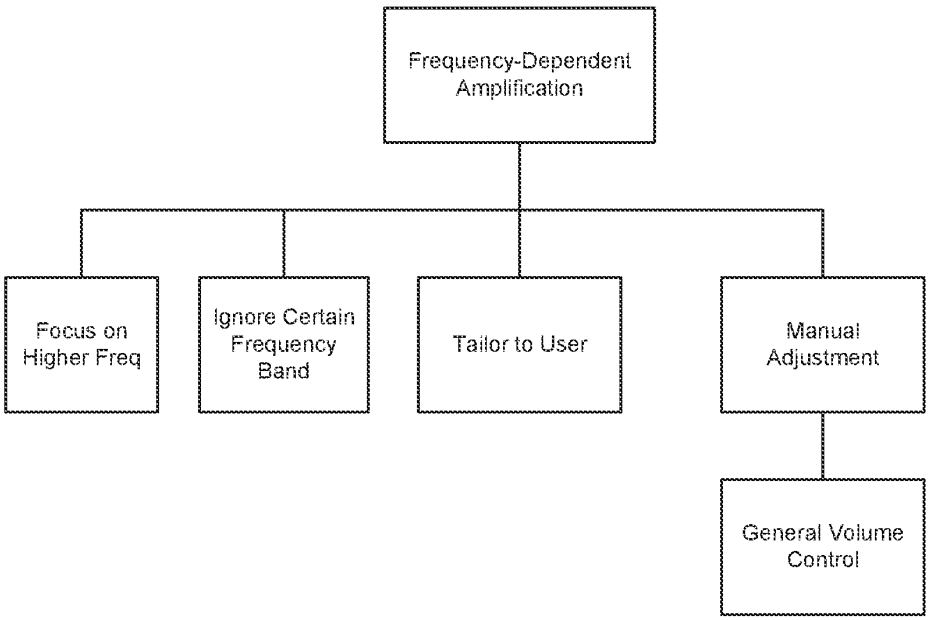

Frequency-Dependent Amplification
Focus on Higher Freq
Ignore Certain Frequency Band
Tailor to User
Manual Adjustment
General Volume Control

FIG. 46

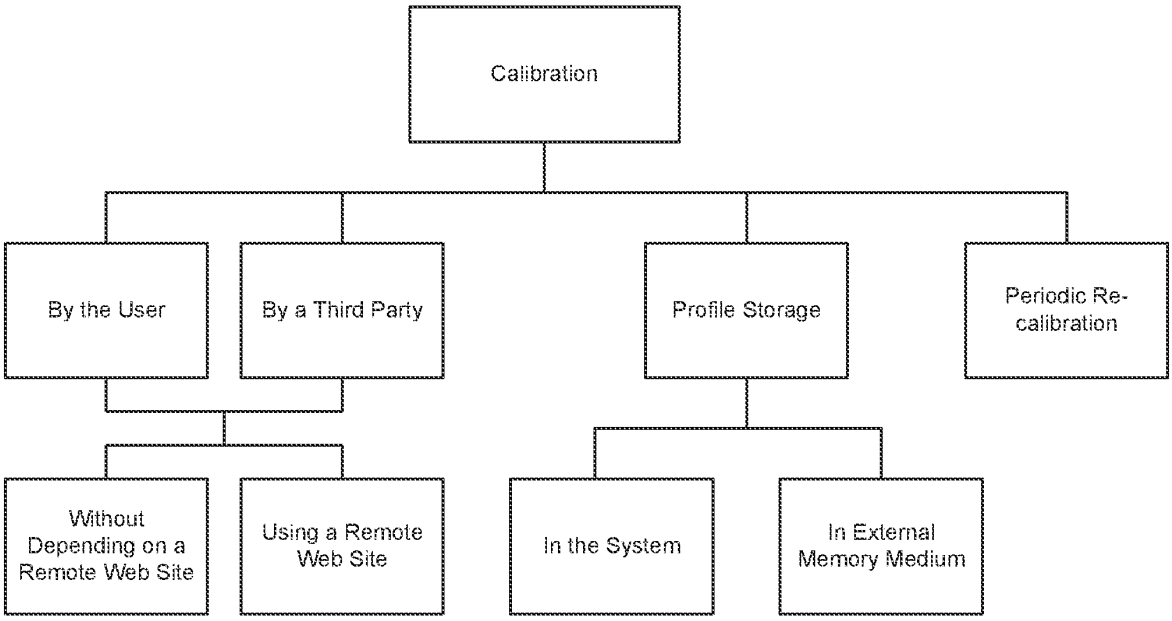

Calibration
By the User
By a Third Party
Profile Storage
Periodic Re-calibration
Without Depending on a Remote Web Site
Using a Remote Web Site
In the System
In External Memory Medium

FIG. 47

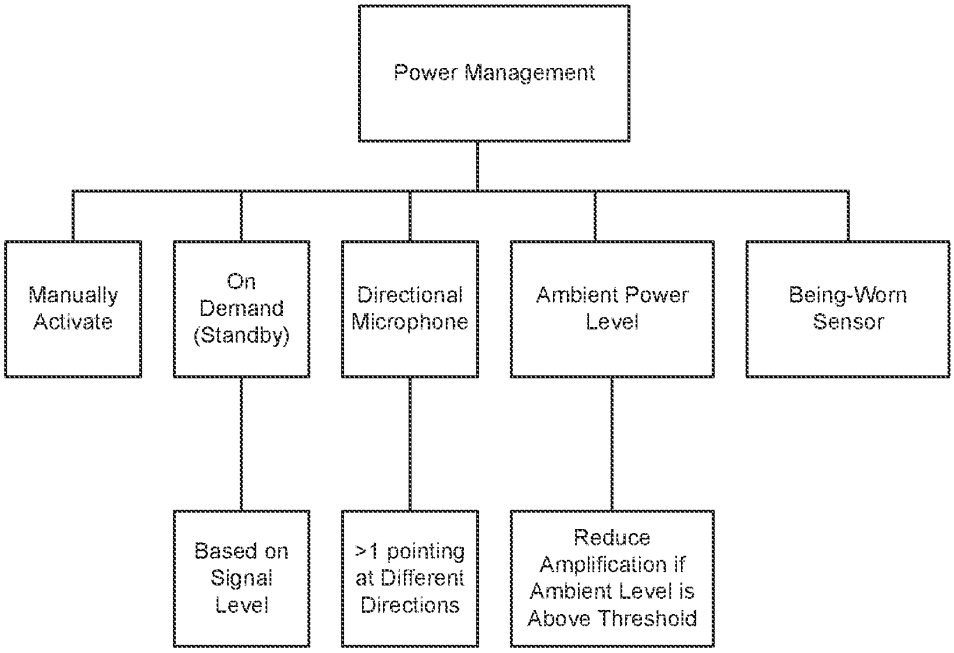

Power Management
Manually Activate
On Demand (Standby)
Directional Microphone
Ambient Power Level
Being-Worn Sensor
Based on Signal Level
>1 pointing at Different Directions
Reduce Amplification if Ambient Level is Above Threshold

FIG. 48

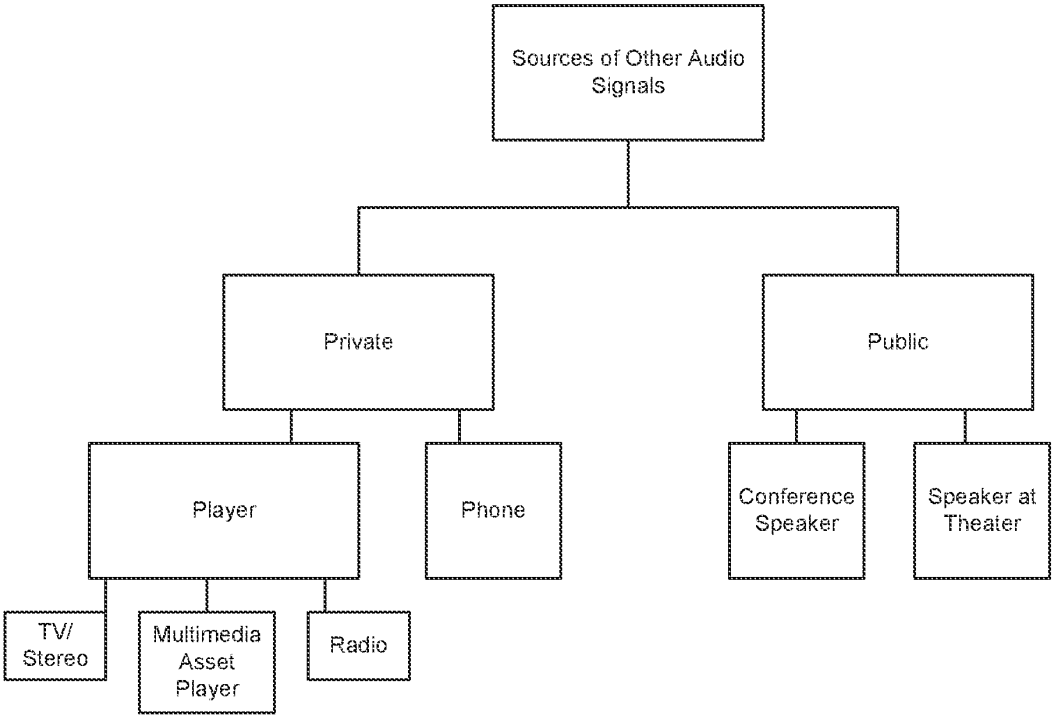

Sources of Other Audio Signals
Private
Public
Player
Phone
Conference Speaker
Speaker at Theater
TV/ Stereo
Multimedia Asset Player
Radio

FIG. 49

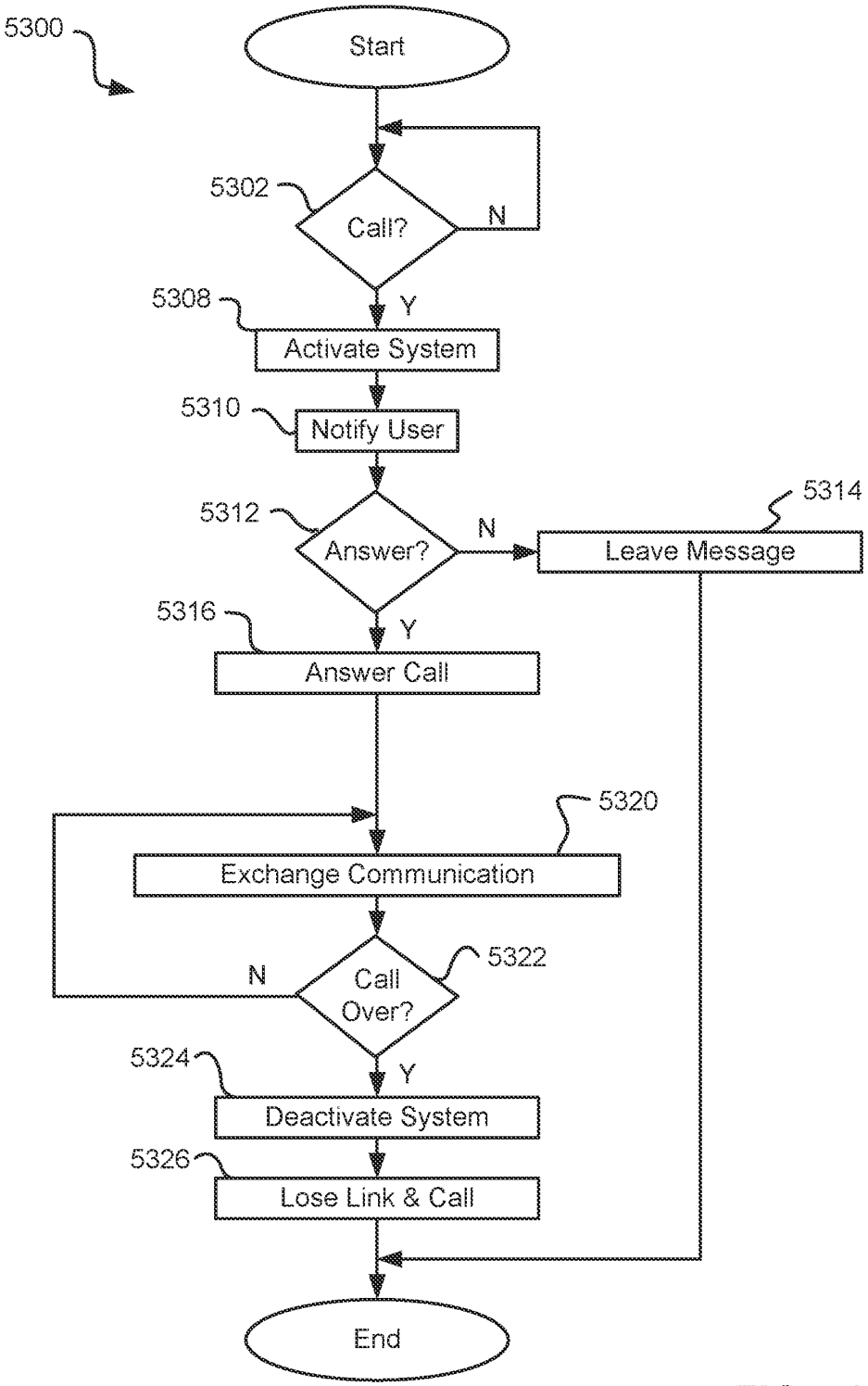

5300
Start
5302
Call?
N
Y
5308
Activate System
5310
Notify User
5312
Answer?
N
5314
Leave Message
Y
5316
Answer Call
5320
Exchange Communication
5322
Call Over?
N
Y
5324
Deactivate System
5326
Lose Link & Call
End

FIG. 50

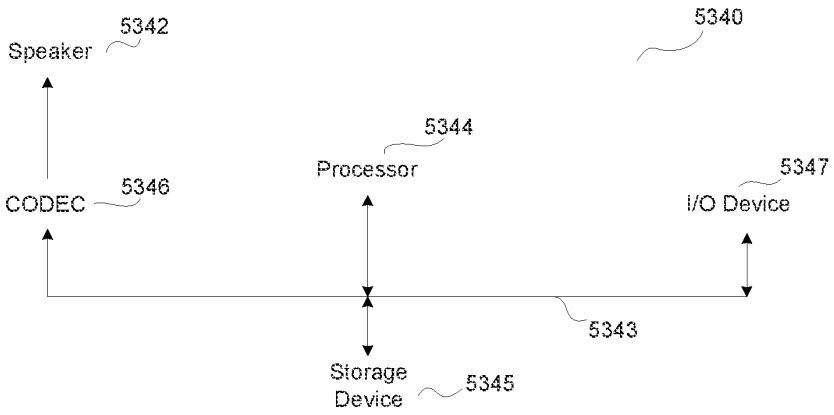

5342
Speaker
5340
5344
Processor
5347
I/O Device
5346
CODEC
5343
Storage
Device
5345

Fig. 51

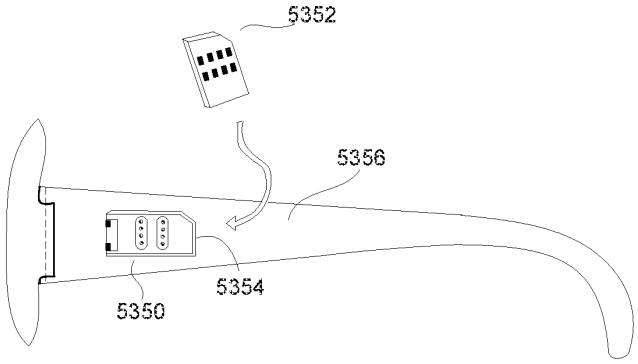


Fig. 52

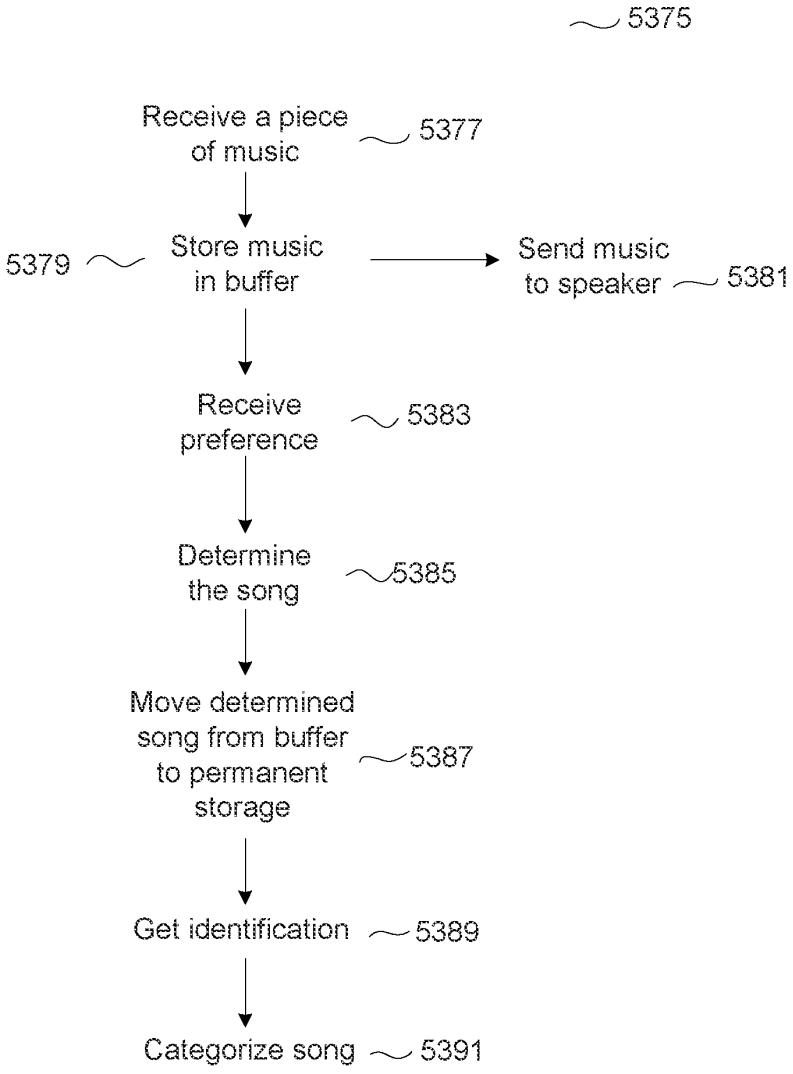

5375
Receive a piece of music
5377
Store music in buffer
5379
Send music to speaker
5381
Receive preference
5383
Determine the song
5385
Move determined song from buffer to permanent storage
5387
Get identification
5389
Categorize song
5391

Fig. 53

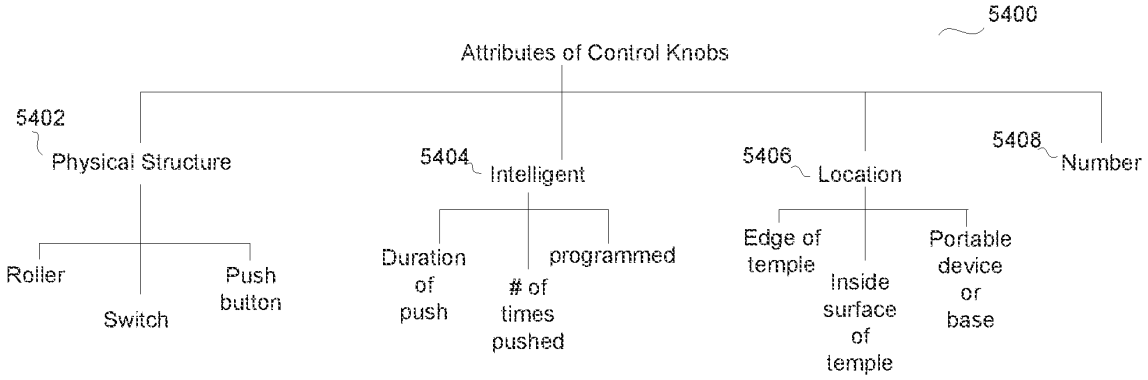

5400
Attributes of Control Knobs
5402
Physical Structure
Roller
Switch
Push button
5404
Intelligent
Duration of push
of times pushed
programmed
5406
Location
Edge of temple
Inside surface of temple
Portable device or base
5408
Number

Fig. 54

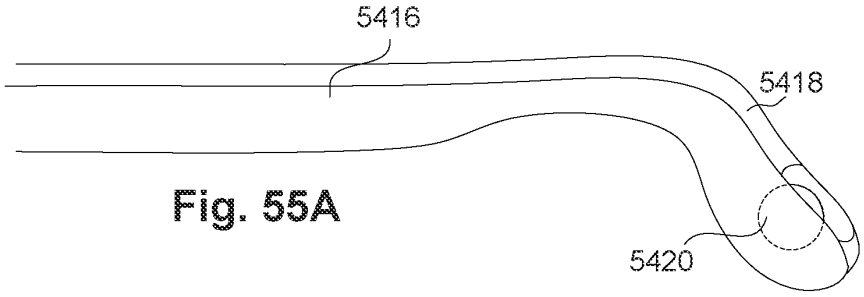


Fig. 55A

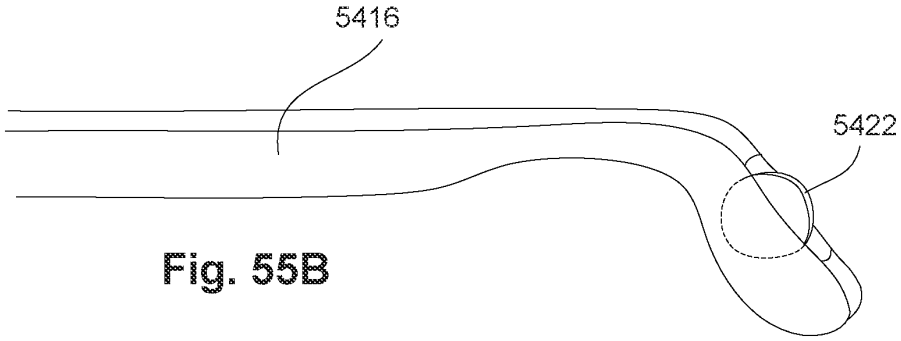


Fig. 55B

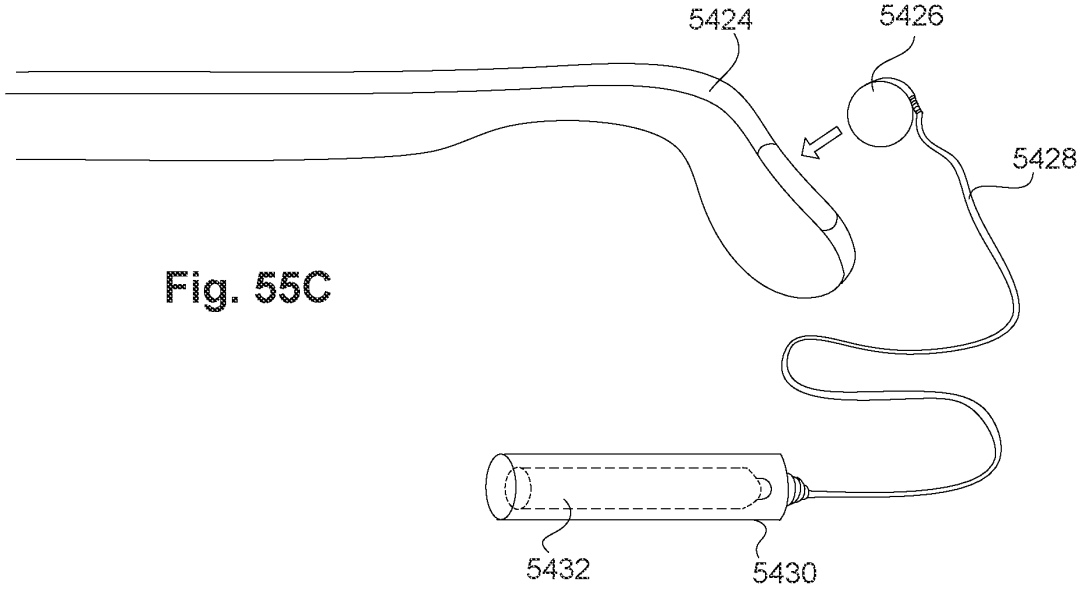


Fig. 55C

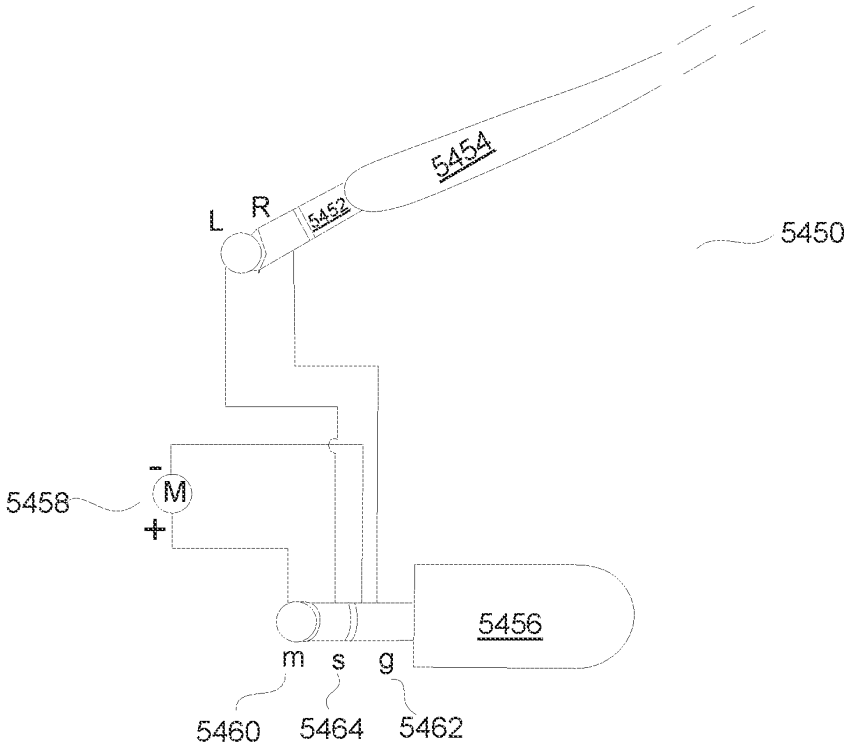


Fig. 56A

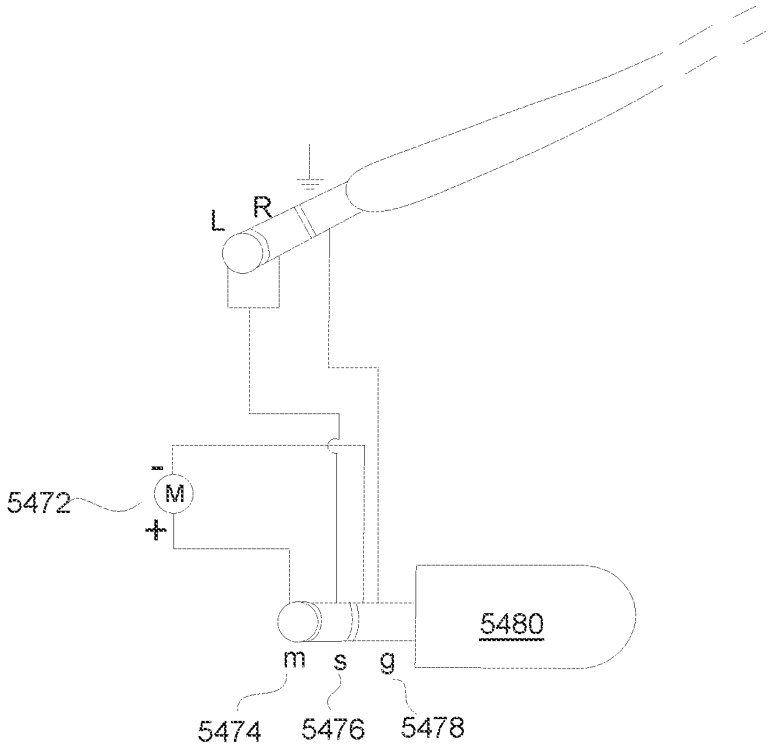


Fig. 56B

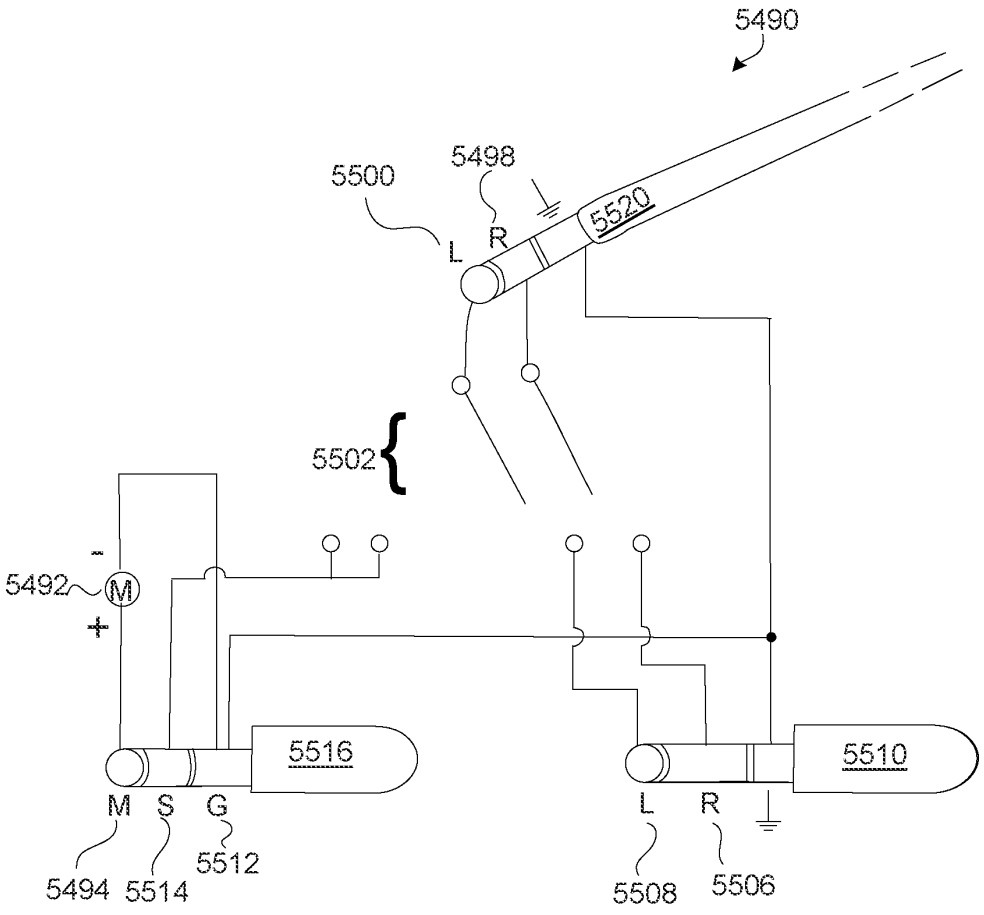

5490
5498
5500
R
L
5520
5502
5492
M
-
+
5516
5510
M
S
G
L
R
5494
5514
5512
5508
5506

Fig. 57

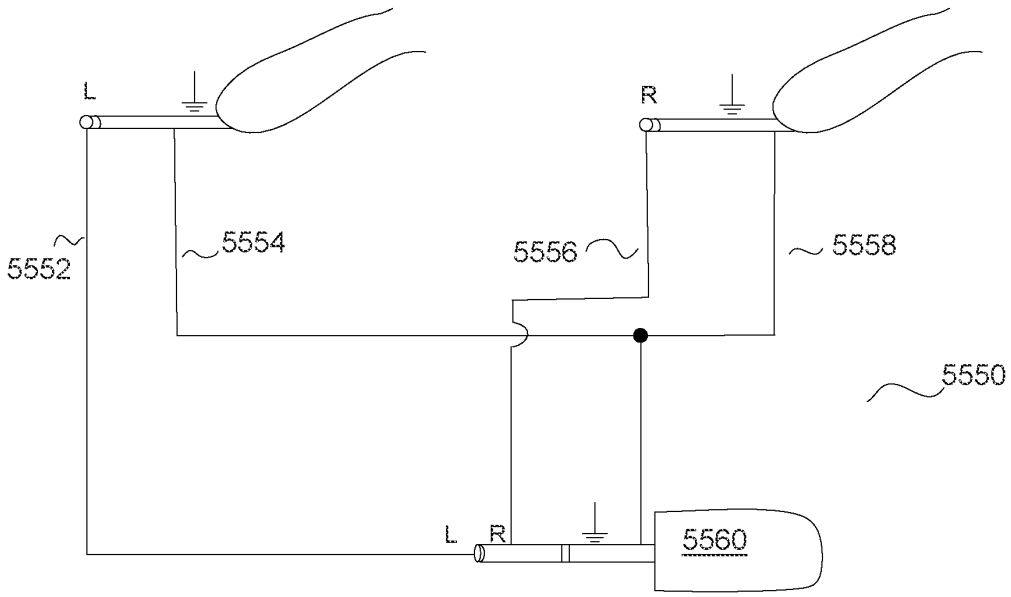


Fig. 58

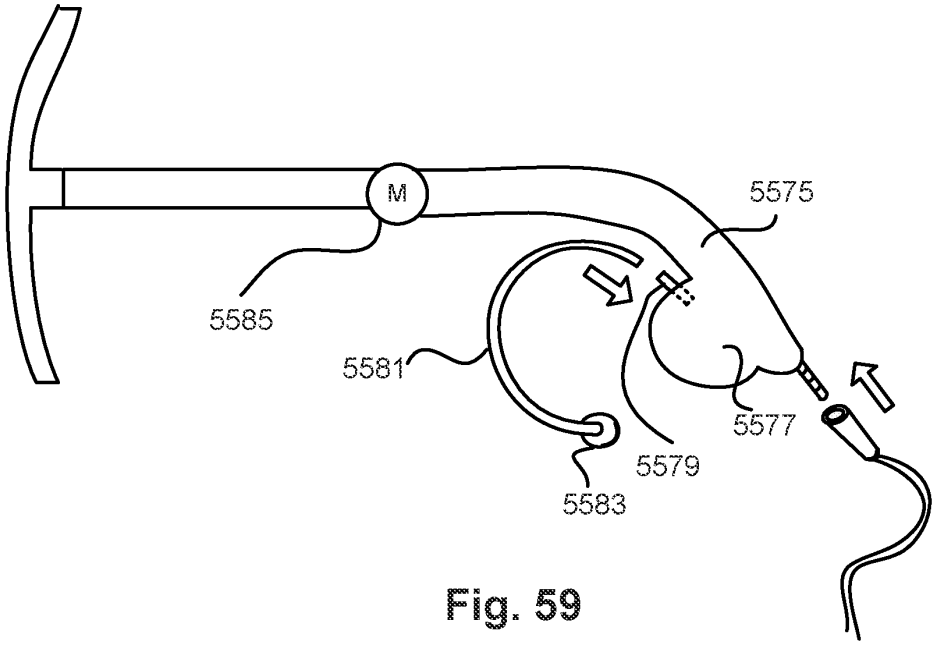

M
5575
5585
5581
5577
5579
5583

Fig. 59

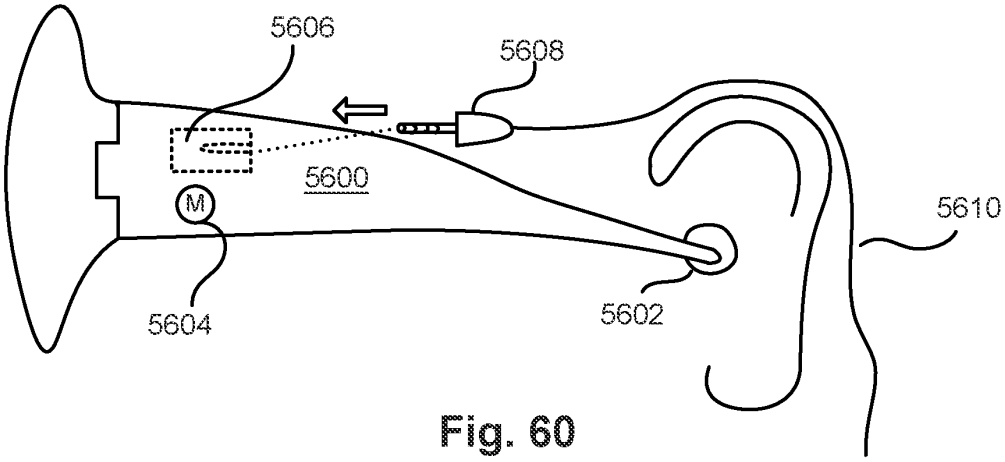

5606
5608
5600
M
5610
5604
5602

Fig. 60

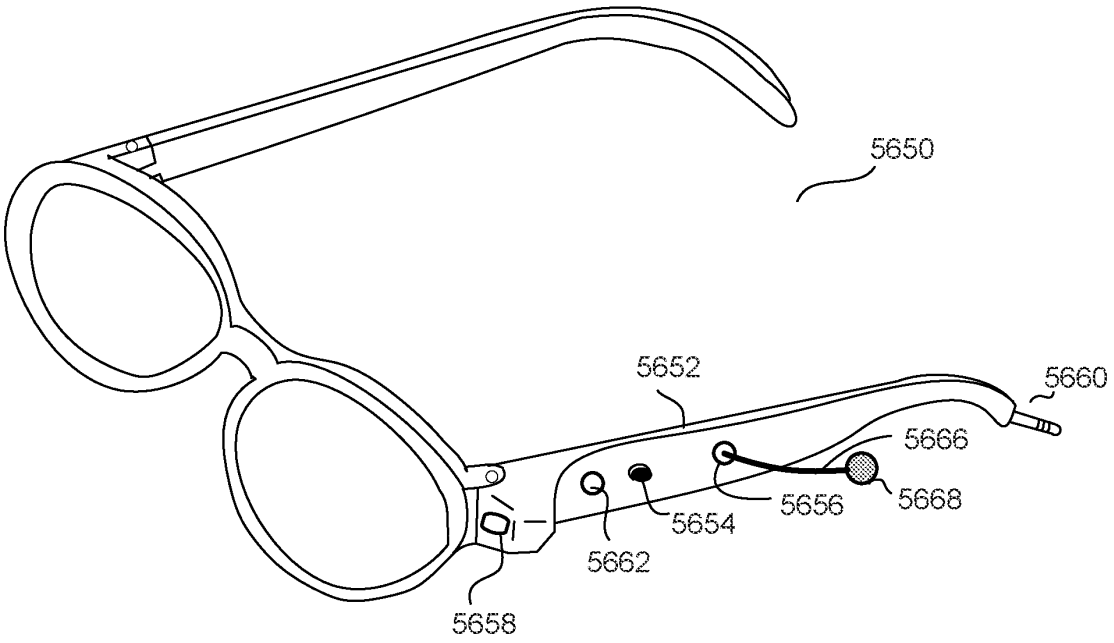


Fig. 61

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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	EYEWEAR WITH PRINTED CIRCUIT BOARD

As the below named inventor, I hereby declare that:

This declaration is directed to:

- ☐ The attached application, or
- ■ United States application or PCT international application number 13/831,445 filed on March 14, 2013

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

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LEGAL NAME OF INVENTOR

Inventor: Thomas A. Howell Date (Optional): 4/26/15

Signature: Thomas A. Howell

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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LEGAL NAME OF INVENTOR

Inventor: David Chao Date (Optional) :

Signature:

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

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LEGAL NAME OF INVENTOR

Inventor: C. Douglass Thomas Date (Optional): 4/23/2015

Signature: C. Douglass Thomas

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	EYEWEAR WITH PRINTED CIRCUIT BOARD

As the below named inventor, I hereby declare that:

This declaration is directed to:

☐ The attached application, or

☒ United States application or PCT international application number 13/831,445 filed on March 14, 2013.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

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LEGAL NAME OF INVENTOR

Inventor: Peter P. Tong Date (Optional) :

Signature: Peter Tong

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

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I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(c).

I hereby appoint:

[X] Practitioners associated with Customer Number: 34071

OR

[ ] Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

Name	Registration Number

Name	Registration Number

As attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignment documents attached to this form in accordance with 37 CFR 3.73(c).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(c) to:

[X] The address associated with Customer Number: 34071

OR

[ ]

Firm or individual name		
Address		
City	State	Zip
Country		
Telephone	Email	

Assignee name and address: IngenioSpec, LLC
4010 Moorpark Avenue
Suite 211
San Jose, CA 95117

A copy of this form, together with a statement under 37 CFR 3.73(c) (Form PTO/AIA/96 or equivalent) is required to be filed in each application in which this form is used. The statement under 37 CFR 3.73(c) may be completed by one of the practitioners appointed in this form, and must identify the application in which this Power of Attorney is to be filed.

SIGNATURE of Assignee of Record

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee.

Signature /Peter P. Tong/	Date September 8, 2022
Name Peter P. Tong	Telephone 650-903-9200, x102
Title Member	

This collection of information is required by 37 CFR 1.31, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public, which is to update (and by the USPTO to process) the file of a patent or reexamination proceeding. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 18 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

PTO/AIA/96 (08-12)
Approved for use through 01/31/2013. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: IngenioSpec, LLC

Application No./Patent No.: Not Yet Assigned Filed/Issue Date: Filed Herewith

Titled: WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT

IngenioSpec, LLC, a corporation

(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

1. ☑ The assignee of the entire right, title, and interest.

2. ☐ An assignee of less than the entire right, title, and interest (check applicable box):

   ☐ The extent (by percentage) of its ownership interest is _____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.

   ☐ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (*e.g.*, bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

A. ☐ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel _____, Frame _____, or for which a copy thereof is attached.

B. ☑ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: HOWELL et al. To: IpVenture, Inc.

   The document was recorded in the United States Patent and Trademark Office at
   Reel 021438, Frame 0402, or for which a copy thereof is attached.

2. From: IpVenture, Inc. To: Peter P. Tong and C. Douglass Thomas

   The document was recorded in the United States Patent and Trademark Office at
   Reel 032263, Frame 0874, or for which a copy thereof is attached.

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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PTO/AIA/96 (08-12)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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STATEMENT UNDER 37 CFR 3.73(c)

3. From: Peter P. Tong and C. Douglass Thomas To: Smart iGlasses, LLC

The document was recorded in the United States Patent and Trademark Office at
Reel 032211, Frame 0330, or for which a copy thereof is attached.

4. From: Smart iGlasses, LLC To: IngeionSpec, LLC

The document was recorded in the United States Patent and Trademark Office at
Reel 032263, Frame 0912, or for which a copy thereof is attached.

5. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

6. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☑ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Peter P. Tong/	September 8, 2022
Signature	Date
Peter P. Tong	35757
Printed or Typed Name	Title or Registration Number

Privacy Act Statement

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3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
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8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: HOWELL et al.	Attorney Docket No.: IPVCP006X1C8
Application No.: Not Yet Assigned	Examiner: Not Yet Assigned
Filed: Filed Herewith	Group: Not Yet Assigned
Title: WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT	

INFORMATION DISCLOSURE STATEMENT
37 CFR §§1.56 AND 1.97(b)

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

The references listed in the attached PTO Form 1449 may be material to examination of the above-identified patent application. Applicants submit the list of these references in compliance with their duty of disclosure pursuant to 37 CFR §§1.56 and 1.97. The Examiner is requested to make these references of official record in this application. The above-identified application is a Continuation of prior application U.S. Patent Application No. 16/429,181. This prior application is being relied upon for an earlier filing date under 35 U.S.C. § 120. Because the listed references (to the extent that copies are required) were either cited by the PTO, or submitted to the PTO in the prior application, under 37 CFR § 1.98(d) Applicants submit that copies need not be provided.

This Information Disclosure Statement is not to be construed as a representation that a search has been made, that additional information material to the examination of this application does not exist, or that these references indeed constitute prior art.

This Information Disclosure Statement is: (i) filed within three (3) months of the filing date of the above-referenced application, (ii) believed to be filed before the mailing date of a first Office Action on the merits, or (iii) believed to be filed before the mailing of a first Office Action after the filing of a Request for Continued Examination under §1.114.

Accordingly, it is believed that no fees are due in connection with the filing of this Information Disclosure Statement. However, if it is determined that any fees are due, the Commissioner is hereby authorized to charge such fees to Deposit Account 50-3874 (Order No. IPVCP006X1C8).

Respectfully submitted,

/Peter P. Tong/

Peter P. Tong
Registration No. 35,757

4010 Moorpark Avenue
Suite 211
San Jose, CA 95117

Form 1449 (Modified)	Atty. Docket No.	IPVCP006X1C8
	Application No.:	Not Yet Assigned
Information Disclosure Statement By Applicant	Applicant	HOWELL et al.
	Filing Date	Filed Herewith
	Group	Not Yet Assigned
(Use Several Sheets if Necessary)		Page 1 of 15

0U.S. Patent Documents

Examiner Initial	No.	Patent No.	Date	Patentee	Class	Sub-class	Filing Date
	1.	2001/0005230 A1	Jun-01	Ishikawa			
	2.	2001/0028309 A1	Oct-01	Torch			
	3.	2001/0050754 A1	Dec-01	Hay et al.			
	4.	2002/0021407 A1	Feb-02	Elliot			
	5.	2002/0017997 A1	Feb-02	Felkowitz			
	6.	2002/0081982 A1	Jun-02	Schwartz et al.			
	7.	2002/0084990 A1	Jul-02	Peterson, III			
	8.	2002/0089639 A1	Jul-02	Starner et al.			
	9.	2002/0090103 A1	Jul-02	Calisto, Jr.			
	10.	2002/0098877 A1	Jul-02	Glezerman			
	11.	2002/0101568 A1	Aug-02	Eberl et al.			
	12.	2002/0109600 A1	Aug-02	Mault et al.			
	13.	2002/0140899 A1	Oct-02	Blum et al.			
	14.	2002/0159023 A1	Oct-02	Swab			
	15.	2002/0197961 A1	Dec-02	Warren			
	16.	2003/0018274 A1	Jan-03	Takahashi et al.			
	17.	2003/0022690 A1	Jan-03	Beyda et al.			
	18.	2003/0032449 A1	Feb-03	Giobbi			
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	27.	2004/0000733 A1	Jan-04	Swab et al.			

Examiner	Date Considered

Examiner: Initial citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Form 1449 (Modified) **Information Disclosure Statement By Applicant** (Use Several Sheets if Necessary)	Atty. Docket No.	IPVCP006X1C8
	Application No.:	Not Yet Assigned
	Applicant	HOWELL et al.
	Filing Date	Filed Herewith
	Group	Not Yet Assigned
		Page 2 of 15

	28.	2004/0029582 A1	Feb-04	Swab et al.			
	29.	2004/0059212 A1	Mar-04	Abreu			
	30.	2004/0063378 A1	Apr-04	Nelson			
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	33.	2004/0101178 A1	May-04	Fedorovskaya et al.			
	34.	2004/0104864 A1	Jun-04	Nakada			
	35.	2004/0128737 A1	Jul-04	Gesten			
	36.	2004/0150986 A1	Aug-04	Chang			
	37.	2004/0156012 A1	Aug-04	Jannard et al.			
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	39.	2004/0160571 A1	Aug-04	Jannard			
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	41.	2004/0160573 A1	Aug-04	Jannard et al.			
	42.	2004/0197002 A1	Oct-04	Atsumi et al.			
	43.	2004/0227219 A1	Nov-04	Su			
	44.	2005/0036103 A1	Feb-05	Bloch			
	45.	2005/0067580 A1	Mar-05	Fontaine			
	46.	2005/0078274 A1	Apr-05	Howell et al.			
	47.	2005/0088365 A1	Apr-05	Yamazaki et al.			
	48.	2005/0201585 A1	Sep-05	Jannard et al.			
	49.	2005/0213026 A1	Sep-05	Da Pra'			
	50.	2005/0230596 A1	Oct-05	Howell et al.			
	51.	2005/0238194 A1	Oct-05	Chornenky			
	52.	2005/0239502 A1	Oct-05	Swab et al.			
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	56.	2005/0264752 A1	Dec-05	Howell et al.			

Examiner	Date Considered

Examiner: Initial citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Form 1449 (Modified) **Information Disclosure Statement By Applicant** (Use Several Sheets if Necessary)	Atty. Docket No.	IPVCP006X1C8
	Application No.:	Not Yet Assigned
	Applicant	HOWELL et al.
	Filing Date	Filed Herewith
	Group	Not Yet Assigned
		Page 3 of 15

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	58.	2006/0001827 A1	Jan-06	Howell et al.			
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Examiner	Date Considered

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	Applicant	HOWELL et al.
	Filing Date	Filed Herewith
	Group	Not Yet Assigned
		Page 4 of 15

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	111.	2012/0033061 A1	Feb-12	Ko et al.			
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Examiner	Date Considered

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Information Disclosure Statement By Applicant	Applicant	HOWELL et al.
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	Group	Not Yet Assigned
(Use Several Sheets if Necessary)		Page 5 of 15

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	118.	2013/0143519 A1	Jun-13	Doezema			
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	120.	2013/0201440 A1	Aug-13	Howell et al.			
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	122.	2014/0132913 A1	May-14	Sweis et al.			
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	134.	2016/0302992 A1	Oct-16	Sweis et al.			
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	142.	2018/0314079 A1	Nov-18	Chao et al.			
	143.	2018/0335650 A1	Nov-18	Howell et al.			

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	146.	2019/0033623 A1	Jan-19	Howell et al.			
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	157.	2020/0364992 A1	Nov-20	Howell et al.			
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	167.	1,255,265	Feb-1918	Zachara			
	168.	1,917,745	Jul-33	Weiss			
	169.	2,249,572	Jul-41	Lieber			
	170.	2,638,532	May-53	Brady			
	171.	2,794,085	May-57	De Angelis			
	172.	2,818,511	Dec-57	Ullery et al.			

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	174.	2,874,230	Feb-59	Carlson			
	175.	2,904,670	Sep-59	Calmes			
	176.	3,060,308	Oct-62	Fortuna			
	177.	3,597,054	Aug-71	Winter			
	178.	3,710,115	Jan-73	Jubb			
	179.	3,858,001	Dec-74	Bonne			
	180.	3,883,701	May-75	Delorenzo			
	181.	4,165,487	Aug-79	Corderman			
	182.	4,254,451	Mar-81	Cochran, Jr.			
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	185.	4,348,664	Sep-82	Boschetti et al.			
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	187.	4,526,473	Jul-85	Zahn, III			
	188.	4,535,244	Aug-85	Burnham			
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	190.	4,683,587	Jul-87	Silverman			
	191.	4,751,691	Jun-88	Perera			
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	193.	4,773,095	Sep-88	Zwicker et al.			
	194.	4,806,011	Feb-89	Bettinger			
	195.	4,822,160	April-89	Tsai			
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	197.	4,851,686	Jul-89	Pearson			
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	203.	4,962,469	Oct-90	Ono et al.			
	204.	4,967,268	Oct-90	Lipton et al.			
	205.	4,985,632	Jan-91	Bianco et al.			
	206.	5,008,548	Apr-91	Gat			
	207.	5,015,086	May-91	Okaue et al.			
	208.	5,020,150	May-91	Shannon			
	209.	5,026,151	Jun-91	Waltuck et al.			
	210.	5,036,311	Jul-91	Moran et al.			
	211.	5,050,150	Sep-91	Ikeda			
	212.	5,064,410	Nov-91	Frenkel et al.			
	213.	5,093,576	Mar-92	Edmond et al.			
	214.	5,106,179	Apr-92	Kamaya et al.			
	215.	5,144,344	Sep-92	Takahashi et al.			
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	217.	5,151,600	Sep-92	Black			
	218.	5,161,250	Nov-92	Ianna et al			
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	220.	5,264,877	Nov-93	Hussey			
	221.	5,306,917	Apr-94	Black et al.			
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	226.	5,379,464	Jan-95	Schleger et al.			
	227.	5,382,986	Jan-95	Black et al.			
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	233.	5,457,751	Oct-95	Such			
	234.	5,463,428	Oct-95	Lipton et al.			
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	236.	5,500,532	Mar-96	Kozicki			
	237.	5,510,961	Apr-96	Peng			
	238.	5,513,384	Apr-96	Brennan et al.			
	239.	5,533,130	Jul-96	Staton			
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	241.	5,581,090	Dec-96	Goudjil			
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	245.	5,606,743	Feb-97	Vogt et al.			
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	248.	5,671,035	Sep-97	Barnes			
	249.	5,686,727	Nov-97	Reenstra et al.			
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	251.	5,715,323	Feb-98	Walker			
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	254.	5,818,381	Oct-98	Williams			
	255.	5,835,185	Nov-98	Kallman et al.			
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	257.	5,903,395	May-99	Rallison et al.			
	258.	5,923,398	Jul-99	Goldman			
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	261.	5,949,516	Sep-99	McCurdy			
	262.	5,966,746	Oct-99	Reedy et al.			
	263.	5,980,037	Nov-99	Conway			
	264.	5,988,812	Nov-99	Wingate			
	265.	5,991,085	Nov-99	Rallison et al.			
	266.	5,992,996	Nov-99	Sawyer			
	267.	5,995,592	Nov-99	Shirai et al.			
	268.	6,091,546	Jul-00	Spitzer			
	269.	6,010,216	Jan-00	Jesiek			
	270.	6,013,919	Jan-00	Schneider et al.			
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	290.	6,301,050 B1	Oct-01	DeLeon			
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	293.	6,343,858 B1	Feb-02	Zelman			
	294.	6,346,929 B1	Feb-02	Fukushima et al.			
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	301.	6,474,816 B2	Nov-02	Butler et al.			
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	308.	6,542,081 B2	Apr-03	Torch			
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	319.	6,771,423 B2	Aug-04	Geist			
	320.	6,788,309 B1	Sep-04	Swan et al.			
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	322.	6,816,314 B2	Nov-04	Shimizu et al.			
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	324.	6,857,741 B2	Feb-05	Blum et al.			
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	333.	7,023,594 B2	Apr-06	Blum et al.			
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	337.	7,059,717 B2	Jun-06	Bloch			
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	341.	7,192,136 B2	Mar-07	Howell et al.			
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	348.	7,376,238 B1	May-08	Rivas et al.			
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	377.	8,430,507 B2	Apr-13	Howell et al.			
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	380.	8,485,661 B2	Jul-13	Yoo et al.			
	381.	8,500,271 B2	Aug-13	Howell et al.			
	382.	8,770,742 B2	Jul-14	Howell et al.			
	383.	8,905,542 B2	Dec-14	Howell et al.			
	384.	9,033,493 B2	May-15	Howell et al.			
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	387.	9,405,135 B2	Aug-16	Sweis et al.			
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	392.	10,042,186 B2	Aug-18	Chao et al.			
	393.	10,060,790 B2	Aug-18	Howell et al.			
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	397.	10,359,311 B2	Jul-19	Howell et al.			
	398.	10,539,459 B2	Jan-20	Howell et al.			
	399.	10,624,790 B2	Apr-20	Chao et al.			
	400.	10,571,715 B2	Feb-20	Rizzo, III et al.			
	401.	10,777,048 B2	Sep-20	Howell et al.			
	402.	11,042,045 B2	Jun-21	Chao et al.			
	403.	11,086,147 B2	Aug-21	Howell et al.			
	404.	11,204,512 B2	Dec-21	Howell et al.			

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Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT
First Named Inventor/Applicant Name:	Thomas A. Howell
Filer:	Peter P. Tong/Angela Nijim
Attorney Docket Number:	IPVCP006X1C8

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
UTILITY APPLICATION FILING	1011	1	320	320
UTILITY SEARCH FEE	1111	1	700	700
UTILITY EXAMINATION FEE	1311	1	800	800
Pages:				
UTILITY APPL SIZE FEE PER 50 SHEETS >100	1081	1	420	420
Claims:				
Miscellaneous-Filing:				
Petition:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**2240**

Electronic Acknowledgement Receipt	
EFS ID:	46575391
Application Number:	17942347
International Application Number:	
Confirmation Number:	1038
Title of Invention:	WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT
First Named Inventor/Applicant Name:	Thomas A. Howell
Customer Number:	34071
Filer:	Peter P. Tong/Angela Nijim
Filer Authorized By:	Peter P. Tong
Attorney Docket Number:	IPVCP006X1C8
Receipt Date:	12-SEP-2022
Filing Date:	
Time Stamp:	12:32:10
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$2240
RAM confirmation Number	E20229BC33414588
Deposit Account	503874
Authorized User	Angela Nijim
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.21 (Miscellaneous fees and charges)	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Application Data Sheet	WebADS.pdf	282667 a2259043d3aa7b95ff265cad8818a65ee78b3ff6	no	10
Warnings:					
Information:					
2	Transmittal of New Application	IPVCP006X1C8_AppTrans.pdf	295729 648842519e4893f5bb6b8e82b4080f6eae490325	no	2
Warnings:					
Information:					
3		IPVCP006X1C8_Application_As Filed.pdf	632684 04ca976421be3f411280695589 6b245cc2304757	yes	124

Multipart Description/PDF files in .zip description

Document Description	Start	End
Specification	1	121
Claims	122	123
Abstract	124	124

Warnings:					
Information:					
4	Drawings-only black and white line drawings	IPVCP006X1C8_AllFigs_1-61_C UTE.pdf	4127888 cb7a23c873f0e7ca6804825aa9ae905aff47617e	no	72
Warnings:					
Information:					
5	Oath or Declaration filed	IPVCP06X1C8_DecsFromParent .pdf	451593 97073d547cfb686ed5e305dac66f17dbd5389226	no	4

Warnings:					
Information:					
6	Power of Attorney	IPVCP006X1C8_PoA.pdf	491896 0c12b516d7f2e78209044b7a33ad51b0ca025e05	no	2
Warnings:					
Information:					
7	Assignee showing of ownership per 37 CFR 3.73	IPVCP006X1C8_Statement373c.pdf	122240 9ebd558cf92699cc1bf4b56ff0dbf31eca153d37	no	3
Warnings:					
Information:					
8	Letter specifying the conditions for filing under 37 CFR 1.97	IPVCP006X1C8_IDSTrans.pdf	24087 6aa507160113bafba3f3428670da5035b7cb1084	no	2
Warnings:					
Information:					
9	Information Disclosure Statement (IDS) Form (SB08)	IPVCP006X1C8_1449.pdf	130769 78ead20671e05a7db53ceb4c3e1007f4120cf3ab	no	15
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
10	Fee Worksheet (SB06)	fee-info.pdf	46554 c3e72a1ab39034fa3f639955ceddec1bc5ec0154	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	6606107		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	IPVCP006X1C8
	Application Number	
Title of Invention	WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2:

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Thomas	A.	Howell	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

City	San Jose	State/Province	CA	Country of Residence i	US

Mailing Address of Inventor:

Address 1	924 S. 8th St.		
Address 2			
City	San Jose	State/Province	CA
Postal Code	95112	Country i	US

Inventor 2

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	David		Chao	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

City	Saratoga	State/Province	CA	Country of Residence i	US

Mailing Address of Inventor:

Address 1	14137 Sobey Road		
Address 2			
City	Saratoga	State/Province	CA
Postal Code	95070	Country i	US

Inventor 3

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	C.	Douglass	Thomas	

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	IPVCP006X1C8
	Application Number	
Title of Invention	WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT	

Residence Information (Select One)	◉ US Residency	○ Non US Residency	○ Active US Military Service		
City	Saratoga	**State/Province**	CA	**Country of Residence** i	US

Mailing Address of Inventor:

Address 1	4010 Moorpark Avenue		
Address 2	Suite 211		
City	San Jose	**State/Province**	CA
Postal Code	95117	**Country** i	US

Inventor 4

Legal Name

Prefix	**Given Name**	**Middle Name**	**Family Name**	**Suffix**
	Peter	P.	Tong	

Residence Information (Select One)	◉ US Residency	○ Non US Residency	○ Active US Military Service		
City	Mountain View	**State/Province**	CA	**Country of Residence** i	US

Mailing Address of Inventor:

Address 1	1807 Limetree Lane		
Address 2			
City	Mountain View	**State/Province**	CA
Postal Code	94040	**Country** i	US

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	34071		
Email Address	peter@ipventure.com	Add Email	Remove Email

Application Information:

Title of the Invention	WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT		
Attorney Docket Number	IPVCP006X1C8	**Small Entity Status Claimed**	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	72	**Suggested Figure for Publication (if any)**	1

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	IPVCP006X1C8
	Application Number	
Title of Invention	WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT	

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	◉ Customer Number	○ US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	34071		

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix	Remove
Registration Number					
Prefix	**Given Name**	Middle Name	**Family Name**	Suffix	Remove
Registration Number					

Additional Representative Information blocks may be generated within this form by selecting the **Add** button.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	IPVCP006X1C8
	Application Number	
Title of Invention	WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT	

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Continuation of	16429181	2019-06-03

Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
16429181	Continuation of	13831445	2013-03-14	10310296	2019-06-04

Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
13831445	Continuation of	12803732	2010-07-01	8434863	2013-05-07

Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
12803732	Continuation of	11546685	2006-10-11	7806525	2010-10-05

Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
11546685	Continuation in part of	11183256	2005-07-15	7500747	2009-03-10

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
11183256	Claims benefit of provisional	60618107	2004-10-12

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
11183256	Claims benefit of provisional	60620238	2004-10-18

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	IPVCP006X1C8
	Application Number	
Title of Invention	WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT	

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
11183256	Claims benefit of provisional	60647836	2005-01-31

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
11183256	Claims benefit of provisional	60647826	2005-01-31

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
11546685	Claims benefit of provisional	60846150	2006-09-20

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
11546685	Claims benefit of provisional	60787850	2006-04-01

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
11546685	Claims benefit of provisional	60725999	2005-10-11

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
11546685	Claims benefit of provisional	60725896	2005-10-11

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button.

Foreign Priority Information:

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	IPVCP006X1C8
	Application Number	
Title of Invention	WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT	

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX) the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button.

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	IPVCP006X1C8
	Application Number	
Title of Invention	WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT	

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	IPVCP006X1C8
	Application Number	
Title of Invention	WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT	

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant 1

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

◉ Assignee	○ Legal Representative under 35 U.S.C. 117	○ Joint Inventor
○ Person to whom the inventor is obligated to assign.	○ Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☒

Organization Name	IngenioSpec, LLC

Mailing Address Information For Applicant:

Address 1	4010 Moorpark Avenue		
Address 2	Suite 211		
City	San Jose	**State/Province**	CA
Country[i] US		Postal Code	95117
Phone Number	650-903-9200	Fax Number	650-908-9200
Email Address	peter@ipventure.com		

Additional Applicant Data may be generated within this form by selecting the Add button.

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Approved for use through 04/30/2017. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	IPVCP006X1C8
	Application Number	
Title of Invention	WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT	

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Assignee 1

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

If the Assignee or Non-Applicant Assignee is an Organization check here. ☐

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1			
Address 2			
City		**State/Province**	
Country i		Postal Code	
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	IPVCP006X1C8
	Application Number	
Title of Invention	WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT	

Signature:

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). **However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).**

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e. g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Peter P. Tong/			Date (YYYY-MM-DD)	
First Name	Peter	Last Name	Tong	Registration Number	35757

Additional Signature may be generated within this form by selecting the Add button.

Form 1449 (Modified)	Atty. Docket No.	IPVCP006X1C8
	Application No.:	17/942,347
Information Disclosure Statement By Applicant	Applicant	HOWELL et al.
	Filing Date	September 12, 2022
	Group	NOT YET ASSIGNED
(Use Several Sheets if Necessary)		Page 1 of 9

U.S. Patent Documents

Examiner Initial	No.	Patent No.	Date	Patentee	Class	Sub-class	Filing Date
	1.						
	2.						

Foreign Documents

							Translation	
Init.		Document No.	Date	Country	Class	Subclass	Yes	No
		CA 2 487 391	Dec-03	Canada				
		CN 88203065	Nov-88	China			X abstract	
		CN 89214222.7	Mar-90	China			X abstract	
		CN 90208199.3	Nov-90	China			X abstract	
		DE 10123226 A1	Nov-02	Germany			X	
		EP 1134491 A2	Sep-01	Europe				
		FR 2530039 A1	Jan-84	France			X abstract	
		GB 1467982	Mar-77	Great Britain				
		JP 02-181722	Jul-90	Japan			X abstract	
		JP 09-017204	Jan-97	Japan			X	
		JP 10-161072	Jun-98	Japan			X	
		JP 2000-039595	Feb-00	Japan			X	
		JP 2002 341059 A	Nov-02	Japan			X	
		JP 2005-151292	Jun-05	Japan			X abstract	
		JP 2005-167902	Jun-05	Japan			X abstract	
		JP 58-113912	Jul-83	Japan			X	
		JP-58-113914	Jul-83	Japan			X abstract	
		TW 484711	Jun-01	Taiwan			X abstract	
		WO 97/12205	Apr-97	WIPO				
		WO 2001/06298 A1	Jan-01	WIPO				
		WO 02/06881 A2	Jan-02	WIPO				
		WO 03/069394 A1	Aug-03	WIPO			X abstract	

Examiner	Date Considered

Examiner: Initial citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Form 1449 (Modified) **Information Disclosure Statement By Applicant** (Use Several Sheets if Necessary)	Atty. Docket No.	IPVCP006X1C8
	Application No.:	17/942,347
	Applicant	HOWELL et al.
	Filing Date	September 12, 2022
	Group	NOT YET ASSIGNED
		Page 2 of 9

		WO 03/100368 A1	Dec-03	WIPO				
		WO 03/100503 A2	Dec-03	WIPO				
		WO 04/012477 A2	Feb-04	WIPO				
		WO 04/025554 A1	Mar-04	WIPO				
		WO 99/50706 A1	Oct-99	WIPO				

Other Documents (Including Author, Title, Date, Pertinent Pages, etc.)		
	A	Notice of Allowance for U.S. Patent Application No. 11/183,269, dated December 10, 2010.
	B	Office Action for U.S. Patent Application No. 11/183,269, dated May 25, 2010.
	C	Final Office Action for U.S. Patent Application No. 11/183,269, dated February 17, 2010.
	D	Office Action for U.S. Patent Application No. 11/183,269, dated June 23, 2009.
	E	Office Action for U.S. Patent Application No. 11/183,269, dated December 4, 2008.
	F	Final Office Action for U.S. Patent Application No. 11/183,269, dated June 5, 2008.
	G	Office Action for U.S. Patent Application No. 11/183,269, dated October 18, 2007.
	H	Restriction Requirement for U.S. Patent Application No. 11/183,269, dated June 25, 2007.
	I	Office Action for U.S. Patent Application No. 13/085,402, dated April 19, 2012.
	J	Notice of Allowance for U.S. Patent Application No. 13/085,402, dated August 2, 2012.
	K	Notice of Allowance for U.S. Patent Application No. 13/085,402, dated November 13, 2012.
	L	Notice of Allowance for U.S. Patent Application No. 13/085,402, dated February 20, 2013.
	M	Notice of Allowance for U.S. Patent Application No. 13/085,402, dated June 14, 2013.
	N	Office Action for U.S. Patent Application No. 13/955,336, dated December 5, 2013.
	O	Notice of Allowance for U.S. Patent Application No. 13/955,336, dated April 28, 2014.
	P	Notice of Allowance for U.S. Patent Application No. 13/955,336, dated August 18, 2014.
	Q	Notice of Allowance for U.S. Patent Application No. 13/955,336, dated October 7, 2014.
	R	Notice of Allowance for U.S. Patent Application No. 13/955,336, dated November 3, 2014.
	S	Office Action for U.S. Patent Application No. 14/557,409, dated June 11, 2015.
	T	Notice of Allowance for U.S. Patent Application No 14/557,409, dated January 14, 2016.
	U	Notice of Allowance for U.S. Patent Application No. 14/557,409, dated April 28, 2016.
	V	Notice of Allowance for U.S. Patent Application No. 14/557,409, dated August 8, 2016.
	W	Notice of Allowance for U.S. Patent Application No. 14/557,409, dated November 4, 2016.
	X	Corrected Notice of Allowance for U.S. Patent Application No. 14/557,409, dated December 12, 2016.
	Y	Office Action for U.S. Patent Application No. 15/375,423, dated March 27, 2017.
	Z	Notice of Allowance for U.S. Patent Application No. 15/375,423, dated July 5, 2017.

Examiner	Date Considered

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Information Disclosure Statement By Applicant	Applicant	HOWELL et al.
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	AA	Notice of Allowance for U.S. Patent Application No. 15/375,423, dated October 31, 2017.
	AB	Notice of Allowance for U.S. Patent Application No. 15/375,423, dated March 23, 2018.
	AC	Notice of Allowance for U.S. Patent Application No. 15/375,423, dated July 13, 2018.
	AD	Office Action for U.S. Patent Application No. 16/049,120, dated February 28, 2020.
	AE	Notice of Allowance for U.S. Patent Application No. 16/049,120, dated June 3, 2020.
	AF	Notice of Allowance for U.S. Patent Application No. 16/049,120, dated September 21, 2020.
	AG	Notice of Allowance for U.S. Patent Application No. 16/049,120, dated February 23, 2021.
	AH	Notice of Allowance for U.S. Patent Application No. 16/049,120, dated June 3, 2021.
	AI	Notice of Allowance for U.S. Patent Application No. 16/049,120, dated September 20, 2021.
	AJ	Notice of Allowance for U.S. Patent Application No. 16/574,254, dated April 16, 2021.
	AK	Notice of Allowance for U.S. Patent Application No. 16/574,254, dated August 9, 2021.
	AL	Office Action for U.S. Patent Application No. 16/821,810, dated February 2, 2022.
	AM	Notice of Allowance for U.S. Patent Application No. 16/821,810, dated April 6, 2022.
	AN	Office Action for U.S. Patent Application No. 17/484,080, dated January 21, 2022.
	AO	Notice of Allowance for U.S. Patent Application No. 17/484,080, dated May 31, 2022.
	AP	Restriction Requirement for U.S. Patent Application No. 11/580,222, dated June 18, 2008.
	AQ	Office Action for U.S. Patent Application No. 11/580,222, dated September 12, 2008.
	AR	Office Action for U.S. Patent Application No. 11/580,222, dated January 28, 2009.
	AS	Notice of Allowance for U.S. Patent Application No. 11/580,222, dated April 20, 2009.
	AT	U.S. Patent Application No. 12/462,286, filed July 31, 2009.
	AU	Restriction Requirement for U.S. Patent Application No. 12/462,286, dated September 17, 2010.
	AV	Office Action for U.S. Patent Application No. 12/462,286, dated January 13, 2011.
	AW	Notice of Allowance for U.S. Patent Application No. 12/462,286, dated June 24, 2011.
	AX	Notice of Allowance for U.S. Patent Application No. 12/462,286, dated November 22, 2011.
	AY	Office Action for U.S. Patent Application No. 13/367,346, dated May 15, 2013.
	AZ	Notice of Allowance for U.S. Patent Application No. 13/367,346, dated October 10, 2013.
	BA	Office Action for U.S. Patent Application No. 13/367,346, dated January 28, 2014.
	BB	Notice of Allowance for U.S. Patent Application No. 13/367,346, dated August 15, 2014.
	BC	Notice of Allowance for U.S. Patent Application No. 13/367,346, dated March 19, 2015.
	BD	Office Action ffor U.S. Patent Application No. 14/715,501, dated September 23, 2015.
	BE	Office Action for U.S. Patent Application No. 14/715,501, dated March 25, 2016.
	BF	Office Action for U.S. Patent Application No. 14/715,501, dated October 17, 2016.
	BG	Office Action for U.S. Patent Application No. 14/715,501, dated July 20, 2017.

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	BH	Office Action for U.S. Patent Application No. 14/715,501, dated January 8, 2018.
	BI	Notice of Allowance for U.S. Patent Application No. 14/715,501, dated May 9, 2018.
	BJ	Notice of Allowance for U.S. Patent Application No. 14/715,501, dated September 11, 2018.
	BK	Office Action for U.S. Patent Application No. 16/127,957, dated June 4, 2020.
	BL	Office Action for U.S. Patent Application No. 16/127,957, dated September 30, 2020.
	BM	Notice of Allowance for U.S. Patent Application No. 16/127,957, dated December 21, 2020.
	BN	Notice of Allowance for U.S. Patent Application No. 17/395,509, dated May 6, 2022.
	BO	Notice of Allowance for U.S. Patent Application No. 16/182,969, dated January 28, 2022.
	BP	Office Action for U.S. Patent Application No. 16/182,969, dated June 24, 2020.
	BQ	Notice of Allowance for U.S. Patent Application No. 16/182,969, dated October 14, 2020.
	BR	Notice of Allowance for U.S. Patent Application No. 16/182,969, dated September 1, 2021.
	BS	U.S. Patent Application No. 12/806,312, filed August 10, 2010.
	BT	Office Action for U.S. Patent Application No. 12/806,312, dated April 20, 2012.
	BU	Office Action for U.S. Patent Application No. 12/806,312, dated September 25, 2012.
	BV	Notice of Allowance for U.S. Patent Application No. 12/806,312, dated December 14, 2012.
	BW	Notice of Allowance for U.S. Patent Application No. 12/806,312, dated March 29, 2013.
	BX	U.S. Patent Application No. 13/831,512, filed March 14, 2013.
	BY	Office Action for U.S. Patent Application No. 13/831,512, dated June 4, 2013.
	BZ	Office Action for U.S. Patent Application No. 13/831,512, dated February 24, 2014.
	CA	Office Action for U.S. Patent Application No. 13/831,512, dated July 2, 2014.
	CB	Office Action for U.S. Patent Application No. 13/831,512, dated January 21, 2015.
	CC	Office Action for U.S. Patent Application No. 13/831,512, dated May 29, 2015.
	CD	Office Action for U.S. Patent Application No. 13/831,512, dated February 24, 2016.
	CE	Notice of Allowance for U.S. Patent Application No. 13/831,512, dated August 1, 2016.
	CF	Notice of Allowance for U.S. Patent Application No. 13/831,512, dated October 25, 2016.
	CG	Notice of Allowance for U.S. Patent Application No. 13/831,512, dated January 30, 2017.
	CH	Notice of Allowance for U.S. Patent Application No. 13/831,512, dated February 21, 2017.
	CI	Office Action for U.S. Patent Application No. 15/396,428, dated February 16, 2018.
	CJ	Office Action for U.S. Patent Application No. 15/396,428, dated June 21, 2018.
	CK	Office Action for U.S. Patent Application No. 15/409,723, dated April 23, 2018.
	CL	Office Action for U.S. Patent Application No. 15/409,723, dated October 31, 2018.
	CM	Notice of Allowance for U.S. Patent Application No. 11/183,256, dated January 13, 2009.
	CN	Office Action for U.S. Patent Application No. 11/183,256, dated September 12, 2008.

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Information Disclosure Statement By Applicant	Applicant	HOWELL et al.
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	CO	Notice of Allowance for U.S. Patent Application No. 11/183,256, dated July 8, 2008.
	CP	Office Action for U.S. Patent Application No. 11/183,256, dated January 25, 2008.
	CQ	Restriction Requirement for U.S. Patent Application No. 11/183,256, dated October 17, 2007.
	CR	Restriction Requirement for U.S. Patent Application No. 11/183,256, dated June 28, 2007.
	CS	Notice of Allowance for U.S. Patent Application No. 11/546,685, dated February 17, 2010.
	CT	Notice of Allowance for U.S. Patent Application No. 11/546,685, dated September 18, 2009.
	CU	Office Action for U.S. Patent Application No. 11/546,685, dated March 5, 2009.
	CV	Restriction Requirement for U.S. Patent Application No. 11/546,685, dated January 27, 2009.
	CW	US Patent Application No. 12/803,732, filed July 1, 2010.
	CX	Notice of Allowance for U.S. Patent Application No. 12/803,732, dated September 1, 2011.
	CY	Notice of Allowance for U.S. Patent Application No. 12/803,732, dated November 15, 2011.
	CZ	Notice of Allowance for U.S. Patent Application No. 12/803,732, dated January 30, 2012.
	DA	Notice of Allowance for U.S. Patent Application No. 12/803,732, dated April 17, 2012.
	DB	Notice of Allowance for U.S. Patent Application No. 12/803,732, dated July 5, 2012.
	DC	Notice of Allowance for U.S. Patent Application No. 12/803,732, dated October 19, 2012.
	DD	Notice of Allowance for U.S. Patent Application No. 12/803,732, dated February 13, 2013.
	DE	Office Action for U.S. Patent Application No. 13/291,020, dated June 4, 2012.
	DF	Office Action for U.S. Patent Application No. 13/291,020, dated April 23, 2012.
	DG	Notice of Allowance for U.S. Patent Application No. 13/291,020, dated August 2, 2012.
	DH	Notice of Allowance for U.S. Patent Application No. 13/291,020, dated November 2, 2012.
	DI	Notice of Allowance for U.S. Patent Application No. 13/291,020, dated February 11, 2013.
	DJ	U.S. Patent Application No. 13/831,419, filed March 14, 2013.
	DK	Office Action for U.S. Patent Application No. 13/831,419, dated April 27, 2015.
	DL	Office Action for U.S. Patent Application No. 13/831,419, dated August 12, 2015.
	DM	Notice of Allowance for U.S. Patent Application No. 13/831,419, dated January 28, 2016.
	DN	Office Action for U.S. Patent Application No. 13/831,419, dated April 28, 2016.
	DO	Office Action for U.S. Patent Application No. 13/831,419, dated November 17, 2016.
	DP	Office Action for U.S. Patent Application No. 13/831,419, dated February 1, 2017.
	DQ	Notice of Allowance for U.S. Patent Application No. 13/831,419, dated June 6, 2017.
	DR	Office Action for U.S. Patent Application No. 13/831,419, dated October 20, 2017.
	DS	Office Action for U.S. Patent Application No. 13/831,419, dated June 8, 2018.
	DT	U.S. Patent Application No. 13/831,445, filed March 14, 2013.

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Information Disclosure Statement By Applicant	Applicant	HOWELL et al.
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	DU	Office Action for U.S. Patent Application No. 13/831,445, dated February 20, 2015.
	DV	Notice of Allowance for U.S. Patent Application No. 13/831,445, dated October 21, 2016.
	DW	Notice of Allowance for U.S. Patent Application No. 13/831,445, dated January 9, 2017.
	DX	Corrected Notice of Allowance for U.S. Patent Application No. 13/831,445, dated January 23, 2017.
	DY	Notice of Allowance for U.S. Patent Application No. 13/831,445, dated April 25, 2017.
	DZ	Office Action for U.S. Patent Application No. 13/831,445, dated February 6, 2018.
	EA	Notice of Allowance for U.S. Patent Application No. 13/831,445, dated August 8, 2018.
	EB	Office Action for U.S. Patent Application No. 16/429,181, dated September 30, 2020.
	EC	Notice of Allowance for U.S. Patent Application No. 16/429,181, dated February 1, 2021.
	ED	Notice of Allowance for U.S. Patent Application No. 16/429,181, dated June 17, 2021.
	EE	Notice of Allowance for U.S. Patent Application No. 16/429,181, dated August 19, 2021.
	EF	Notice of Allowance for U.S. Patent Application No. 16/429,181, dated October 4, 2021.
	EG	Office Action for U.S. Patent Application No. 16/429,181, dated February 9, 2022.
	EH	Notice of Allowance for U.S. Patent Application No. 16/429,181, dated August 10, 2022.
	EI	Office Action for U.S. Patent Application No. 16/424,018, dated June 10, 2020.
	EJ	Notice of Allowance for U.S. Patent Application No. 16/424,018, dated October 20, 2020.
	EK	Notice of Allowance for U.S. Patent Application No. 16/424,018, dated March 8, 2021.
	EL	Office Action for U.S. Patent Application No. 16/424,018, dated May 13, 2021.
	EM	Office Action for U.S. Patent Application No. 16/424,018, dated September 3, 2021.
	EN	Notice of Allowance for U.S. Patent Application No. 16/424,018, dated November 2, 2021
	EO	Office Action for U.S. Patent Application No. 16/424,018, dated January 24, 2022.
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Electronic Acknowledgement Receipt

EFS ID:	46613201
Application Number:	17942347
International Application Number:	
Confirmation Number:	1038
Title of Invention:	WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT
First Named Inventor/Applicant Name:	Thomas A. Howell
Customer Number:	34071
Filer:	Peter P. Tong/Angela Nijim
Filer Authorized By:	Peter P. Tong
Attorney Docket Number:	IPVCP006X1C8
Receipt Date:	14-SEP-2022
Filing Date:	
Time Stamp:	11:35:23
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Letter specifying the conditions for filing under 37 CFR 1.97	IPVCP006X1C8_IDSTrans_9-22.pdf	19933 2594b096f5f5f118f12e1a37e9257b8b62ad6959	no	2

Warnings:

Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	IPVCP006X1C8_1449_9-22.pdf	84731 ae3089615f7b4b4f9490b73e519d057e1d8c3f60	no	9
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
			Total Files Size (in bytes):	104664	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: HOWELL et al.	Attorney Docket No.: IPVCP006X1C8
Application No.: 17/942,347	Examiner: Not Yet Assigned
Filed: September 12, 2022	Group: Not Yet Assigned
Title: WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT	

INFORMATION DISCLOSURE STATEMENT
37 CFR §§1.56 AND 1.97(b)

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

The references listed in the attached PTO Form 1449 may be material to examination of the above-identified patent application. Applicants submit the list of these references in compliance with their duty of disclosure pursuant to 37 CFR §§1.56 and 1.97. The Examiner is requested to make these references of official record in this application. The above-identified application is a Continuation of prior application U.S. Patent Application No. 16/429,181. This prior application is being relied upon for an earlier filing date under 35 U.S.C. § 120. Because the listed references (to the extent that copies are required) were either cited by the PTO, or submitted to the PTO in the prior application, under 37 CFR § 1.98(d) Applicants submit that copies need not be provided.

This Information Disclosure Statement is not to be construed as a representation that a search has been made, that additional information material to the examination of this application does not exist, or that these references indeed constitute prior art.

This Information Disclosure Statement is: (i) filed within three (3) months of the filing date of the above-referenced application, (ii) believed to be filed before the mailing date of a first Office Action on the merits, or (iii) believed to be filed before the mailing of a first Office Action after the filing of a Request for Continued Examination under §1.114.

Accordingly, it is believed that no fees are due in connection with the filing of this Information Disclosure Statement. However, if it is determined that any fees are due, the Commissioner is hereby authorized to charge such fees to Deposit Account 50-3874 (Order No. IPVCP006X1C8).

Respectfully submitted,

/Peter P. Tong/

Peter P. Tong
Registration No. 35,757

4010 Moorpark Avenue
Suite 211
San Jose, CA 95117

Doc code : PET.OP.AGE
Description : Petition to make special based on Age/Health

PTO/SB/130 (07-09)

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number

PETITION TO MAKE SPECIAL BASED ON AGE FOR ADVANCEMENT OF EXAMINATION UNDER 37 CFR 1.102(c)(1)

Application Information

Application Number	17942347	Confirmation Number	1038	Filing Date	
Attorney Docket Number (optional)	IPVCP006X1C8	Art Unit		Examiner	
First Named Inventor	Thomas A. Howell				
Title of Invention	WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT				

Attention: Office of Petitions

An application may be made special for advancement of examination upon filing of a petition showing that the applicant is 65 years of age, or more. No fee is required with such a petition. See 37 CFR 1.102(c)(1) and MPEP 708.02 (II).

APPLICANT HEREBY PETITIONS TO MAKE SPECIAL FOR ADVANCEMENT OF EXAMINATION IN THIS APPLICATION UNDER 37 CFR 1.102(c)(1) and MPEP 708.02 (II) ON THE BASIS OF THE APPLICANT'S AGE.

A grantable petition requires one of the following items:
(1) Statement by one named inventor in the application that he/she is 65 years of age, or more; or
(2) Certification by a registered attorney/agent having evidence such as a birth certificate, passport, driver's license, etc. showing one named inventor in the application is 65 years of age, or more.

Name of Inventor who is 65 years of age, or older

Given Name	Middle Name	Family Name	Suffix
Peter	P.	Tong	

A signature of the applicant or representative is required in accordance with 37 CFR 1.33 and 10.18. Please see 37 CFR 1.4(d) for the format of the signature.

Select (1) or (2) :

○ (1) I am an inventor in this application and I am 65 years of age, or more.

◉ (2) I am an attorney or agent registered to practice before the Patent and Trademark Office, and I certify that I am in possession of evidence, and will retain such in the application file record, showing that the inventor listed above is 65 years of age, or more.

Signature	/Peter P. Tong/		
Name	Peter P. Tong	Registration Number	35757

EFSWeb 1.0.18

PTO/SB/130 (07-09)
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Fr eedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about indivi duals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

In re Application of
Thomas A. Howell

Application No. 17942347

Filed:

Attorney Docket No. IPVCP006X1C8

:
:
:DECISION ON PETITION TO MAKE SPECIAL
:UNDER 37 CFR 1.102(c)(1)
:

This is a decision on the electronic petition under 37 CFR 1.102 (c)(1), filed 15-SEP-2022 to make the above-identified application special based on applicant's age as set forth in MPEP § 708.02, Section II.

The petition is **GRANTED**.

A grantable petition to make an application special under 37 CFR 1.102(c)(1), MPEP § 708.02, Section II : Applicant's Age must include a statement by applicant or a registered practitioner having evidence that applicant is at least 65 years of age. No fee is required.

Accordingly, the above-identified application has been accorded "special" status and will be taken up for action by the examiner upon the completion of all pre-examination processing.

Telephone inquiries concerning this electronic decision should be directed to the Electronic Business Center at 866-217-9197.

All other inquiries concerning either the examination or status of the application should be directed to the Technology Center.

Electronic Acknowledgement Receipt	
EFS ID:	46612925
Application Number:	17942347
International Application Number:	
Confirmation Number:	1038
Title of Invention:	WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT
First Named Inventor/Applicant Name:	Thomas A. Howell
Customer Number:	34071
Filer:	Peter P. Tong/Angela Nijim
Filer Authorized By:	Peter P. Tong
Attorney Docket Number:	IPVCP006X1C8
Receipt Date:	15-SEP-2022
Filing Date:	
Time Stamp:	13:41:50
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	ePetition Request Form	petition-request.pdf	44908 8cdffca5b443fe5e8ccdae33bbd1ee4e37766c4e	no	2

Warnings:

Information:	
Total Files Size (in bytes):	44908

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 17/942,347

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	320
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	700
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	800
TOTAL CLAIMS (37 CFR 1.16(i))	6 minus 20 =	* 0			OR	x =	0
INDEPENDENT CLAIMS (37 CFR 1.16(h))	1 minus 3 =	*				x =	0
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						420
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	2240

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE($)	ADDITIONAL FEE($)		RATE($)	ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
17/942,347	09/12/2022		2240	IPVCP006X1C8	6	1

CONFIRMATION NO. 1038

FILING RECEIPT

34071
IPVENTURE, INC.
4010 Moorpark Avenue
Suite 211
San Jose, CA 95117

OC000000049117385

Date Mailed: 09/28/2022

Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please submit a written request for a corrected Filing Receipt, including a properly marked-up ADS showing the changes with strike-through for deletions and underlining for additions. If you received a "Notice to File Missing Parts" or other Notice requiring a response for this application, please submit any request for correction to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections provided that the request is grantable.

Inventor(s)

Thomas A. Howell, San Jose, CA;
David Chao, Saratoga, CA;
C. Douglass Thomas, Saratoga, CA;
Peter P. Tong, Mountain View, CA;

Applicant(s)

IngenioSpec, LLC, San Jose, CA;

Power of Attorney: The patent practitioners associated with Customer Number 34071

Domestic Priority data as claimed by applicant

This application is a CON of 16/429,181 06/03/2019
which is a CON of 13/831,445 03/14/2013 PAT 10,310,296
which is a CON of 12/803,732 07/01/2010 PAT 8,434,863
which is a CON of 11/546,685 10/11/2006 PAT 7,806,525
which is a CIP of 11/183,256 07/15/2005 PAT 7,500,747
which claims benefit of 60/618,107 10/12/2004
and claims benefit of 60/620,238 10/18/2004
and claims benefit of 60/647,836 01/31/2005
and claims benefit of 60/647,826 01/31/2005
and said 11/546,685 10/11/2006 claims benefit of 60/846,150 09/20/2006
and claims benefit of 60/787,850 04/01/2006
and claims benefit of 60/725,999 10/11/2005
and claims benefit of 60/725,896 10/11/2005

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

Projected Publication Date: 01/05/2023

Non-Publication Request: No

Early Publication Request: No

Title

WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT

Preliminary Class

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

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The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor

community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop technology, manufacture products, deliver services, and grow your business, visit http://www.SelectUSA.gov or call +1-202-482-6800.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
17/942,347	09/12/2022	Thomas A. Howell	IPVCP006X1C8

CONFIRMATION NO. 1038

34071
IPVENTURE, INC.
4010 Moorpark Avenue
Suite 211
San Jose, CA 95117

NEW OR REVISED PPD NOTICE

OC000000136450867

NOTICE OF NEW OR REVISED PROJECTED PUBLICATION DATE

The above-identified application has a new or revised projected publication date. The current projected publication date for this application is 01/05/2023. If this is a new projected publication date (there was no previous projected publication date), the application has been cleared by Licensing & Review or a secrecy order has been rescinded and the application is now in the publication queue.

If this is a revised projected publication date (one that is different from a previously communicated projected publication date), the publication date has been revised due to processing delays in the USPTO or the abandonment and subsequent revival of an application. The application is anticipated to be published on a date that is more than six weeks different from the originally-projected publication date.

More detailed publication information is available through the private side of Patent Application Information Retrieval (PAIR) System. The direct link to access PAIR is currently http://pair.uspto.gov. Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Questions relating to this Notice should be directed to the Office of Data Management, Application Assistance Unit at (571) 272-4000, or (571) 272-4200, or 1-888-786-0101.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
17/942,347	09/12/2022		2240	IPVCP006X1C8	6	1

CONFIRMATION NO. 1038

CORRECTED FILING RECEIPT

34071
IPVENTURE, INC.
4010 Moorpark Avenue
Suite 211
San Jose, CA 95117

OC000000050242736

Date Mailed: 10/31/2022

Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

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and claims benefit of 60/620,238 10/18/2004
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and claims benefit of 60/725,896 10/11/2005

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

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Title

WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT

Preliminary Class

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

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Form 1449 (Modified)	Atty. Docket No.	IPVCP006X1C8
	Application No.:	17/942,347
Information Disclosure Statement By Applicant	Applicant	HOWELL et al.
	Filing Date	September 12, 2022
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(Use Several Sheets if Necessary)		Page 1 of 2

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	A	Notice of Allowance for U.S. Patent Application No. 16/821,810, dated October 19, 2022.
	B	Notice of Allowance for U.S. Patent Application No. 17/484,080, dated September 13, 2022.
	C	Office Action for U.S. Patent Application No. 17/873,104, dated October 6, 2022.
	D	Office Action for U.S. Patent Application No. 17/873,104, dated November 6, 2022.

Examiner	Date Considered

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Form 1449 (Modified) **Information Disclosure Statement By Applicant** (Use Several Sheets if Necessary)	Atty. Docket No.	IPVCP006X1C8
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	Filing Date	September 12, 2022
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		Page 2 of 2

	E	Notice of Allowance for U.S. Patent Application No. 17/395,509, dated September 9, 2022.
	F	Notice of Allowance for U.S. Patent Application No. 17/737,866, dated September 16, 2022.
	G	Office Action for U.S. Patent Application No. 16/424,018, dated September 6, 2022.

Examiner	Date Considered

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(54) **LIGHTED READING GLASSES**

BELEUCHTETE LESEBRILLE

LUNETTES DE LECTURE ECLAIRANTES

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EP 2 290 433 B1

Description

Field of the Invention

[0001] The present invention relates generally to lighted glasses and, more particularly, to eyeglasses that are especially well-suited for reading in poorly lit areas.

Background

[0002] The use of lights and other illuminating devices with glasses is known. Generally, however, they have not been very well adapted for use with reading glasses. As is known, these types of glasses typically are not worn all the time, and are subject to being frequently taken off and put back on. On the other hand, when reading glasses are worn, they should be comfortable enough to encourage their use so that people are not avoiding their glasses and instead straining their eyes to read.

[0003] Incandescent light bulbs commonly have been proposed for use with lighted glasses. Unfortunately, such lighting devices generate a significant amount of heat Smaller, less powerful incandescent lights still may make the wearer feel quite uncomfortable after even a short while due to the proximity of the light source and the wearer's face. Further decreasing the size of the incandescent lights, to the point where the wearer is comfortable, may cause light output to be very dim and therefore unusable for illuminating reading material that are held at distances optimal for reading.

[0004] For example, if reading distance after using corrective lenses for those in need of vision correction of ordinary size text, e.g. 10 or 12 point font, is optimally ten to eighteen inches from the eyes, a light that is capable of brightly illuminating the pages within that range of distances is necessary for ensuring comfort in reading in dimly lighted areas. However, a lower intensity light bulb, which may be preferable to reduce heat or increase battery life, may result in less than optimal lighting at the optimal reading distance, causing eye-strain and discomfort. In other words, the lower intensity of the light source will result in a decrease in the brightness of the light on the page so that the text to be read is only dimly lit

[0005] The use of fiber optic lighting devices instead of incandescent light bulbs is known. In such devices, optical fibers are bundled together to create a light producing device. The nature of fiber optics is such that there is no heat generated at the point where the light is typically transmitted; that is, adjacent the user's temple. Unfortunately, such devices suffer from a rather major limitation. Namely, a very intense and powerful light source must be available to provide light to the optical fibers. As such, head gear such as worn by surgeons having a fiber optic lighting device must at all times stay tethered to a fiber optic light source, which severely restricts the mobility of the user and thus the ease of use of the headgear. A portable light source that stays connected to the fiber optic light head via electrical cables is less than desirable in terms of the need to be able to conveniently carry the light source, and the inconveniences associated with dangling connecting lines.

[0006] An additional problem that exists with fiber optic devices, as well as incandescent lighting devices, is rapid battery consumption. Incandescent light bulbs are known to consume large amounts of power. Similarly, a fiber optic device, since it requires a strong lighting source, also requires a large amount of power. As a result, the user is be forced to change batteries often or stay tethered to a constant power source or light source.

[0007] Another disadvantage in prior art lighting devices is the manner in which surfaces are illuminated. Lighting devices used in the medical field generally produce a single fixed narrow beam of light to brightly illuminate the particular stationary body area on which the doctor may be operating. However, such a single narrow beam would not be particularly helpful in reading textual material as the beam would have to be continually shifted across the page being read. On the other hand, lights used with glasses generally tend to be very inefficient in their use of the light they generate as large amounts of light are cast beyond the field of view of the glasses. Adjustable lights are less than desirable as they require a user to make sure the lights are properly positioned each time the glasses are used.

[0008] Accordingly, there is a need for lighted glasses that are optimized for use in poorly lit or dim areas. More particularly, reading glasses having lights that are arranged to direct an optimum, amount of light to the area where it is required most, i.e. the reading area, is needed. Further, lights that are very compact and lightweight, while still providing the necessary lighting strength and having a sufficiently long life for the power source that power these lights would be desirable.

[0009] DE 94108862 U1 disclose a carryable minilighting device for which a light bulb mount can be attached to glasses and supplied with power from a power pack through a wire extending therebetween. US 4,959,760 discloses lighting equipment for eyeglasses.

Summary of the Invention

[0010] In accordance with one form of the invention, lighted glasses, and preferably those adapted for reading which include corrective lenses, e.g. magnifiers, are provided to enable conventional sized text to be clearly read in dimly lit areas when held at a normal range of reading distances at which a user typically reads such material, such as between ten inches and eighteen inches from the lenses. High strength lights and light mounts therefor cooperate to light the reading area with a maximum amount of light provided in the reading distance range. More particularly, highly efficient and high intensity light emitting diodes (LEDs) are mounted in housings configured to fix narrow beams of light to be directed slightly inward toward each other so that the beams overlap in the reading distance range thus providing double the

amount of light for reading over that provided by a single one of the lights. To this end, the housings are attached adjacent outer portions of the lenses so that the inwardly directed light beams light up the areas generally in front of the glasses, i.e. in its field of view, and which begins spaced forwardly therefrom, i.e. generally coinciding with the start of the reading distance range. Further, the small size and efficient nature of the preferred solid-state material, i.e. InGaN (indium gallium nitride), for the LEDs, allows very small power supplies to be used such as disc-shaped coin cell batteries for powering the LEDs which, in turn, allows both the light source and power source herein to be self-contained in a highly compact housing therefor. In this regard, the present invention provides compactly sized lighting modules as described above that can be attached to reading or other glasses either removably or fixed in a more permanent fashion as described hereinafter.

[0011] The beams of light from the LEDs generate conical-shaped lighted areas such that upon intersection they cooperate to form a conical overlapping lighted area in which the brightness of the light is effectively doubled over that provided by a single LED. The conical overlapping lighted area increases in size as distances increase from the lenses. As is known, light tends to dissipate the further it is from its source. The overlapping conical lighted area is such that the peripheral areas in the field of view of the lenses that do not receive the double light strength of the overlapping light beams are closest to the lenses where light dissipation has its least effect in the reading distance range, whereas the overlapping lighted area increases in size further from the lenses with a corresponding decrease in the single light strength peripheral areas on either side of the cone of overlapping light. Thus, as light dissipates and distances increase from the lenses, the lighting provided will not suffer as the double light strength of the overlapping conical region of light will more than make up for the effects of light dissipation in the reading distance range.

[0012] To achieve the optimum amount of light flooding in the reading area, the light housings have surfaces configured to orient the central axis of the conical light beams in a direction that is canted slightly inward with the beams directed toward each other. The preferred canting of the narrow light beams which in the preferred and illustrated form are cones forming angles of twenty degrees is such that the cone axis has a fifteen degree angle with a reference line extending straight forwardly from the lenses. The lenses are preferably magnifiers of a predetermined diopter rating selected by a user so that conventionally sized text such as ten or twelve point font can be clearly read at distances ranging from between approximately ten and eighteen inches forwardly of the user. And it is in this distance range where the overlapping cone of light is formed by the conical light beams canted inward toward each other, as described. In this way, the present lighted reading glasses are provided with lights whose light beams are directed in a carefully coordinated manner with the vision correction provided by the corrective reading lenses so that the amount of light is maximized where it is needed most, i.e. in the field of view of the lenses and within the range of distances at which conventional sized printed text is most commonly read.

[0013] The glasses include temple arms that extend rearwardly from the outer portions of the lenses with the housings attached to the arms toward the forward ends thereof. The temple arms can be opened for use or folded when not in use. With the temple arms opened, the housings are each oriented to project light therefrom forwardly inwardly and toward the light emanating from the housing attached on the other arm. The temple arms toward their forward ends typically will extend substantially straight rearwardly generally normal to the lens frame portions so that the longitudinal axis of the housing is likewise in a normal orientation to the lens frame with the mounting surfaces of the housing configured to be canted inwardly therefrom to direct the light beams as earlier described. Should the configuration of the temple arms and/or housings vary from that described herein, the mounting surfaces can be configured to adapt accordingly such that the light beams are inwardly directed as desired.

[0014] The LEDs herein are a small lightweight device that provide a very bright light, while consuming very little power. As such, the batteries enclosed in the housing are small and do not need to be changed as frequently as devices that utilize incandescent lights or fiber optics, which require large batteries. The LEDs provide a relatively narrow beam of light that can be well focused in a particular direction. For example, if two light modules are mounted on a pair of glasses, the LEDs in each module are positioned such that the cones of light produced by the LEDs in the light modules begin intersecting at a point closely adjacent to or coinciding with the start of the range of ideal reading distances. As such, the illuminated reading portion receives the brightest light possible since the intersection of both cones of light are trained on that area. Another advantage of using the high intensity LEDs is that because they consume such a small amount of power, virtually no heat is dissipated. Therefore, a user is able to wear eyeglasses having the light modules mounted thereon, for longer periods of time without suffering from heat and without being bothered by the weight of the devices.

[0015] In another form, the light modules are provided with spring clips that are attached to the light module housing. The spring clips are preferably a resilient material such as metal or sturdy plastic. The spring clips enable the light module to be removably attached to any pair of eyeglasses. Alternatively, the modules can be fixed at ends of a clip-on frame with a clip mechanism intermediate the ends for releasably securing the clip-on frame to eyeglasses in the general area of the nose bridge and adjacent lens portions thereof.

[0016] In still another form not according to the invention as claimed, the lights such as provided in the aforedescribed light modules are fixedly mounted to a clip-on

light apparatus for being removably secured to eyeglasses. Preferably, the clip-on frame is adjustable so that it can be fit onto differently sized eyeglasses. More particularly, the frame is an elongate spacer frame having end portions to which lights are mounted. An adjustment assembly or draw spring assembly of the spacer frame spring biases the end portions toward each other. At the end portions, retainer members are configured to grip onto the lenses to position the lights adjacent thereto. In particular, the light modules are mounted at the corresponding temple area of the clip-on glasses to enable the LEDs in the light modules to project light in the manner described above. To this end, the lights can include high intensity LEDs that are mounted in the light modules which orient the LEDs to project light at an inward cant relative to each other so the maximum amount of light is trained on the reading area, as previously described.

Brief Description of the Drawings

[0017]

Fig. is a perspective view of lighted reading glasses in accordance with the present invention showing the glasses used to read material held at a normal reading distance range;

Fig. 2 is a side elevational view of the reading glasses of Fig. 1 showing a lighting module attached to a forward end portion of one of the temple arms of the glasses;

Fig. 3 is a plan view of the glasses of Fig. 2 showing a light switch shifted to activate the lights to generate cones of light emanating therefrom;

Fig. 4 is a perspective view of the light module showing the compact configuration of a housing of the module with a slot opening for the switch and a forward opening for the light in the form of an LED;

Fig. 5 is an exploded view of the light module of Fig. 4 showing a pair of coin cell batteries used to power the LED;

Fig. 6 is a side elevational view of the light module showing the coin cells in phantom and the tapered configuration of the housing from the widest diameter to hold the coin cells therein;

Fig. 7 is a front elevational view of the light module showing the thin configuration of the housing;

Fig. 8 is a cross-sectional view taken along line 8-8 of Fig. 6 showing light mounting surfaces for orienting the LED to project light at an oblique angle to a longitudinal axis of the housing;

Fig. 8A is an enlarged fragmentary view of the forward portion of the module to show more clearly the preferred angle at which the LEDs are mounted in the housing;

Fig. 9 is a diagramatic view of the lighted glasses showing the respective inwardly directed cones of light produced by each of the light modules and the overlapping lighted area they create in the reading distance range;

Fig. 10 is a side elevational view of a light module having spring-clips for being removable attached to the glasses;

Fig. 11 is a front elevational view of the light module of Fig. 10 showing a ridged surface on a resilient arm of one of the clips;

Fig. 12 is a plan view of a light module, not according to the invention as claimed, fixed to a frame to be clipped onto gasses;

Fig. 13 is a front elevational view of the lighted clip-on frame of Fig. 12;

Fig. 14 is a side elevational view of the lighted clip-on frame of Fig. 12;

Fig. 15 is a front elevational view of the lighted clip-on frame removably attached to a pair of spectacles;

Fig. 16 is a plan view of the lighting modules modified so that each include a blinder extension integral with the housing and disposed between the LEDs and the adjacent lenses;

Fig. 17 is an enlarged elevational view of the lighting module of Fig. 16;

Fig. 18A is a perspective view of a clip-on light apparatus not in accordance with the present invention, showing an adjustable frame with light modules secured at either end thereof;

Fig. 18B is a perspective view similar to Fig. 18A showing the clip-on frame removably secured to eyeglasses with the light modules adjacent the lenses;

Fig. 19 is a plan view of the clip-on light apparatus showing a draw spring assembly of the frame that allows the end portions to be pulled away from each other against the spring bias;

Fig. 20 is a front elevational view of the clip-on light apparatus showing a pair of retainers at either end of the frame that are adapted to engage the eyeglass lenses;

Fig. 21 is an enlarged plan view of one of the frame ends and light module mounted thereto showing a coilspring of the drawstring assembly in an expanded state for close positioning of the light modules relative to each other;

Fig. 22 is a view similar to Fig. 21 showing the frame end portion pulled to compress the spring from its expanded state for shifting the light modules away from each other;

Fig. 23 is a side elevational view taken along line 23-23 of Fig. 21 showing a mounting plate for attaching the frame end portion to the light module.

Fig. 24 is a perspective view of an alternative clip-on apparatus showing a frame having light modules fixed at either end with a clipping mechanism therebetween releasably securing the frame to eyeglasses;

Fig. 25 is a plan view of the alternative clip-on apparatus showing pairs of clip arms and a pivot actuator therefor; and

Fig. 26 is a cross-sectional view taken along line

26-26 of Fig. 25 showing pivoting of the actuator for opening the pairs of clip arms.

Detailed Description of the Preferred Embodiments

[0018] As shown in drawings for purposes of illustration, the invention is embodied in lighted reading glasses 5 which enable a user wearing the glasses 5 as shown in Fig. 1 to clearly read conventionally sized printed text 10, e.g. ten or twelve point font, held in a range of distances suitable for reading such text sizes where the reading is occurring in poorly or dimly lit areas. In this regard, the present lighted reading glasses 5 are ideally suited for use in areas that normally require a user to turn on a light before reading can occur but where doing so is less than desirable, such as in a car or when reading in bed with another present who is trying to sleep while you read.

[0019] The lighted glasses 5 which as stated above are preferably reading glasses 5 will include lenses 12 of light transmissive material configured to refract light to correct for defects in vision due to errors of refraction in the human eye and thus, at least one of the lens surfaces 14 will be curved to precisely correct for the defect being addressed in a particular individual that wishes to use the lighted reading glasses 5 herein. A variety of lens types may be utilized including concave, convex, plano-convex, cylindrical, compound lenses and/or bi, tri, or tetrofocal lenses, although the reading glasses 5 are preferably adapted for use by those who are farsighted so that convexly configured lenses 12 will typically be employed. Further, although the reading glasses 5 can be provided with prescription lenses 12, from a cost standpoint the lighted glasses 5 are preferred for use with lower cost magnifier lenses 12 that have a well-defined diopter rating. In this regard, the lenses 12 can be offered with nine different diopter ratings from 1.00 up to 3.00 in intervals of 0.25 therebetween. Alternatively, the lenses 12 can be non-refractive for people who do not need vision correction but still want to read in the dark via the lighting provided by the glasses 5 herein.

[0020] With the reading glasses 5 on, the user will be able to read in dark or dimly lit areas via lights 16 that are on the glasses 5 attached by way of respective light mounts 18 therefor. The light mounts 18 fix the predetermined lighted areas 20 to be oriented so that they overlap and create an overlapping lighted area 22 which has double the amount of light and thus significantly increase brightness over that provided by a single one of the lights 16. As best shown in Fig. 9, the overlapping lighted area 22 is disposed in the predetermined reading distance range generally designated 24 by the direction afforded to the lights 16 via their light mounts 18. This range for a normal functioning eye or using an appropriate corrective lens for those requiring vision correction for reading ten or twelve point font with a sufficiently large or wide field of view will be approximately ten to eighteen inches in front of the lenses 12.

[0021] The lights 16 are, preferably high intensity, LEDs 108 that form their lighted areas 20 as narrow light beams in the shape of respective cones 136 and 138 of light directed inwardly toward each other, as shown in Figs. 3 and 9. In this manner, the point of intersection 48 will be closely adjacent or substantially coincident with the start of the reading distance range 24 and the overlapping area 22 will likewise take on a conical shape 140 and be maximized in size in the range 24. There is also a proximate conical area 25 right in front of the glasses 5 that does not receive light. However, this unlighted area 25 is of little consequence as it substantially falls before the start of the reading distance range 24.

[0022] By canting the light beams 136 and 138 inwardly, little light is wasted on areas that are outside the effective field of view, generally designated 26, of the glasses 5. Further, the conical overlap area 140 that receives double the amount of light increases in size with increasing distances from the lenses 12. By contrast, the peripheral areas 30 and 32 on either side of the double-lit overlap area 140 become smaller with increasing distance from the lenses 12. Since light dissipation can become an issue as distances increase from the light source, the increasing size of the double-lit area 22 in comparison to the decreasing size of the single-lit areas 30 and 32 provides a significant advantage in having a very well-lit reading area with an efficient use of the light generated by the LEDs 108 herein. Further, the fixed canting of the beams 136 and 138 allows a user to put on the glasses 5 and know that they will be able to begin reading even in dimly-lit areas by simply turning on the lights 16 without requiring that they be adjusted for focusing them on the material to be read.

[0023] The light mounts 18 are compactly sized housings 109 for containing the high intensity LEDs 108 and at least one, and preferably two, small disc-shaped battery power supplies 116 in a space savings manner therein. The housings 109 can be constructed of two halves or cover members 106 and 107 each with mounting surfaces generally designated 30 and 32 configured to orient the LED dome lens 34 in forward opening 36 of the housing 109 such that the light beam cones 136, 138 emanate in the desired inward direction. As best seen in Figs. 7,8 and 8A, the surfaces 30 and 32 can be formed integrally with their respective housing portions 106 and 107 such as on raised ribs 38 and 40. As shown, the surfaces 30 and 32 are each inclined to extend in the same direction relative to longitudinal axis 42 of the housing 109 such that they extend transversely and at an oblique angle thereto. In this manner, when the housing portions 106 and 107 are attached, the ribs 38 and 40 cooperate to capture the LED dome lens 34 in a canted orientation thereof relative to housing axis 42. Accordingly, with the LEDs 108 switched on, the axis 44 extending centrally through or bisecting the light beam cones 136 and 138 will generally extend parallel to the housing mounting surfaces 30 and 32 and at an oblique angle to the axis 42.

[0024] In the preferred and illustrated form, the eye-

glasses 5 including temple arms 104 are constructed such that with the arms 104 opened, their forward end portions 104a will extend substantially normal to the general plane of the eyeglass lenses 12 and to any frame portions that may be included thereabout. Further, the housings 109 are constructed so that when attached flush to the arm forward end portion 104a as shown in Fig. 3, the housing axis 42 will extend parallel to the forward end portion 104a and straight forwardly from the glasses 5. With the preferred solid state material for the LEDs 108 as described hererinafter, they will generate a narrow light beam cone 136,138 of twenty degrees. For this narrow cone 136, 138, the oblique inward cant angle 46 is preferably approximately fifteen degrees so that the point 48 of intersection where the overlap lighted area 22 begins is centrally disposed between the lenses 12 and spaced forwardly therefrom approximately at the start of the reading distance range 24. This inward canting of the light beam cones 136 and 138 also minimizes the amount of light that is projected to lateral areas outside the field of view 26 forwardly of the glasses 5.

[0025] The LEDs 108 are preferably high-intensity white LED, such as manufactured by Chicago Miniature Lamp, Inc., of Hackensack, New Jersey, part number CMD333UWC-ND. Similar types of LEDs are available from a variety of manufacturers and such LEDs would also be acceptable for use in the light module 105. A particular advantage of using the described high-intensity LEDs is the ability of the LEDs to provide large amounts of bright light while consuming significantly less power than incandescent light sources and fiber optic devices. In particular, the LED 108 provides a typical 2300 mcd light output using only 20mA of power. This allows for significantly extended battery life using inexpensive and lightweight batteries. A further advantage of this type of LED is the relatively narrow viewing angle of approximately 20 degrees. This allows the light output to be directed in a very precise manner, making it ideally suited for use in the present invention. Referring in particular to Fig. 3, it can be seen that the angle of the LED 108 causes the cone of light to be emitted at a specific angle so that the light is directed slightly inward toward the portion being read and thereby avoiding scattering of light outwards and particularly outside the field of view of the glasses 5.

[0026] Turning now to Fig. 4, the light module 105 is shown in isolation from the eyeglasses. As can be seen in greater detail, the light module 105 houses a switch 114 having an actuator projecting portion 110. The projecting portion 110 is designed such that a user's thumb or finger can quickly and easily engage the projecting portion 110 to push the switch 114 for sliding in either one of two directions to turn the light module off and on. The elongated slot 112 is sized such that the switch 114 can be moved only a preset distance, thereby enabling the on and off functions to be accomplished with a minimum of motion. When the switch 114 is moved to the "on" position, a set of batteries 116 energize the LED 108. Similarly, when the switch 114 is moved to the "off" position, the connection between the batteries 116 and the LED 108 is broken and the LED 108 is turned off.

[0027] Referring to Fig. 5, an exploded perspective view of the light module 105 is shown. The light module 105 comprises a housing 109 that is preferably constructed of a lightweight material, such as plastic, to provide the greatest amount of comfort to the wearer, while still being a cost-effective product The housing 109 includes a first cover member 106 and a second cover member 107. The second cover member 107 is formed with a main flat wall 107a from which upstanding walls 107b extend from the periphery thereof to form an interior space 107c in which the switch 114, the batteries 116 and the LED 108 are disposed. The fastening devices 124, which may be self tapping screws among others, are used to fasten the first cover member 106 as a lid onto the second cover member 107.

[0028] The first cover member 106 is formed with an elongated slot 112 cut out of the main flat wall 106a, several integral projecting bosses 120 that can be internally threaded for receiving fastening members or screws 124 and an integral LED positioning member or raised rib 40. The LED positioning member 40 extends toward the cover 107 and has a concave surface 32 that cooperates with curved surface 30 of the cover member 107 for capturing the LED dome lens 34 at the desired angle 46 to axis 42 (Fig. 8a). As described above, the elongated slot 112 is designed to receive the projecting portion 110 of a switch 114 such that the projecting portion 110 extends slightly outside the first cover member 106 and is accessible by a user's finger or thumb. The cover member 106 also is formed having a slot 119 (Fig. 8) to form a housing for the switch 114 when the light module is fully assembled.

[0029] The LED 108 includes anode 111 and cathode 115 leads that are used to energize the LED 108. In addition, the anode 111 and cathode 115 leads are physically configured to also enable the LED 108 to be securely held in position within the light module 105. The cathode 115 lead, which is generally the shorter of the two leads, is trimmed further to a size suitable for engaging an aperture 113 in a box shaped member 130. The trimmed cathode 115 lead is bent into a curved hook configuration to behave as a resilient spring clip when mounted into the light module 105; and the anode lead is left in its original form and engages a second aperture in the box shaped member 130, which enables the anode 111 lead to extend into the open portion of the second cover member 107, as further discussed below.

[0030] The second cover member 107 includes a LED positioning member or rib 38 having curved surface 30 formed thereon for cooperating with surface 32 to capture the LED dome lens 34, as previously described. A lead guide assembly 130 is disposed within cover member 107. The guide assembly 130 channels or guides the anode 111 lead and the cathode 115 lead into their respective appropriate positions for conducting and switch-

ing functions. The guide assembly 130 includes an extending sidewall 131 and an extending support structure 132. The support structure 132 includes first 133 and second 134 indents and a block 135 oriented between the first 133 and second 134 indents. When the LED 108 is placed into position in the guide assembly 130, the anode 111 lead is placed into the channel between the extending sidewall 131 and extending support structure 132. A large portion of the anode 111 lead extends beyond the sidewall 131 and into the cover member 107 opening. The cathode 115 lead, which is in a bent hook configuration is placed into the support structure 132 such that the portion of the cathode that is connected to the LED 108 is situated in the second 134 indent and the hooked portion engages the first 133 indent. The block 135 forces part of the cathode 115 lead to extend beyond the support structure 132 to enable contact between the batteries 116 and the cathode 115 via the switch 114.

[0031] The second cover member 107 also includes several apertures 122 for receiving the fastening devices 124. The fastening devices 124 are inserted into apertures 122 and engage the fastening receiving members 120 of cover member 106. The apertures 122 in the second cover member 107 are preferably countersunk such that the heads of the fastening devices 124 sit flush with the surface of the second cover member 107. Furthermore, by providing a standard phillips or slot headed fastening device, a user is able to gain access to the interior of the light module using a simply, commonly found household screwdriver. Once inside, the user self-services the light module 105 and, in particular, replaces the batteries 116 when they are exhausted.

[0032] The batteries 116, because of the low power consumption of the high-intensity LEDs 108, may be any commonly found small form factor batteries, such as three volt coin cells manufactured by Panasonic Corporation of Japan, part no. P189D. To this end, the disc-shaped batteries preferably have a diameter of slightly greater than three-fourths of an inch and a width of approximately one-eighth of an inch so that two batteries 116 can be stacked in a compact fashion. Accordingly, with the small LED 108 and the small and thin batteries 116, the housings 109 can be constructed in a very compact fashion. By way of example and not limitation, the main housing walls 106a and 107a have a maximum width of less than approximately one-inch. Since neither the batteries 116 or the LED 108 is particularly long, and the stroke of the switch 110 in minimized as previously described, the length of the housing 109 can be minimized to be on the order of approximately one and one-half inches. Finally, since the batteries 116 are so thin, the depth of the housing 109 can be sized to be slightly greater than the thickness of the two stacked disc batteries 116 or less than approximately one-half inch.

[0033] When assembled, the batteries 116 make contact with the anode or elongated portion 111 of the LED 108. The batteries 116 are stacked together such that the negative terminal of the first battery is an electrical contact with the positive terminal of the second battery. The positive terminal of the first battery 116 is then placed in electrical contact with the elongated portion 111 of the LED 18. The switch 114 which is constructed of an electrically conductive lightweight metal strip rests solely on the negative terminal of the second battery when the light module is not producing light, resulting in an open circuit When the switch 114 is placed in its "on" position, an electrical connection is created between the negative terminal of the battery 116 and the depending hooked portion 115 of the LED 108. Thus the circuit from the positive terminal of the battery 116 to the LED 108 is completed using the switch 114, and the LED 108 illuminates. The projecting portion 110 may be integrally formed as part of the metal strip or may be a plastic or metal projection that is fastened at an appropriate position in the body of the switch 114. The body of the switch 114 is constructed such that the metal strip includes one or more inclines formed by bends in the metal strip of the switch. The inclines are sized to cause the switch 114 to fit relatively sightly between the battery and the housing much like a spring, thereby enabling the switch to maintain its on or off position into which it has been placed.

[0034] Referring to Figs. 8 and 8A, the light module is shown in its assembled form. The LED positioning member 40 of the cover member 106 presses against the body of the LED 108 and pushed the LED 108 into a canted position within the housing 105. A particular advantage in such a configuration is that the LED is able to project light at a precise predetermined angle. Referring in particular to Fig. 8A, it can be clearly seen that the base 108a of the LED 108 helps to hold the LED 108 in place within the housing 105. Furthermore, it also clearly can be seen that the LED positioning member 40 is angled to a degree such that the top of the LED 108 is pushed against the second cover member 107 and particularly the positioning rib 38 thereof.

[0035] Turning now to Fig. 9, the eyeglasses 101 having the light modules 105 mounted thereon are shown in operation. The canted positioning of the LEDs 108 in each of the light modules 105 cooperate to create an overlapping zone 140 of their respective cones of light 136, 138 in the desired reading range. In particular, because of the twenty degree viewing angle of the LEDs 108, and their precise cant within the housing 107, the overlap area 140 occurs within a range of distances that is ideally suited for reading after the use of corrective lenses in the eyeglasses for those in need of vision correction. As a result, the incidence of stray light is reduced and the amount of light illuminating the reading surface is maximized, as previously described. The eyeglasses themselves may be of any configuration. For example, the lenses of the eyeglasses may or may not have frames surrounding the exterior edges of the lenses. Furthermore, the eyeglasses may have bridges for interconnecting the inner portions of the lenses of for interconnecting the inner portions of the lens frames, depending on whether the eyeglasses have frames.

[0036] Referring to Figs. 10 and 11, the light module 105 is shown with a pair of spring clips 135 attached to the second cover member 107. The spring clips 135 may be manufactured of any strong resilient materials such as a high impact ABS plastic or metal, such as stainless steel. The spring clips 135 may be formed having slight ridges 135 to more securely hold the light modules 105 in place. The spring clips 135 enable the light module 105 to be retrofitted or removably attached to any eyeglasses. Therefore, the present invention is not limited to eyeglasses having premounted light modules that are more perfectly fixed to eyeglasses as by fasteners or the like requiring tools for their removal. Rather, any existing eyeglass frames maybe fitted with the light modules. Referring to Fig. 10, it can be seen that the spring clips 124 are fastened onto the housing 109 using the same apertures 120 and fastening devices 124 as described above. Therefore, a manufacturer of the light module obtains a cost benefit by using the same light module 105 platform, but easily configuring it in a number of different ways, depending on the type and configuration of the lighted eyeglasses.

[0037] Turning now to Figs. 12, 3, 4, and 15, a light module not according to the present invention is carried by clip-on glasses 142 having module mounts 145. Referring in particular to Fig. 12, the module mount 145 runs along the length of the light module 105 to provide stability and support to the light module 105. The module mount 145 is attached to the frame at the outer ends of the clip-on glasses and extends rearwardly therefrom. The light modules 105 are mounted on the light mounts 145 such that the respective LEDs 108 project light in a generally forward angled direction. As shown in greater detail in Fig. 13, the module mount 145, although running the entire length of the light module 105, is a relatively narrow strip. This ensures that the device remains light weight and retains its aesthetically pleasing design. As shown in Fig. 14, each of the light modules 105 is attached to a module mount in the temple area of the clip-on glasses 142 and is oriented such that the module mount can not be seen from the side. Fig. 15 shows a representative appearance of the clip-on glasses, having the light modules 105 mounted thereon, attached to a pair of standard eyeglasses 148.

[0038] Referring now to Figs. 16 and 17, a light module is shown having an integrally formed blinder extension 154 to eliminate glare. An advantage of such a light module is that reducing glare also reduces eye-fatigue that a wearer may suffer when wearing eyeglasses with the light modules for extended periods of use. Although both types of light modules work equally well, individuals with sensitive eyes may prefer the light module with the blinder extensions. By way of example only, and to illustrate the difference between the two light modules, eyeglasses are shown mounted with a first light module 150 with an integrally formed blinder extension 154 on one temple area of the eyeglasses and a second light module 105 (as generally described above) mounted on the other temple area of the eyeglasses.

[0039] Lighted eyeglasses having the light module 105, mounted in the manner described above may, in certain instances, create glare that is perceivable by the wearer. As shown, stray or incident light rays 170 that are emitted by the LED 108 may project towards the lens 156 of the pair of eyeglasses 158. The rays 170 are then reflected or refracted by the lenses 156 into the eyes of the wearer. In contrast, the glare reducing light module 150 includes an integral projecting portion or blinder extension 154 for reducing potential glare that may be generated as a result of the light 160 emitted by the LED 108 as it is reflected or refracted off the lenses 156 in the glasses 158. The light module 150 is comprised of a housing 162 that includes a first cover member 164 and a second cover member 166. The second cover member 166 includes the blinder extension 154, which is situated between the LED dome and the lens 156 when the light module is mounted to eyeglasses. The blinder extension 154 is configured such that it extends outwards in the direction of the LED 108 and is optimally sized such that the blinder extension 154 blocks the incident rays of light without distracting the wearer or interfering with the light 168 projected for illuminating a reading surface.

[0040] Similar to the clip-on glass frame 142, Figs. 18A, 18B and 19-23 are directed to another clip-on light apparatus 200. As shown, the apparatus 200 includes a frame 202 which spaces the lights along the length thereof. In this regard, the spacer frame 202 includes opposite ends or end portions 204 and 206 to which the lights 16 are mounted. The lights 16 can be provided in the illustrated light modules 150 including the compact housing 162 in which the LED 108 is oriented to project light forwardly so that as depicted in Fig. 9, the amount of light in the predetermined reading distance range 24 is maximized via large double lit area 140 therein with the frame 202 removably secured to the eyeglasses 208 and the lights turned on.

[0041] In the preferred and illustrated form, retainers 210 are provided at the frame end portions 204 and 206 that are configured to grip the lenses 212 and 214 of the eyeglasses 208. In particular, the frame 202 can include spacer rods, generally designated 216, that can be shifted along their length relative to each other to allow the frame 202 to adjust to differently sized eyeglasses 208, and specifically for eyeglasses that have different distances between the outer sides 212a and 214a of their respective lenses 212 and 214, at which the retainers 216 preferably grip the lenses 212 and 214, as shown in Fig. 18B.

[0042] For this purpose, the rods 216 are preferably incorporated in a draw spring assembly 218, as best seen in Figs. 19,21 and 23. The draw spring assembly 218 includes a coil extension spring 220. In the extended state of the spring 220, the frame end portions 204 and 206 are biased toward each other. To fit the adjustable frame 202 onto glasses 208, a user pulls one or both of the end portions 204 and 206 including the associated light mod-

ules 150 in a direction away from each other as indicated by double-headed arrow 222 in Figs. 19 and 22. The pulling action compresses the coils 220a of the spring 220 as shown in Fig. 22 so that the frame 202 is spring loaded toward the Fig. 19 position where the end portions 204 and 206 are at their closest position relative to each other. With the retainers 210 aligned with the lens sides 212a and 214a, the user then allows the end portions 204 and 206 to shift back toward each other under the influence of the spring bias afforded by the compressed spring 220 of the draw spring assembly 218.

[0043] As the coils expand, the aligned retainers 210 shift toward each other to grip onto the lens sides 212a and 214a. In this manner, the retainers 210 are spring loaded into secure gripping engagement with the lenses 212 and 214. The retainers 210 at the opposite end portions 210 and 214 are generally spaced at approximately same or slightly greater distance than the distance between the outer lens sides 212a and 214a of the glasses 208 when they are removably attached thereto, as can be seen in Fig. 18B.

[0044] To resist fore and aft shifting of the clip-on frame 202, the retainers 210 preferably have a generally U-shaped configuration including forward and rearward legs 224 and 226, respectively. The lens sides 212a and 214a fit into the space 228 between the small retainer legs 224 and 226 so that the forward legs 224 extend around the front 212b and 214b of the lenses 212 and 214, and the rearward legs 226 extend around the rear 212c and 214c of the lenses 212 and 214. For providing additional stability, a pair of vertically spaced upper and lower retainer members 210 can be provided at either end portion 204 and 206, as best seen in Fig. 20. The upper and lower retainer members 210 grip the lens sides 212a and 214a along their height so that they are above and below each other. By having the vertically spaced retainers 210, pivoting of the apparatus 200 as releasably attached to the eyeglasses 208 such as about a plane defined between a pair of opposite retainers 210 is likewise resisted.

[0045] The retainers 210 are mounted to flange arms 230 at inner end portions 230a thereof. The arms 230 are preferably malleable so that the precise position of the retainers 210 can be adjusted for fitting securely against various configurations of lenses 212 and 214, and particularly the outer sides 212a and 214a thereof. For this purpose, the arms 230 are formed of thin wire stock that can be slightly bent such as to bring the upper and lower retainers 210 closer together or further apart depending on the height and configuration of the lens sides 212a and 214a.

[0046] Turning to more of the details of the illustrated clip-on light apparatus 200, the arm end portions 224a can be provided with a U-shaped configuration to form a portion of the retainer members 210 that is integral with the arms 230. To improve the frictional engagement of the retainers 210 with the hard material, e.g. metal, glass or hard plastic, of the lenses outer sides 212a and 214a, a small resilient plastic sleeve 232 is fit tightly over the U-shaped arm ends 230a. The sleeve 232 also avoids damaging the eyeglass lenses 212 and 214 with the retainers 210 spring-loaded thereagainst

[0047] As best seen in Figs. 21 and 22, the arms 230 can extend rearwardly from their inner end retainer portions 230a also generally in a U-shape configuration opening forwardly so that they have an inner leg 234 connected to the retainer portion 230a and an outer leg 236 connected to the light module 150. More specifically, mounting plate 238 is fastened to the housing cover member 166, as shown in Fig. 23. The outer leg 236 of the mounting arms 230 extends transversely across the plate 238 and is welded or otherwise attached thereto. In the double or paired retainer configuration where two vertically spaced retainers 210 are employed at each end portion 204 and 206 of the light module spacer frame 202, the arms 230 can be formed from a single piece of wire so that there is a vertical wire portion 240 that interconnects the forward ends of the upper and lower outer legs 236 and which can likewise be welded to the plate 238 along the length thereof.

[0048] With respect to the frame 202, it can be formed of slightly thicker wire stock vis-a-vis that used for the malleable mounting arms 230 so that the frame 202 is of rigid construction. In the illustrated and preferred form, the spacer frame 202 includes opposite vertical wire portions 242 and 244 welded or otherwise attached to the mounting plates 238 adjacent to and forwardly of the wire portion 240 that interconnects the retainer arms 230, as previously described. The wire portions 242 and 244 project beyond the top side of the modules 150 so that the draw spring assembly 218 is disposed above the eyeglass lenses 212 and 214 when the clip-on light apparatus 200 is releasably secured thereto, as can be seen in Fig. 18B.

[0049] The wire portions 242 and 244 are bent above the modules 150 generally at right angles to extend toward each other. Referring to Fig. 19, a horizontal wire portion or rod 246 extends perpendicular from wire portion 242 and through the barrel formed by the coils 220a of the coil spring 220. A pair of horizontal wire portions or rods 246 extend perpendicular from wire portion 244 on either side of the spring 220 so that the rod 246 extends between the rods 248.

[0050] The coil spring 220 is disposed between slide members 250 and 252 that ride on respective rods 248 and 246 for adjusting the length of the frame 202. The slide member 250 is fixedly connected toward distal end 246a of the rod 246 and the slide member 252 is fixedly connected at the distal ends of the rods 248. The slide member 250 extends transversely to span the rods 248 on either side thereof and has a pair of apertures 254 (Fig. 23) sized in clearance fit with the rods 248 so that the slide or plate member 250 can ride therealong. Similarly, the slide or plate member 252 is apertured for riding along the centrally extending rod 246.

[0051] The coil spring 220 normally biases the plate

members 250 and 252 apart bringing the frame end portions 204 and 206 toward each other. Referring to Figs. 19 and 21, a stop 256 is formed between yoke juncture 258 of the rods 248 and the projecting rod end 246a that extends beyond slide plate 250 fixed thereto to limit the axial expansion of the spring 220, thus defining the closest axial position of the end portions 204 and 206 and opposite light modules 150. With the rod end 246a engaged against the yoke portion 258, the rods 246 and 248 have their greatest degree of overlap and can no longer be shifted in an inward direction toward each other. As such, with the stop 256 operable, the coils 220a of the spring 220 are at their maximum extended state.

[0052] Adjusting the length of the frame 202 by pulling either or both of the frame end portions 204 and 206 in the axial direction 222 causes the opposite plates 250 and 252 to slide toward each other axially compressing the spring 220 and coils 220a thereof therebetween with rod end 246a separating from the yoke portion 258, as shown in Fig. 22. In this manner, the draw spring assembly 218 provides a return force via the compressed spring to bias the retainers 210 at the opposite end portions 204 and 206 back toward each other and into secure engagement with the eyeglasses 208 properly positioned therebetween. Once the coil spring 220 is fully compressed between the plate member 250 and 252, i.e. the adjacent spring coils 220a are engaged without intervening gaps, the maximum length of the frame 202 has been reached thus substantially defining the largest size of eyeglasses 208 as measured between the lenses outer sides 212a and 214a to which the apparatus 200 can be releasably attached or dipped.

[0053] With the apparatus 200 releasably secured to the eyeglasses 208, the preferred light modules 150 will be positioned in a manner akin to that as provided on the previously-described lighted eyeglasses 5. Referring to Figs. 18B and 23, it can be seen that the retainers 210 are disposed toward the forward end of the housing 162 so that the housing 162 will extend adjacent to and rearwardly along the forward portions of the eyeglass temple arms 260 for the majority of the housing length. The forward end of the housing 162 will generally be aligned with the lens front sides 212b and 214b depending on their thickness and degree of curvature. In this manner, the reader will be able to obtain the same benefits as provided by the lighted eyeglasses 5 in terms of having the maximum amount of light trained onto the reading area, while also minimizing glare during reading via the blinder extensions 154 disposed between the LED dome lens 34 projecting out forwardly from the housing 162 and the adjacent eyeglass lenses 212 and 214. At the same time, when lights for reading are not needed, the apparatus 200 can be easily removed to reduce the weight for maximum comfort when wearing the eyeglasses 208.

[0054] Figs. 24-26 illustrate another alterative clip-on light apparatus 300. In this version, the apparatus 300 includes an elongate spacer frame 302 having opposite ends 304 and 306 to which the lights 16 are mounted, which again can be provided in the previously-described light modules 150. However, unlike the apparatus 200 and specifically the spacer frame 202 thereof, the frame 302 is not adjustable in length and thus can be in the form of a single rod 308 having transverse mounting plates 310 and 312 at either frame end 304 and 306 for fastening of the light modules 150 thereto.

[0055] To releasably secure the apparatus 300 to the eyeglasses 208, a clipping mechanism 314 is provided intermediate the frame ends 304 and 306 and preferably centrally therebetween to allow the apparatus 300 to be clipped in the area that is generally disposed between the lenses 212 and 214, this area including inner portions 212a and 214a of the respective lenses and the nose bridge 209 extending therebetween. More particularly, the clipping mechanism 314 has spring-loaded arm pairs 316 and 318 that clamp onto the inner lens portions 212a and 214a or the frame portions thereat to minimize interference with the field of view provided through the lenses 212 and 214. An actuator lever 320 is operable to pivot the arm pairs open for securing the apparatus 300 to or removing the apparatus 300 from the eyeglasses 208. With the apparatus 300 releasably clipped onto the eyeglasses 208, the actuator 320 will generally be disposed above the bridge portion 209 of the glasses 208, as can be seen in Fig. 24.

[0056] The lever 320 is integrally connected with pivotal clamp arms 322 and 324 of the arm pairs 316 and 318 with the other arms 326 and 328 being fixed relative thereto and integrally formed with base 329 of the clipping mechanism 314. Torsion springs 330 and 332 are attached between the lever 320 and an upstanding wall portion 329a of base 329 to bias the arms 322 and 324 toward associated arms 326 and 328 for clamping the lens potions 212a and 214a therebetween. To open the arm pairs 316 and 318, the lever actuator 320 is pushed against the spring bias provided by springs 330 and 332 to pivot it along with transverse shaft portions 334 and 336 formed integrally between the lever 320 and the arms 322 and 324, respectively, in the direction indicated by arrow 338 in Fig. 26. This pivoting causes pivoting of the integral arms 322 and 324 away from associated arms 326 and 328 in the direction indicated by arrow 340 to separate the ends of the arms 322 and 326 and the arms 324 and 328 from each other allowing the apparatus 300 to be either removed form or secured onto the eyeglasses 208.

[0057] As shown in Fig. 26, the rod 308 is captured in a recess 342 formed in the base wall portion 329a by ends of the springs 330 and 332. In this manner, the rod 308 can be rotated about its axis 308a to allow a user to direct the light emanating from the modules 150 to their preferences. The rod 308 can include enlarged stops formed thereon laterally spaced to be disposed on either side of the base 329 and specifically the wall portion 329a to limit axial or longitudinal shifting of the rod 308 relative to the clipping mechanism 314.

[0058] While there have been illustrated and described particular embodiments of the present invention, it will be appreciated that numerous changes and modifications will occur to those skilled in the art, and it is intended in the appended claims to cover all those changes and modifications that fall within the scope of the present invention.

Claims

1. Lighted eyewear (10) comprising:

   a pair of lenses (12);
   a pair of temple arms (104) that extend rearwardly from respective outer portions of the lenses (12) wherein the temple arms (104) can be opened for use and folded when not in use;
   characterised by:

   light emitting diodes (LEDs) (108) mounted in housings (162) configured to fix beams of light to be directed inward toward each other so that the beams overlap in a reading distance range;
   wherein the housings (162) are fixed to the temple arms (104) toward the forward ends thereof, and with the temple arms (104) opened, the housings (162) are each oriented to project light therefrom forwardly, inwardly and toward the light emanating from the housing (162) fixed on the other arm (104);
   wherein the housings (162) include blinder extensions (154) that respectively project between the LEDs (108) and adjacent ones of the lenses (12) to minimise refraction or reflection of light emanating from the LEDs (108) through the lenses (12); and
   wherein the housings (162) include at least one disc-shaped battery power supply (116) for the light emitting diodes (108) to allow the housing (162) to be compactly sized with each of the light emitting diodes (108) and the battery power supply (116) therefor self-contained in respective ones of the housings (162).

2. The lighted eyewear of claim 1, wherein each blinder extension comprises an integral portion of the housing.

3. The lighted eyewear of claim 1 or 2, wherein the lenses are configured to be either refractive or non-refractive.

4. Lighted eyewear according to claim 1, 2 or 3, wherein the housings have opposite ends and a housing axis extending between the ends, the LEDs at one of the ends of the housings, and
   the blinder extensions extending alongside the LEDs at the one end of the housings for minimizing glare from the light projected from the LEDs, and thereby reducing eye-fatigue that the wearer of the eyewear may suffer.

5. The eyewear of claim 4, wherein the LEDs are each configured to project light in a cone having an axis that is canted to extend transversely to the housing axis, and the blinder extensions extend generally parallel to the housing axis in position to block incident or stray light from the LEDs.

6. The eyewear of any one of the preceding claims, wherein
   the housings have an opening at the one end in which a portion of the LEDs is disposed, and the blinder extensions extend from the openings away from the housings.

7. The eyewear of any one or the preceding claims, wherein
   the housings have side walls, and the blinder extensions are a portion of one of the side walls extending axially beyond the other side wall at the one end of the housing.

8. The eyewear of any one of the preceding claims, wherein the LEDs have a lens, and the blinder extensions extend alongside the LED lenses.

9. The eyewear of claim 8, wherein the housings have an opening at the one end with the LED lens disposed therein and projecting out therefrom.

10. The eyewear of any one of the preceding claims and including switches operable to selectively provide power from the power sources to the LEDs.

11. The eyewear of any one of the preceding claims, wherein
    the housings are compactly-sized, self-contained lighting modules for the glasses, and wherein the lighting modules are attached to the eyewear removably.

Patentansprüche

1. Leuchtende Brille (10) umfassend:

   ein paar Linsen (12);
   ein paar Bügelarme (104), die sich von jeweils äußeren Abschnitten der Linsen (12) nach hinten erstrecken, wobei die Bügelarme (104) zur Verwendung geöffnet und bei Nicht-Verwen-

dung gefaltet werden können;
gekennzeichnet durch:

Leuchtdioden (LEDs) (108), die in Gehäusen (162) montiert sind, die dazu ausgestaltet sind, Lichtstrahlen, die aufeinander zu nach innen zu richten sind, zu befestigen, so dass die Strahlen in einem Leseabstandsbereich überlappen;
wobei die Gehäuse (162) an den Bügelarmen (104) in Richtung von deren frontseitigen Enden befestigt sind und, wenn die Bügelarme (104) geöffnet sind, die Gehäuse (162) so ausgerichtet sind, dass sie Licht von sich nach vorne, nach innen und in Richtung des Lichtes projizieren, das von dem Gehäuse (162), das an dem anderen Arm (104) befestigt ist, ausgeht;
wobei die Gehäuse (162) Abschattungsverlängerungen (154) umfassen, die jeweils zwischen den LEDs (108) und benachbarten der Linsen (12) vorstehen, um Brechung oder Reflexion von Licht, das von den LEDs (108) **durch** die Linsen (12) ausgeht, zu minimieren; und
wobei die Gehäuse (162) zumindest eine scheibenförmige Batteriestromzufuhr (116) für die Leuchtdioden (108) umfassen, damit das Gehäuse (162) kompakt bemessen sein kann, wobei jede der Leuchtdioden (108) und der Batteriestromzufuhr (116) hierfür in jeweils einem der Gehäuse (162) abgeschlossen ist.

2. Leuchtende Brille nach Anspruch 1, wobei jede Abschattungsverlängerung einen integralen Abschnitt des Gehäuses umfasst.

3. Leuchtende Brille nach Anspruch 1 oder 2, wobei die Linsen entweder brechend oder nicht brechend ausgestaltet sind.

4. Leuchtende Brille nach Anspruch 1, 2 oder 3, wobei

die Gehäuse gegenüberliegende Enden und eine Gehäuseachse haben, die sich zwischen den Enden erstreckt, wobei die LEDs an einem der Enden der Gehäuse sind, und
die Abschattungsverlängerungen sich längsseits der LEDs an dem einen Ende der Gehäuse erstrecken, um ein Blenden durch das Licht, das von den LEDs projiziert wird, zu minimieren und dadurch eine Ermüdung der Augen, die der Träger der Brille erleiden kann, zu reduzieren.

5. Brille nach Anspruch 4, wobei die LEDs jeweils dazu ausgestaltet sind, Licht in einem Kegel zu projizieren, der eine Achse aufweist, die geneigt ist, so dass sie sich quer zur Gehäuseachse erstreckt, und die Abschattungsverlängerungen sich allgemein parallel zu der Gehäuseachse in einer Position erstrecken, um einfallendes oder gestreutes Licht von den LEDs zu blockieren.

6. Brille nach einem der vorhergehenden Ansprüche, wobei die Gehäuse eine Öffnung an dem einen Ende aufweisen, in dem ein Abschnitt der LEDs angeordnet ist, und die Abschattungsverlängerungen sich von den Öffnungen von den Gehäusen weg erstrecken.

7. Brille nach einem der vorhergehenden Ansprüche, wobei die Gehäuse Seitenwände aufweisen und die Abschattungsverlängerungen ein Abschnitt einer der Seitenwände sind, die sich axial über die andere Seitenwand an dem einen Ende des Gehäuses hinaus erstreckt.

8. Brille nach einem der vorhergehenden Ansprüche, wobei die LEDs eine Linse aufweisen und die Abschattungsverlängerungen sich längsseits der LED Linsen erstrecken.

9. Brille nach Anspruch 8, wobei die Gehäuse eine Öffnung an dem einen Ende aufweisen, wobei die LED Linse darin angeordnet und davon vorstehend ausgebildet ist.

10. Brille nach einem der vorhergehenden Ansprüche und umfassend Schalter, die dazu betätigt werden können, wahlweise Strom der Stromquellen zu den LEDs zuzuführen.

11. Brille nach einem der vorhergehenden Ansprüche, wobei die Gehäuse kompakt bemessene, eigenständige Beleuchtungsmodule für die Brille sind und wobei die Beleuchtungsmodule abnehmbar an der Brille angebracht sind.

Revendications

1. Lunettes éclairantes (10) comprenant :

une paire de lentilles (12) ;
une paire de branches (104) qui s'étendent vers l'arrière à partir de parties extérieures respectives des lentilles (12) où les branches (104) peuvent être ouvertes en cas d'utilisation et pliées en cas de non-utilisation ;
caractérisées par :

des diodes électroluminescentes (LED) (108) montées dans des coffrets (162) configurées pour fixer des faisceaux de lumière pour être dirigés vers l'intérieur l'une de

l'autre de sorte que les faisceaux se chevauchent dans une plage de distance de lecture ;
où les coffrets (162) sont fixés aux branches (104) vers leurs extrémités avant, et avec les branches (104) ouvertes, les coffrets (162) sont orientés chacun pour projeter de la lumière de ceux-ci vers l'avant, vers l'intérieur et vers la lumière émanant du coffret (162) fixé sur l'autre branche (104) ;
où les coffrets (162) comportent des extensions de liaison (154) qui se projettent respectivement entre les LED (108) et des lentilles adjacentes parmi les lentilles (12) pour minimiser la réfraction ou la réflexion de la lumière émanant des LED (108) à travers les lentilles (12) ; et
où les coffrets (162) comportent au moins un bloc d'alimentation à pile (116) en forme de disque pour les diodes électroluminescentes (108) pour permettre d'avoir un coffret (162) d'une conception compacte, chacun des diodes électroluminescentes (108) et du bloc d'alimentation à pile associé (116) pouvant tenir dans des coffrets respectifs (162).

2. Lunettes éclairantes de la revendication 1, où chaque extension de liaison comprend une partie intégrante du coffret.

3. Lunettes éclairantes de la revendication 1 ou 2, où les lentilles sont configurées pour être réfractive ou non réfractive.

4. Lunettes éclairantes de la revendication 1, 2 ou 3, où les coffrets ont des extrémités opposées et un axe de coffret s'étendant entre les extrémités, les LED étant au niveau d'une première extrémité des extrémités des coffrets, et
les extensions de liaison s'étendant le long des LED au niveau de la première extrémité des coffrets pour minimiser le reflet de la lumière projetée depuis les LED, et ainsi réduire la fatigue oculaire que le porteur des lunettes peut en souffrir.

5. Lunettes de la revendication 4, où les LED sont configurées chacune pour projeter de la lumière dans un cône ayant un axe qui est incliné pour s'étendre transversalement par rapport à l'axe de coffret, et les extensions de liaison s'étendent de manière globalement parallèle à l'axe de coffret en position pour bloquer la lumière parasite ou incidente provenant des LED.

6. Lunettes de l'une quelconque des revendications précédentes, où les coffrets ont une ouverture au niveau de la première extrémité dans laquelle une partie des LED est disposée, et les extensions de liaison s'étendent depuis les ouvertures loin des coffrets.

7. Lunettes de l'une quelconque des revendications précédentes, où les coffrets ont des parois latérales, et les extensions de liaison représentent une partie de l'une des parois latérales s'étendant axialement au-delà de l'autre paroi latérale au niveau de la première extrémité du coffret.

8. Lunettes de l'une quelconque des revendications précédentes, où les LED ont une lentille, et les extensions de liaison s'étendent le long des lentilles de LED.

9. Lunettes de la revendication 8, où les coffrets ont une ouverture au niveau de la première extrémité à l'intérieur de laquelle la lentille de LED est disposée et depuis laquelle elle se projette.

10. Lunettes de l'une quelconque des revendications précédentes et comportant des commutateurs pouvant fonctionner pour fournir sélectivement de la puissance depuis des sources d'alimentation aux LED.

11. Lunettes de l'une quelconque des revendications précédentes, où les coffrets sont des modules d'éclairage autonomes, de conception compacte pour les lunettes, et où les modules d'éclairage sont attachés de manière amovible aux lunettes.

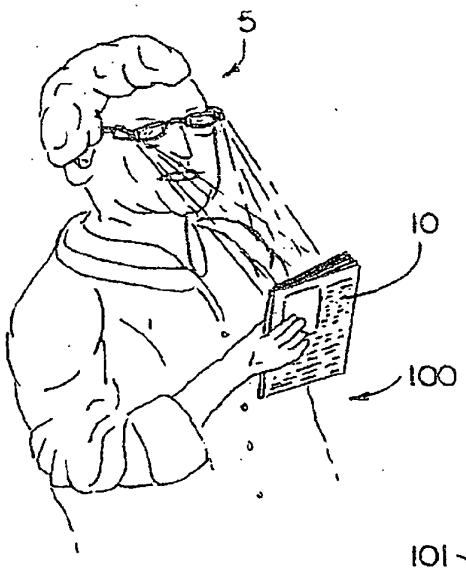


FIG. 1

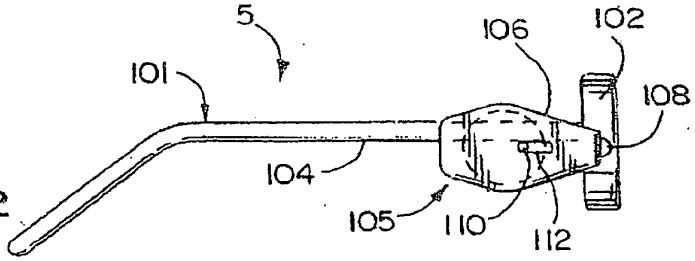


FIG. 2

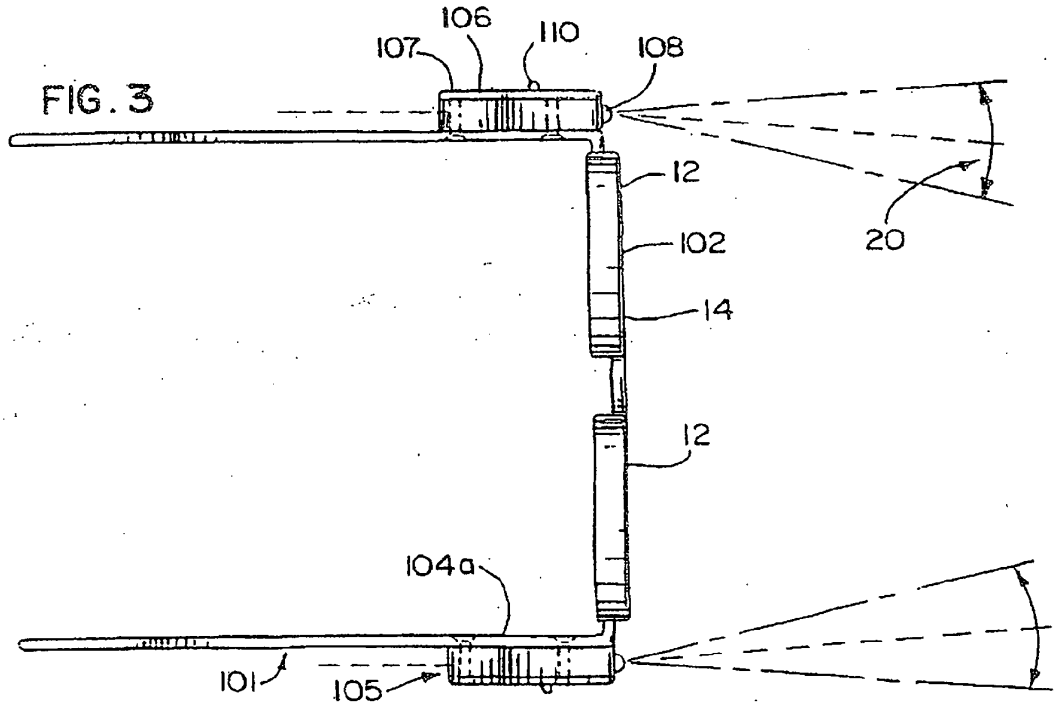


FIG. 3

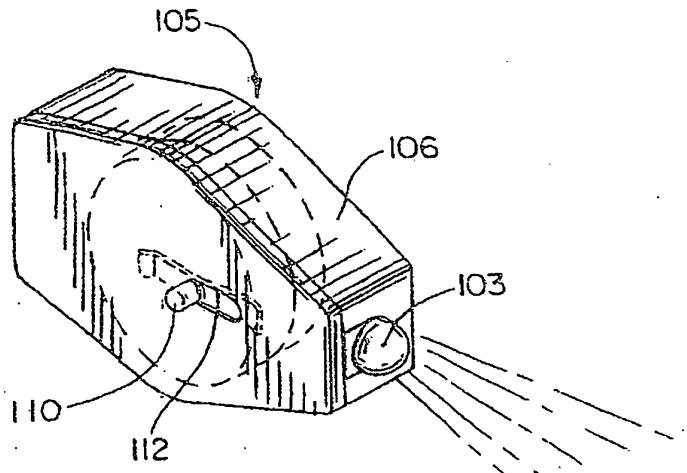
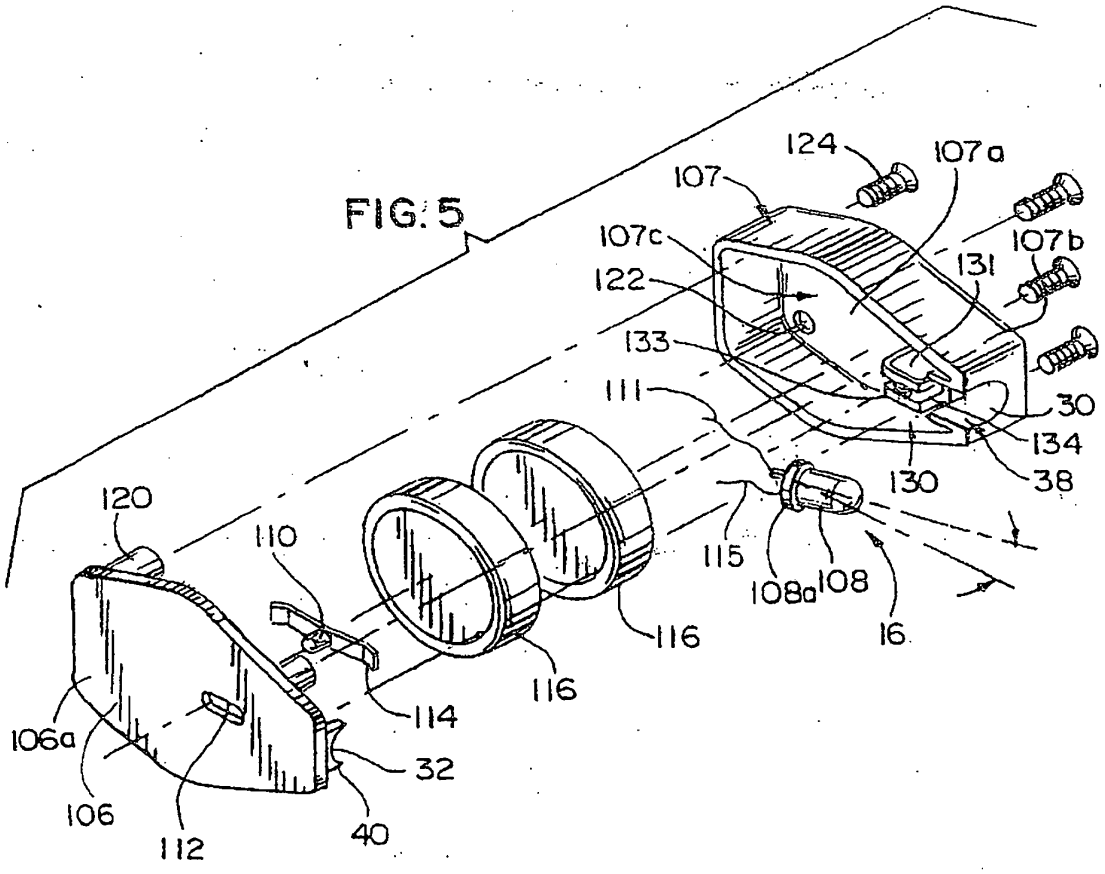

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FIG. 4

FIG. 5


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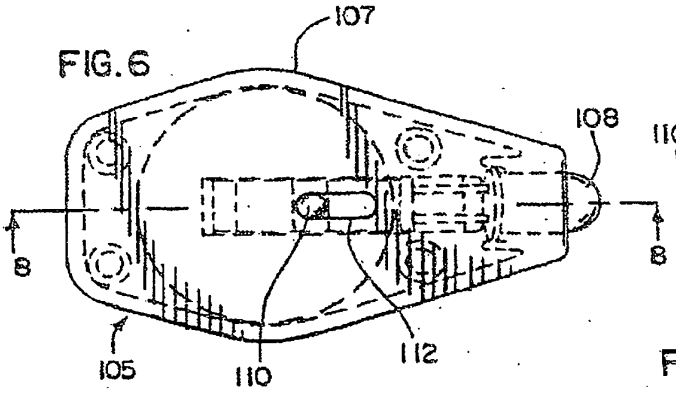


FIG. 6

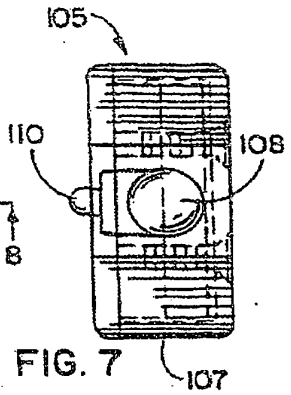


FIG. 7

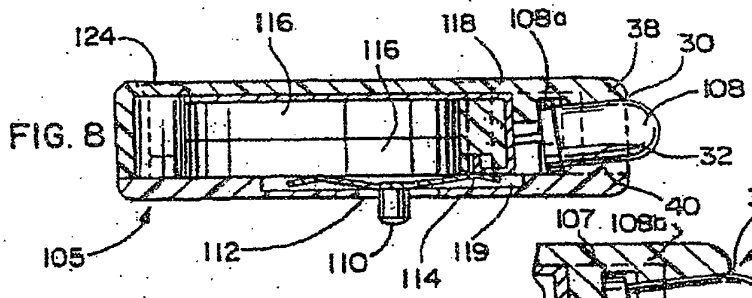


FIG. 8

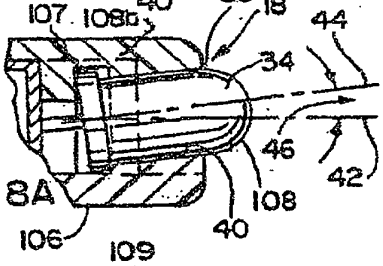


FIG. 8A

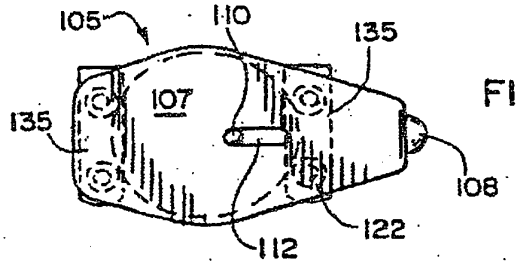


FIG. 10

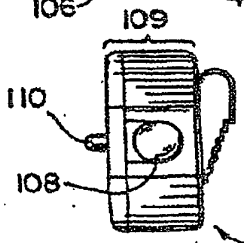


FIG. 11

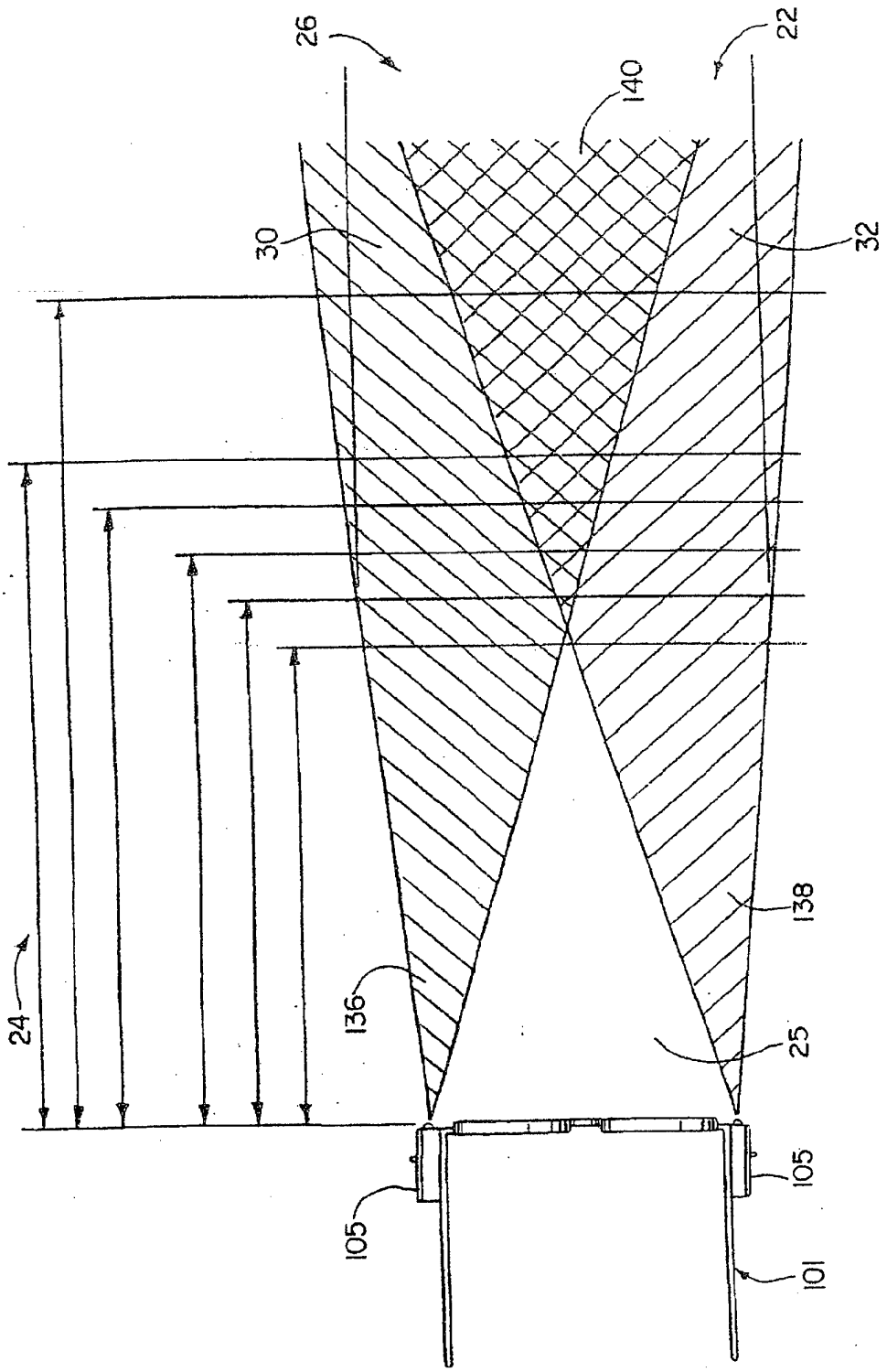


FIG. 9

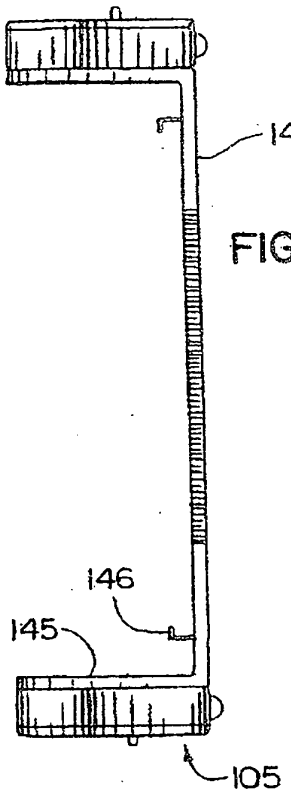


FIG. 12

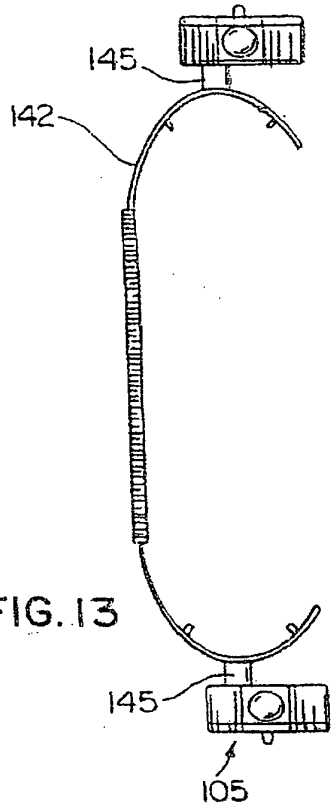


FIG. 13

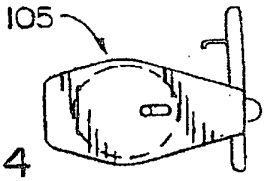


FIG. 14

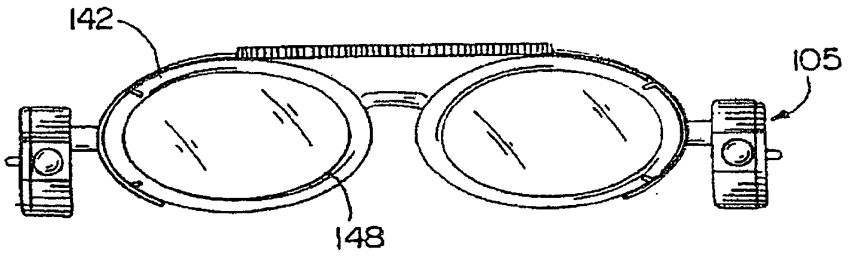


FIG. 15

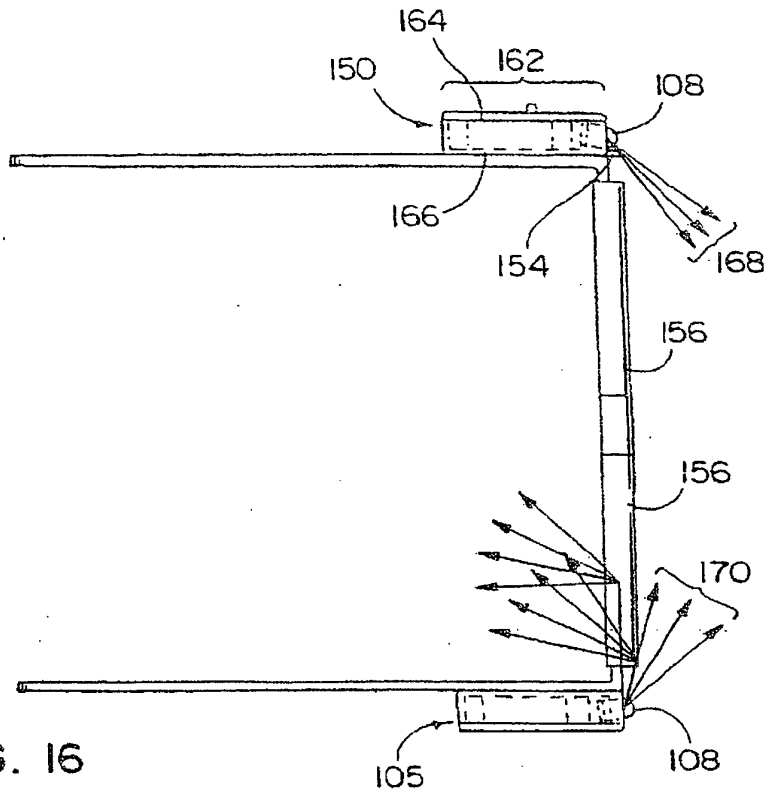

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FIG. 16

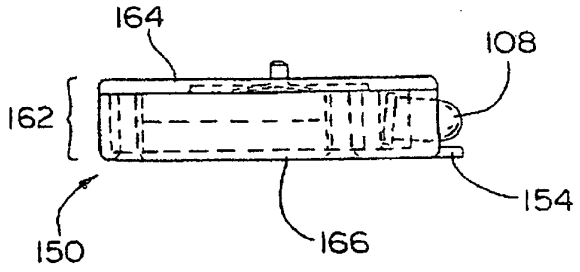

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FIG. 17

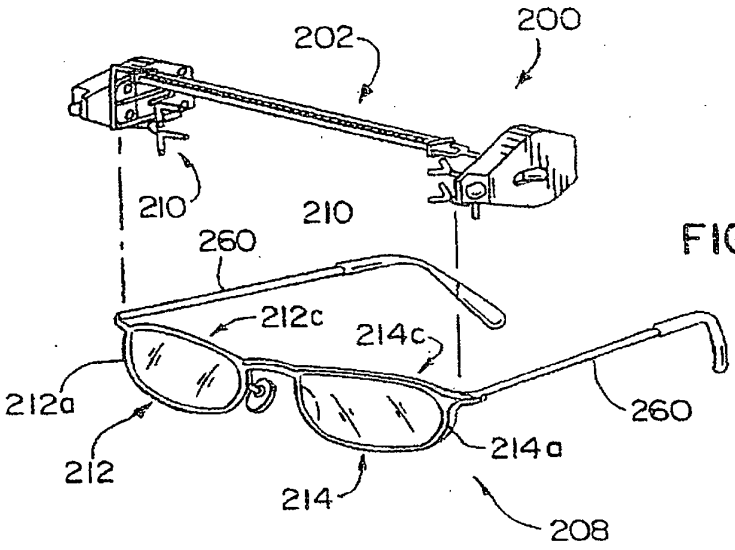


FIG. 18A

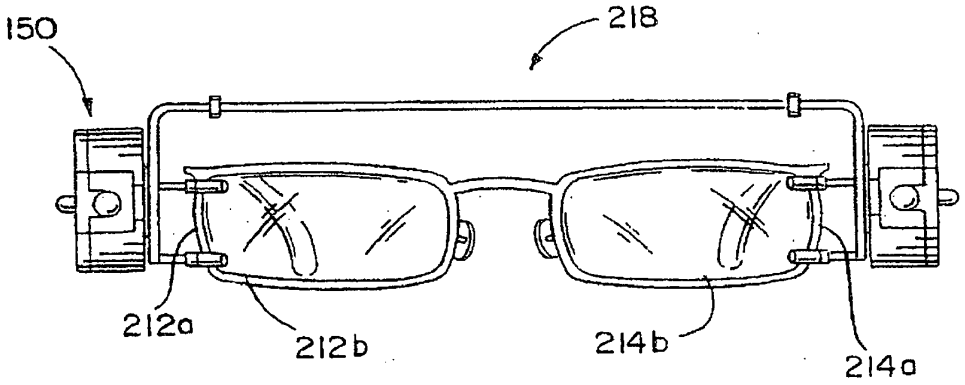


FIG. 18B

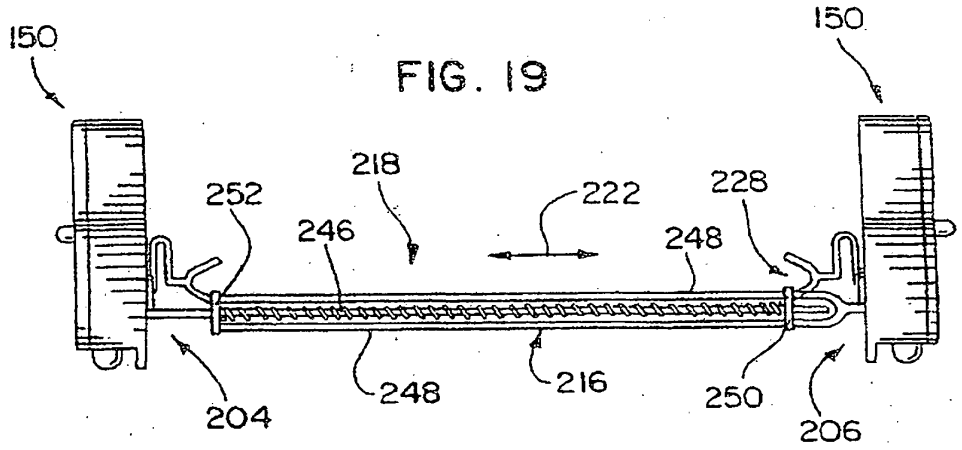

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FIG. 19

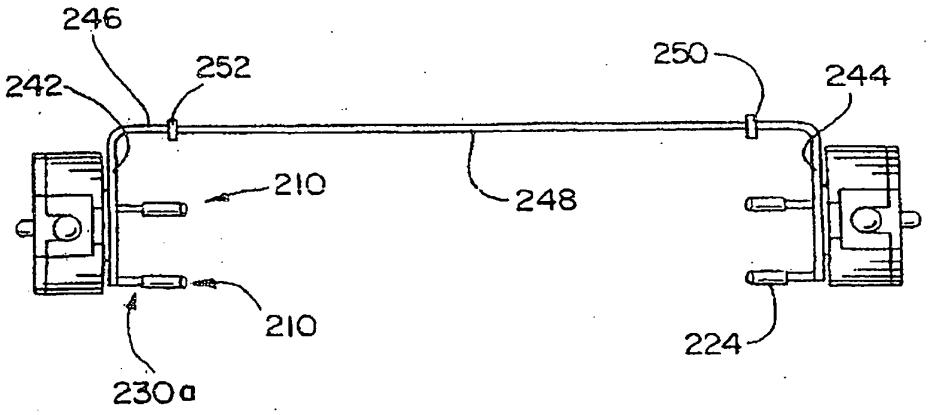

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FIG. 20

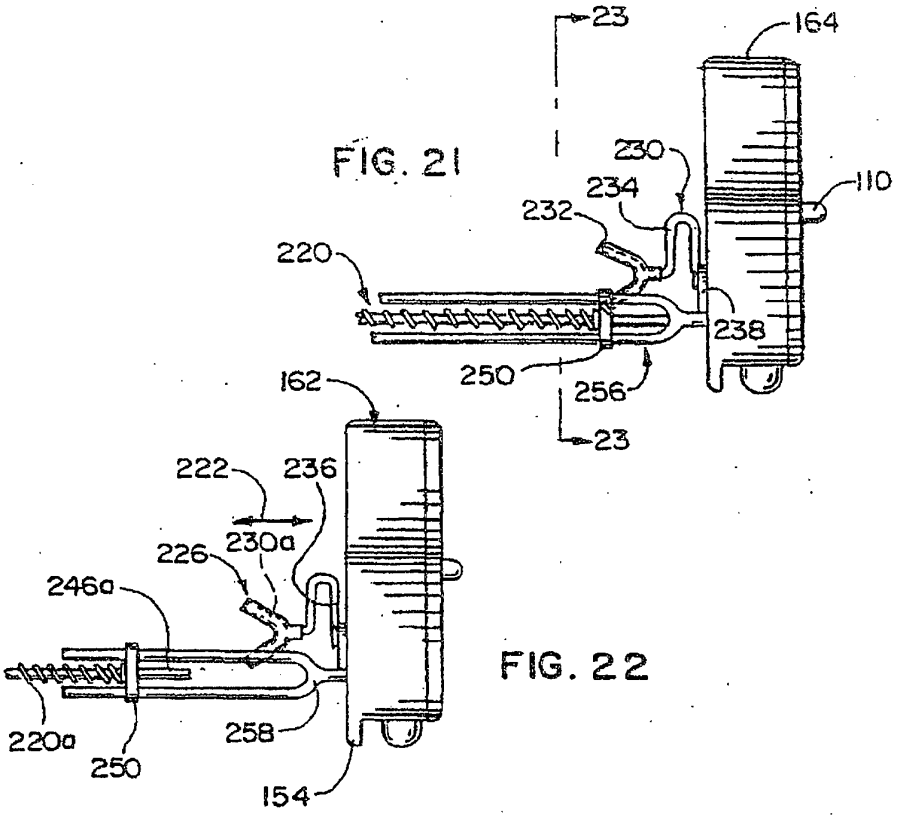


FIG. 21

FIG. 22

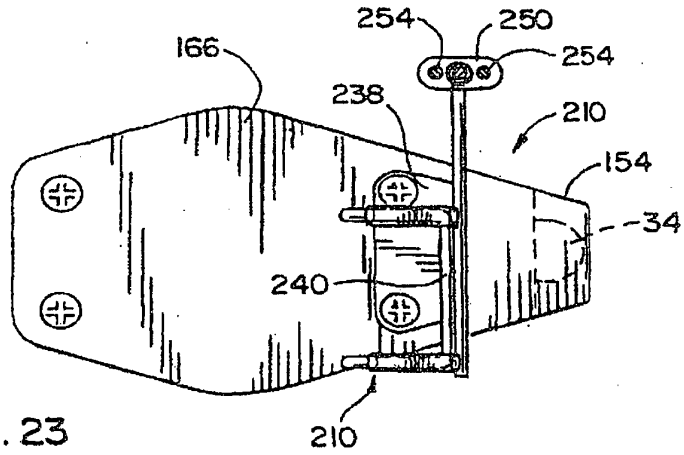


FIG. 23

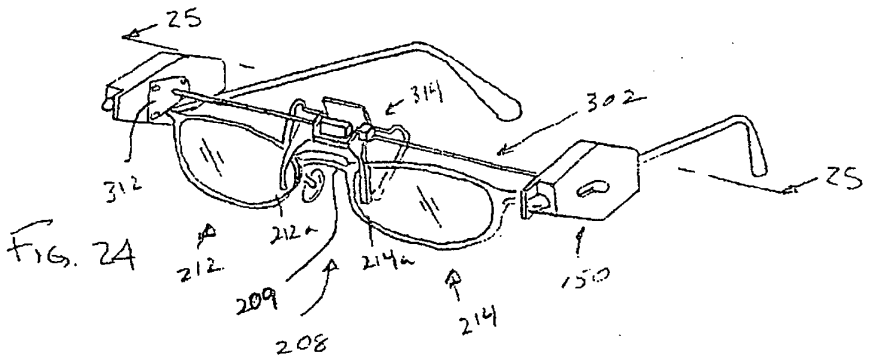


FIG. 24

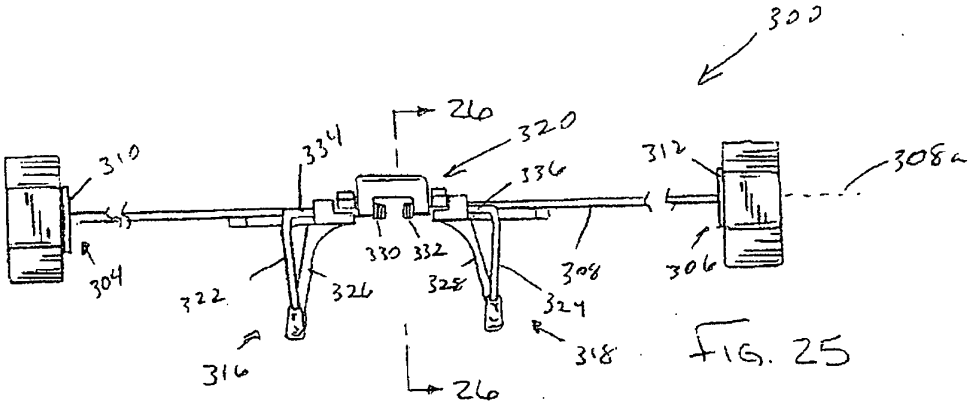


FIG. 25

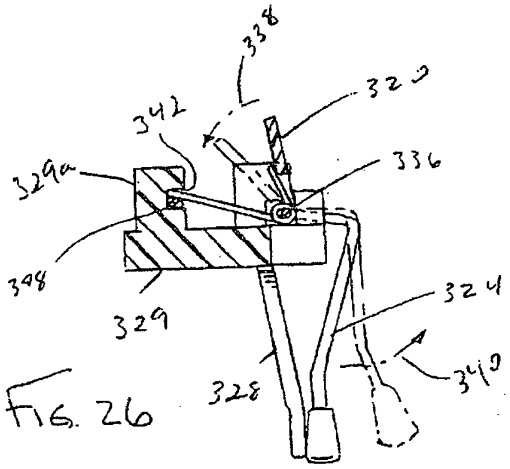


FIG. 26

REFERENCES CITED IN THE DESCRIPTION

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(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 027 626 B1

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G02B 27/01 *(2006.01)*

(86) International application number:
PCT/US1998/023031

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WO 1999/023525 (14.05.1999 Gazette 1999/19)

(54) **LIGHT WEIGHT, COMPACT REMOUNTABLE ELECTRONIC DISPLAY DEVICE FOR EYEGLASSES OR OTHER HEAD-BORNE EYEWEAR FRAMES**

LEICHTGEWICHTE, KOMPAKTE, WIEDERBEFESTIGBARE ELEKTRONISCHE ANZEIGEVORRICHTUNGFÜR BRILLENGLÄSER ODER ANDEREN AM KOPF GETRAGENEN BRILLENSTELLEN

DISPOSITIF D'AFFICHAGE ELECTRONIQUE LEGER, COMPACT, AMOVIBLE POUR VERRES DE LUNETTES OU AUTRES MONTURES DE LUNETTES PORTEES EN CASQUE

(84) Designated Contracting States:
DE FI FR GB IT NL SE

(30) Priority: **30.10.1997 US 64430 P**
14.10.1998 US 170887

(43) Date of publication of application:
16.08.2000 Bulletin 2000/33

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EP 1 027 626 B1

Description

BACKGROUND OF THE INVENTION

[0001] There are many examples of displays mounted on the head, sunglasses, eyeglasses and the like. For example, Perera in U.S. Patent 4,867,551 describes a display to be mounted on eyeglasses, the limitation of which is the high degree of occlusion of the user's field of view beyond the display, and the use of non-axial optics which introduces distortion. A high degree of occlusion is also present in an eyeglass mounted display offered for sale by Albacomp Computers Corp. Other companies, such as Liquid Image or Virtual Vision, provide displays that are suspended by a cable, gooseneck fixture or other mechanical support in front of one or both of the user's eyes. Similarly, displays from Reflection Technology have been mounted on eyewear in order to provide a computer display in a mobile fashion. This approach also highly limits the user's view of the surroundings.

[0002] Not only do such prior art displays obscure a large part of the user's visual field, but also the display obscures the user's face. The obscuration of the visual field is a limitation particularly in applications in which the user must be free to focus on the work at hand, without diverting attention to the display.

[0003] Generally, head-mounted and helmet-mounted display systems are based on miniature displays having a diagonal dimension of 4 cm or less. The display systems that use such miniature displays must provide a lens near the eye for magnification, and to make possible comfortable viewing at near distances. The lens and any other associated optics that must be placed near the eye are termed the "eyepiece." Most prior art head-mounted systems also place the display (for example a miniature liquid crystal flat panel display) near the eye as well, which requires both a support fixture for the eyepiece, and a conduit for electrical cables to the display. These components (wires, liquid crystal display, and any other required circuits) are placed within an opaque housing near the eye. Consequently, such systems block a portion of the user's visual field, and also obscure the user's face. Obscuration of the face reduces the desirability of using the device in social occasions.

[0004] A helmet-mounted display is also known in which the image is provided by a glass fixture suspended in front of the user's face. The glass fixture is mounted to the helmet and contains an eyepiece near the eye. The glass fixture serves as a mechanical support for the eyepiece as well as an image conduit for the display which is mounted to the helmet. The limitation of this system, however, is its size and weight, and its configuration as a helmet.

[0005] US 5,369,415 discloses a display which writes an image directly on the retina of an eye. The display includes a laser which produces a collimated light beam that is modulated with video information and is then scanned and directed through the eye pupil to produce an image on the retina. The scanning uses micro-machined mirrors, electro-optic or acousto-optic devices which are extremely small and require very low power.

SUMMARY OF THE INVENTION

[0006] The present invention, defined in the appended claims, provides a compact, remountable display device for attachment to eyewear having a head-borne frame. The display devices are provided as defined by the independent claims.

[0007] This invention provides a new approach to a light weight, compact, ergonomic, remountable display system that combines an image relay system and mechanical support with a simple mounting system that can be applied to eyeglasses or other head gear. The display device provides several improvements on the prior art, including the use of a miniature flat panel display mounted near the glasses combined with a transparent optomechanical fixture that suspends the eyepiece near the eye. The display device can be mounted to eyeglasses or other head gear, does not significantly obscure the field of view of the user, does not hide the user's face, and provides a largely undistorted image of the displayed image as well as of the ambient scene. Similarly, the view of the user's eye to another observer is largely undistorted as well. The display device is able to provide an image in a see-through manner, so that the user sees a superposition of the image from the display and the ambient image.

[0008] This invention provides many of the same functions and advantages as the image combining system described in Patent Application No. 08/844,098, filed on April 18, 1997, entitled "Image Combining System for Eyeglasses and Face Mask. The invention has the additional advantage that it can be fit to a wide range of users without prescriptive correction or other customization.

[0009] The display device can be made adjustable to allow the user to position the image in a convenient location in the user's field of view. The device can be added to or removed from eye glasses with little discomfort to the user. The device may include a clamping mechanism to attach to the temple of a pair of eyeglass frames. In an alternative example, the device may clip to a lower or upper edge of the frame around the lens. The device may also include a hinge or link element to allow the optical element to be moved away from the user's field of view without removing the device from the eyeglass frames. Two display devices may also be used to provide a binocular display.

DESCRIPTION OF THE DRAWINGS

[0010] The invention will be more fully understood from the following detailed description taken in conjunction with the accompanying drawings in which:

Fig. 1 is a plan view of a display device mounted to a pair of eyeglass frames;
Fig. 2 is a plan view of the display device of Fig. 1;
Fig. 3 is a plan view of an imaging assembly and optical element of the display device of Fig. 1;
Fig. 4 is an exploded view of a housing assembly of the display device of Fig. 1;
Fig. 5 is a cross-sectional view of the housing assembly of Fig. 4;
Fig. 6 is a cross-sectional view of the display device of Fig. 1;
Fig. 6A is a cross-sectional view taken along line 6-6 of Fig. 6;
Fig. 7 is a plan view of a further example of a display device using a swivel fixture;
Fig. 8 is a plan view of the display device of Fig. 7;
Fig. 9 is a plan view of an embodiment of an optical element;
Fig. 10 is a plan view of a further example of the display device using a graded index lens;
Fig. 11 is a plan view of a still further example of the display device illustrating an alternative optical path and optical element;
Fig. 12 is a plan view of a further example of the display device using a link element;
Fig. 13 is a plan view of the display device of Fig. 12;
Fig. 14 is a side view of a further example of the display device using a mounting along the outer bottom edge of an eyeglass frame; and
Fig. 15 is a plan view of a further example having a rotatable adjustment mechanism.

DETAILED DESCRIPTION OF THE INVENTION

[0011] A display device is illustrated generally in Fig. 1. The display device 10 comprises an imaging assembly 12 (see Figs. 4-6), an optical element 14, and a housing assembly 16 which is removably mountable to eyeglass frames 18.

[0012] Referring to Figs. 1-6, the housing assembly 16 includes an enclosure 20 for containing circuitry 22 for receiving data or images relayed to the display device 10 and for containing the imaging assembly. The circuitry may include integrated or discrete circuits which are connected to the imaging assembly. Light from the imaging assembly is relayed via the optical element 14 through the eyeglass lens 24 to the user's eye. The optical element 14 comprises a transparent fixture or relay 26 and an eyepiece assembly 28 which, in the example shown in Figs. 1 through 3, comprises a mirror 30 and lens 32. The housing assembly 16 is mounted to the temple 34 of the user's glasses 18 by a clamping assembly 36 illustrated by a mounting fixture 38 and clamps 40. The relay 26 and eyepiece assembly 28 are positioned in front of the user's eyeglass lens 24 so that the image is viewed through the eye lens 32 which is positioned by the user in a convenient location for viewing. The housing assembly is located substantially outside the user's field of view, which means that the housing assembly does not block the user's main field of view. For corrective lenses, the main field of view is defined by the view through the lens. For non-corrective lenses such as safety glasses, the main field of view is defined by the area bounded by about 45° to the sides of a line looking ahead and about 20° above and below the line the looking ahead.

[0013] The imaging assembly 12 may comprise a transmissive or reflective miniature active matrix liquid crystal display (AMLCD), an electroluminescent display, or any other miniature flat panel display having a screen diagonal of less than 2 cm. For example, the Kopin Cyber Display P/N KCD-QMO2-AA is suitable. Additionally, the imaging component may comprise a scanning display as described in U.S. Patent No. 5,715,337 or any number of other imaging elements formed from liquid crystals, light emitting diodes, electroluminescent materials or field emissions displays. In Figs. 4 through 6, an AMLCD image generator 40 with a backlight 42 is shown. The backlight may be made from any number of illuminators such as light emitting diodes, incandescent lamps, lasers, or other light emitting devices. For a reflective AMLCD, the backlight is repositioned as a front light by methods known in the art.

[0014] The optical element 14 preferably comprises five optical surfaces 44, 46, 48, 49, and 50 (Fig. 6). The optical element 14 is preferably rectangular in cross section, as shown in Fig. 6A. The surfaces 52 and 53 may optionally also be of optical quality, or may be frosted or blackened, and may or may not be optically parallel. Preferably, sections of the optical relay 26 within the user's main field of view are optically clear and of uniform index of refraction. The surfaces 49 and 50 are polished and optically parallel so that ray 54 representing a ray from the ambient scene traverses the relay with little or no change in propagation angle.

[0015] Surface 44, which may optionally be formed by a lens 45, receives rays created by the imaging assembly. The rays propagate through the relay 26 to the surface 46, which comprises a mirror 30 in the example illustrated in Figs. 1 through 6. The sides of the relay 26 are preferably parallel to minimize refraction and thus displacement in the image. The mirror 30 reflects the light toward the surface 48 of the lens 32. The lens 32 modifies the vergence of the rays from the imaging assembly 12 so that the image can be viewed with magnification and with the image formed at a comfortable distance between about 25 cm and infinity, depending on lens positions and focal lengths. The typical focal lengths of the lenses 45 and 32 are in the range of 20 to 100 mm. The lens surfaces 44 and 48 modify the vergence of the light from the imaging assembly to create a virtual image in front of the user at a distance of between 25 cm (close) and infinity. The distance of the virtual image may be set by selection of the focal length of the lens surfaces 44 and 48 and by adjustment of the distances between the lens surfaces 44 and 48 and the imaging assembly. Other folds using mirrors may be added to the optical path to

relay the light on other optical paths if desired, or the light may be relayed by total internal reflections occurring along the sides of the relay 26.

[0016] The display device utilizes largely transparent relay optics. Figs. 1-3 illustrate in particular a "see-around" example. The relay 26 serves both as a mechanism for transmitting the image to the eyepiece assembly, and also as a structural member for supporting the eyepiece assembly in the user's field of view. Since the relay 26 is transparent, the occlusion of the user's visual field is minimal or for certain designs, zero, and the obscuration of the user's face is minimal. Alternatively, a cover could be placed over or formed within the optical element to block ambient light from passing through the optical element if desired, for example, to reduce glint or other undesirable reflections. Additionally, if a hinge is provided within the unit, discussed further below, the optical element 14 can be swung out of the user's visual field when not in use, so that the obscuration can conveniently be eliminated. The display device thereby provides a miniature, clear, optical element 14 so that the user's vision is not significantly impeded by the presence of the display. Additionally, the display device can be made very small, because the imaging assembly is located at the side of the user's eyeglasses, thereby minimizing the amount of structure in front of the user's eye.

[0017] Referring to Figs. 4 through 6, the housing assembly 16 comprises a body 60, preferably having an open side 62 which is covered by one or more coverplates. In the example shown, two coverplates 64,66 are used. The components are mounted within a cavity 68 in the body. Data or images may be relayed to the device by a cable 70 which enters the body 60 through an aperture 72 at one end thereof. The cable may comprise wire, one or more optical fibers as described in U. S. Patent No. 5,715,337, or a fiber optic coherent bundle image conduit. Alternatively, the data or images may be relayed to the device by radio frequency (RF) transmission.

[0018] The coverplates 64 and 66 are affixed to the body 66 in any known manner, such as with screws or adhesive, after insertion of the components. The components include a flexible circuit 74 made of Kapton or other material known in the art, upon which is provided metal conductors or traces which connect the various components, such as terminating resistors 76,78 to input cable 70. The flexible circuit also connects the cable to one or more LEDs that form the backlight 42, and the second flexible circuit 80 that connects the system to the display 40. The display is visible through an opening 82 in the coverplate.

[0019] Referring to Fig. 6, the optical element 14 may be affixed to the coverplate 66 at a collar 84. The collar may be affixed to the coverplate in any known manner or may be formed integrally with the coverplate, such as by molding. The optical element 14 may be held in place by friction so that adjustments in focus may be made by the user, simply by moving the optical element 14 with respect to the imaging assembly, by sliding the optical element within the collar 84. A friction lock may be added to lock the optical element in a desired position relative to the imaging assembly, as would be known by those of skill in the art. Alternatively, the optical element may be fixed in place by adhesive, screws, or any other manner known in the art. In this case, the position of the optical element 14 in the collar is adjusted during assembly to provide the required distance between the optical surfaces of the optical element and the imaging assembly. Typically this distance is 10 to 15 mm, but it can be zero if the cavity between the imaging assembly and the entrance surface 44 of the optical element 14 is filled with index of refraction-matched epoxy.

[0020] The clamping assembly 36 may be affixed to the housing assembly in any suitable manner. For example, the mounting fixture 38 may be adhesively or otherwise fastened to the coverplate 64. The clamps 40 may be configured to allow the display device to be positioned at a variety of elevations with respect to the temple. In another variation, the body 60 may be attached to the mounting fixture 38 by a rotary joint formed by discs 650 and 660, as illustrated in Fig. 15. These discs rotate with respect to each other about a central pivot point and may have click stops built within to hold the device at various predefined angles with respect to the eyeglass temples, as would be known by those of skill in the art.

[0021] In an alternative example, the optical element 14 may be mounted on a swivel fixture 90 as shown in Figs. 7 through 8. The swivel fixture 90 pivots around a pin 92 so that the device can fold up in a compact form for storage or convenience while remaining attached to the eyeglasses.

[0022] An embodiment of the present invention includes a non-occluded design of optical element 114, as shown in Fig. 9. In this design, the eyepiece assembly 128 comprises a polarization beam-splitter coating 129, quarterwave plate 131, and focusing mirror 130. Polarized light from the display is passed by the beamsplitter coating 129, through the quarterwave plate 131, to the focusing mirror 130. The reflected light passes again through the quarterwave plate 131, and the light, having passed twice through the properly oriented quarterwave plate, has a polarization which is rotated in a direction orthogonal to the original polarization, and the light is therefore reflected by the coating 129 to the eye, as shown by light ray 135. Light having polarization oriented properly with respect to the beam splitter 129 from the ambient beyond the device, represented by light ray 137, passes through the eyepiece.

[0023] Yet another example is shown in Fig. 10. The image is relayed from an image assembly in the housing 226 to the eye lens 232 by an image relay comprising a graded index lens 211 and mirrors 215 and 228. Alternatively, the relay may comprise a coherent fiber bundle or conventional lens relay. Such image relays may be formed from polished glass to reduce the obscuration and to improve peripheral vision. This example further

removes obscuring surfaces from the user's face. The device functions in the following way. The image is provided by a display as previously described. The image is placed at the focal plane of the relay 211. For the graded index relay, this is accomplished through a reflection at mirror 213, so that the object image is at the entrance pupil of the relay system. The relay forms an image at its distal end which is relayed to the eyepiece assembly 228 by a mirror 215.

[0024] Fig. 11 illustrates another example of the remountable display device. In this example, the light is relayed from an imaging assembly in the housing 366 along an optical conduit 313 to a reflective surface 315. The reflective surface may comprise a polished glass surface, in which the reflection occurs by total internal reflection, or it may comprise a metal or other coating intended to reflect the rays from the imaging assembly within the display housing toward the eyepiece assembly 319 along the light path 317. Any number of folds of this type may be incorporated to cause the eyepiece and housing assembly to be placed in convenient, ergonomic, or aesthetic locations. For example, for convenience, the housing assembly may be fixed to the frame 318 in a position in which it is easy to attach or detach the device. Ergonomic considerations include obtaining a degree of balance in the device which can be the result of placing the housing and part of the optical conduit over the frame so that the device's center of gravity resides over the frame. Aesthetic considerations include minimizing the amount of surface area of the device around the user's face.

[0025] Figs. 12 and 13 illustrate a further example of the display device with a link element 411 that connects the imaging assembly and optical element 414 to the housing assembly 416. The housing assembly includes a main body 460 which contains the connections for the cable and the flexible circuits as well as electronic components. A further body 466 supports the imaging assembly. The link element 411 connects the main body 460 and the further body 466 and provides a support for wires connecting the components in the main body with the imaging assembly. The link element allows the optical element to be folded out of view, as shown in Fig. 12, without adjusting the mounting mechanism that attaches the housing to the temple of the user's eyeglasses. The link element also allows some adjustment of the position of the optical element in front of the eyeglass lens.

[0026] Fig. 14 illustrates a method of remountably attaching the device to the eyeglass frame front 700. A clamping apparatus 701 hinged at point 710 and drawn together by spring 703 is affixed to the bottom of the frame front below the lens. The clamp may be shaped in a manner similar to the curvature of the frame to provide increased contact area between the clamp and the frame front. Small handles 720 are provided to apply force against the spring 703 to release the clamp. Affixed to the clamp 701 is the housing 90 of the display device that has been previously described. The optical relay 26 extends into the user's main field of view to provide an image. Any of the foregoing adjustments and pivots may be implemented in order to position the image at a location convenient for viewing.

[0027] Alternative examples include various forms of eyepiece, illumination optics, and mounting fixtures. Two display devices operated in cooperation, one device in front of each of the two lenses of a pair of eyeglasses, can also be used if desired to provide a binocular display.

[0028] The invention is not to be limited by what has been particularly shown and described, except as indicated by the appended claims.

Claims

1. A compact, remountable display device (10) for eyewear having a head-borne frame, the display device (10) comprising:

   a housing assembly (16) having a mounting mechanism disposed to removably mount to the head-borne frame of the eyewear at a location outside a user's main field of view;
   circuitry (22) disposed within the housing assembly (16) to receive data or video signals;
   an electronic imaging assembly (12) supported by the housing assembly (16) outside of the user's main field of view and in communication with the circuitry (22) within the housing assembly (16) to produce an image; and
   an optical element (114) comprising:

      a transparent fixture for supporting an eyepiece assembly (128) in front of a user's eye, the fixture located to receive the image from the electronic imaging assembly and capable of relaying the image internally; and
      an eyepiece assembly (128) supported by the transparent fixture to direct an image to the user's eye;

   characterised in that the eyepiece assembly (128) comprises a polarization beam-splitter coating (129), a quarterwave plate (131), and a focusing mirror (130) arranged so that polarized light from the imaging assembly (12) passes the beam-splitter coating (129) and the quarterwave plate (131) and is reflected from the focusing mirror (130) to pass in the opposite direction through the quarterwave plate (131) and is reflected from the beam-splitter coating (129) toward the eye.

2. The device of claim 1, wherein the mounting mechanism is disposed to removably mount to a temple of the head-borne frame of the eyewear.

3. The device of claim 1 or claim 2, wherein the transparent fixture comprises an optical relay (126) defining an optical path therethrough.

4. The device of claim 1 or claim 2, wherein the transparent fixture comprises an optical relay (126) having first and second surfaces disposed to permit transmission of ambient light, the first and second surfaces further being optically parallel.

5. The device of claim 1 or claim 2, wherein the transparent fixture comprises an optical relay (126), the optical relay (126) being optically clear and having a uniform index of refraction within at least a main field of view of the user.

6. The device of claim 1 or claim 2, wherein the transparent fixture further includes a cover to block ambient light from passing through the transparent fixture to the user's eye.

7. The device of claim 1 or claim 2, wherein the imaging assembly (12) comprises a miniature flat panel display.

8. The device of claim 7, wherein the display has a screen diagonal of less than 2 cm.

9. The device of claim 1 or claim 2, wherein the imaging assembly (12) comprises a transmissive or reflective miniature active matrix liquid crystal display, an electroluminescent display, or a scanning display.

10. The device of claim 1 or claim 2, wherein the housing assembly (16) comprises an elongated body having an open side and at least one cover plate (64, 66) disposed to cover the open side.

11. The device of claim 2, wherein the mounting mechanism comprises a clamping device (36) disposed to clamp the housing assembly to the temple of the head-borne frame.

12. The device of claim 1 or claim 2, wherein the mounting mechanism is configured to adjust the elevation of the optical element with respect to the user's eye.

13. The device of claim 1 or claim 2, wherein the mounting mechanism includes a rotatable mechanism configured to rotatably adjust the optical element with respect to the user's eye.

14. The device of claim 1 or claim 2, wherein the housing assembly includes a collar (84), and the optical element is movably supported within the collar (84) to provide a focusing adjustment.

15. The device of claim 1, wherein the transparent fixture has a uniform index of refraction and includes first and second optically parallel surfaces disposed to permit transmission of ambient light to the user's eye.

16. The device of claim 15, wherein the transparent fixture comprises an optical relay (26) defining an optical path therethrough.

Patentansprüche

1. Kompakte, wiedermontierbare Displayvorrichtung (10) für eine Brille mit einem am Kopf getragenen Rahmen, wobei die Displayvorrichtung (10) umfasst:

   eine Gehäusebaugruppe (16) mit einem Befestigungsmechanismus, der derart angeordnet, dass er entfernbar an dem am Kopf getragenen Rahmen der Brille an einem Ort außerhalb des Hauptsichtfelds eines Benutzers befestigt ist;
   Schaltungen (22), die innerhalb der Gehäusebaugruppe (16) angeordnet sind, um Daten oder Videosignale zu empfangen;
   eine elektronische Bildgebungsbaugruppe (12), die durch die Gehäusebaugruppe (16) außerhalb des Hauptsichtfelds des Benutzers gestützt wird und in Kommunikation mit den Schaltungen (22) innerhalb der Gehäusebaugruppe (16) steht, um ein Bild zu erzeugen; und
   ein Optikelement (114), umfassend:

      eine transparente Halterung, um eine Okularbaugruppe (128) vor einem Auge eines Benutzers zu stützen, wobei die Halterung angeordnet ist, um das Bild von der elektronischen Bildgebungsbaugruppe zu empfangen, und fähig ist, das Bild intern weiterzuleiten; und
      eine Okularbaugruppe (128), die von der transparenten Halterung gestützt wird, um ein Bild zum Auge des Benutzers zu lenken;

   dadurch gekennzeichnet, dass die Okularbaugruppe (128) eine Polarisationsstrahlteilerbeschichtung (129), eine Viertelwellenplatte (131) und einen Fokussierspiegel (130) umfasst, der derart angeordnet ist, dass das polarisierte Licht von der Bildgebungsbaugruppe (12) durch die Strahlteilerbeschichtung (129) und die Viertelwellenplatte (131) hindurchgeht und von dem Fokussierspiegel (130) reflektiert wird, um in der entgegengesetzten Richtung durch die Viertelwellenplatte (131) hindurchzugehen und von der Strahlteilerbeschichtung (129) zum Auge reflektiert zu werden.

2. Vorrichtung nach Anspruch 1, wobei der Befestigungsmechanismus derart angeordnet ist, dass er

an einem Bügel des am Kopf getragenen Rahmens der Brille entfernbar befestigt ist.

3. Vorrichtung nach Anspruch 1 oder Anspruch 2, wobei die transparente Halterung eine Lichtübertragung (126) umfasst, die einen optischen Weg dort hindurch definiert.

4. Vorrichtung nach Anspruch 1 oder Anspruch 2, wobei die transparente Halterung eine Lichtübertragung (126) umfasst, die erste und zweite Flächen aufweist, welche angeordnet sind, um die Übertragung von Umgebungslicht zu erlauben, und die ersten und zweiten Flächen weiter optisch parallel sind.

5. Vorrichtung nach Anspruch 1 oder Anspruch 2, wobei die transparente Halterung eine Lichtübertragung (126) umfasst und die Lichtübertragung (126) optisch klar ist und einen gleichförmigen Brechungsindex innerhalb von mindestens einem Hauptsichtfeld des Benutzers aufweist.

6. Vorrichtung nach Anspruch 1 oder Anspruch 2, wobei die transparente Halterung weiter eine Abdeckung umfasst, um Umgebungslicht daran zu hindern, durch die transparente Halterung zum Auge des Benutzers hindurchzugehen.

7. Vorrichtung nach Anspruch 1 oder Anspruch 2, wobei die Bildgebungsbaugruppe (12) ein Miniaturflachdisplay umfasst.

8. Vorrichtung nach Anspruch 7, wobei das Display eine Bildschirmdiagonale von kleiner als 2 cm aufweist.

9. Vorrichtung nach Anspruch 1 oder Anspruch 2, wobei die Bildgebungsbaugruppe (12) ein lichtdurchlässiges oder reflektierendes Miniaturaktivmatrix-Flüssigkeitskristalldisplay, ein Elektrolumineszenzdisplay oder ein Scanningdisplay umfasst.

10. Vorrichtung nach Anspruch 1 oder Anspruch 2, wobei die Gehäusebaugruppe (16) einen länglichen Körper umfasst, der eine offene Seite und mindestens eine Abdeckplatte (64, 66) aufweist, die angeordnet ist, um die offene Seite abzudecken.

11. Vorrichtung nach Anspruch 2, wobei der Befestigungsmechanismus eine Klemmvorrichtung (36) umfasst, die angeordnet ist, um die Gehäusebaugruppe am Bügel des am Kopf getragenen Rahmens festzuklemmen.

12. Vorrichtung nach Anspruch 1 oder Anspruch 2, wobei der Befestigungsmechanismus konfiguriert ist, die Höhe des Optikelements in Bezug auf das Auge des Benutzers anzupassen.

13. Vorrichtung nach Anspruch 1 oder Anspruch 2, wobei der Befestigungsmechanismus einen drehbaren Mechanismus umfasst, der konfiguriert ist, das Optikelement in Bezug auf das Auge des Benutzers drehbar anzupassen.

14. Vorrichtung nach Anspruch 1 oder Anspruch 2, wobei die Gehäusebaugruppe einen Kragen (84) umfasst und das Optikelement innerhalb des Kragens (84) beweglich gestützt wird, um eine Brennweiteneinstellung bereitzustellen.

15. Vorrichtung nach Anspruch 1, wobei die transparente Halterung einen gleichförmigen Brechungsindex aufweist und erste und zweite optisch parallele Flächen umfasst, die angeordnet sind, um die Übertragung des Umgebungslichtes zum Auge des Benutzers zu erlauben.

16. Vorrichtung nach Anspruch 15, wobei die transparente Halterung eine Lichtübertragung (26) umfasst, die einen optischen Weg dort hindurch definiert.

Revendications

1. Dispositif d'affichage (10) compact, remontable, pour lunettes comportant une monture, le dispositif d'affichage (10) comprenant :

   un ensemble formant le boîtier (16) ayant un mécanisme de montage disposé pour se fixer de façon amovible à la monture des lunettes, à un endroit situé en dehors du champ de vision principal de l'utilisateur ;
   un circuit (22) disposé à l'intérieur de l'ensemble formant le boîtier (16) pour recevoir des données ou des signaux vidéo ;
   un ensemble d'imagerie électronique (12) supporté par l'ensemble formant le boîtier (16) à l'extérieur du champ de vision principal de l'utilisateur et en communication avec le circuit (22) à l'intérieur de l'ensemble formant le boîtier (16) afin de produire une image ; et
   un élément optique (114) comprenant :

      une installation transparente pour tenir un ensemble oculaire (128) en face de l'oeil de l'utilisateur, l'installation étant positionnée pour recevoir l'image de l'ensemble d'imagerie électronique et être capable de relayer l'image en interne ; et
      un ensemble oculaire (128) tenu par l'installation transparente pour diriger une image vers l'oeil de l'utilisateur ;

   caractérisé en ce que

l'ensemble oculaire (128) comprend un revêtement séparateur de faisceaux polarisant (129), une lame quart d'onde (131), et un miroir de focalisation (130) disposés de sorte que la lumière polarisée provenant de l'ensemble d'imagerie (12) passe par le revêtement séparateur de faisceaux (129) et la lame quart d'onde (131) et est réfléchie par le miroir de focalisation (130) pour passer dans la direction opposée à travers la lame quart d'onde (131) et est réfléchie par le revêtement séparateur de faisceaux (129) vers l'oeil.

2. Dispositif selon la revendication 1, dans lequel le mécanisme de fixation est disposé pour se fixer de façon amovible à la monture des lunettes.

3. Dispositif selon la revendication 1 ou la revendication 2, dans lequel l'installation transparente comprend un relais optique (126) définissant un trajet optique la traversant.

4. Dispositif selon la revendication 1 ou la revendication 2, dans lequel l'installation transparente comprend un relais optique (126) ayant une première et une seconde surfaces disposées pour permettre la transmission de la lumière ambiante, les première et seconde surfaces étant en outre optiquement parallèles.

5. Dispositif selon la revendication 1 ou la revendication 2, dans lequel l'installation transparente comprend un relais optique (126), le relais optique (126) étant optiquement transparent et ayant un indice de réfraction uniforme dans au moins un champ de vision principal de l'utilisateur.

6. Dispositif selon la revendication 1 ou la revendication 2, dans lequel l'installation transparente comprend en outre un couvercle pour empêcher la lumière ambiante de passer à travers l'installation transparente jusqu'à l'oeil de l'utilisateur.

7. Dispositif selon la revendication 1 ou la revendication 2, dans lequel l'ensemble d'imagerie (12) comprend un écran plat miniature.

8. Dispositif selon la revendication 7, dans lequel l'affichage a une diagonale d'écran inférieure à 2 cm.

9. Dispositif selon la revendication 1 ou la revendication 2, dans lequel l'ensemble d'imagerie (12) comprend un écran miniature à cristaux liquides à matrice active transmissif ou réfléchissant, un affichage électroluminescent ou un affichage à balayage.

10. Dispositif selon la revendication 1 ou la revendication 2, dans lequel l'ensemble formant le boîtier (16) comprend un corps allongé ayant un côté ouvert et au moins une plaque de recouvrement (64, 66) disposée de façon à couvrir le côté ouvert.

11. Dispositif selon la revendication 2, dans lequel le mécanisme de montage comprend un dispositif de serrage (36) disposé pour serrer l'ensemble formant le boîtier au niveau de la tempe de la monture.

12. Dispositif selon la revendication 1 ou la revendication 2, dans lequel le mécanisme de montage est configuré pour ajuster l'élévation de l'élément optique par rapport à l'oeil de l'utilisateur.

13. Dispositif selon la revendication 1 ou la revendication 2, dans lequel le mécanisme de montage inclut un mécanisme rotatif configuré pour ajuster par rotation l'élément optique par rapport à l'oeil de l'utilisateur.

14. Dispositif selon la revendication 1 ou la revendication 2, dans lequel l'ensemble de boîtier inclut un collier (84), et l'élément optique est soutenu de façon mobile à l'intérieur du collier (84) pour fournir un ajustement de focalisation.

15. Dispositif selon la revendication 1, dans lequel l'installation transparente a un indice de réfraction uniforme et inclut une première et une seconde surfaces optiquement parallèles disposés pour permettre la transmission de lumière ambiante à l'oeil de l'utilisateur.

16. Dispositif selon la revendication 15, dans lequel l'installation transparente comprend un relais optique (26) définissant un trajet optique la traversant.

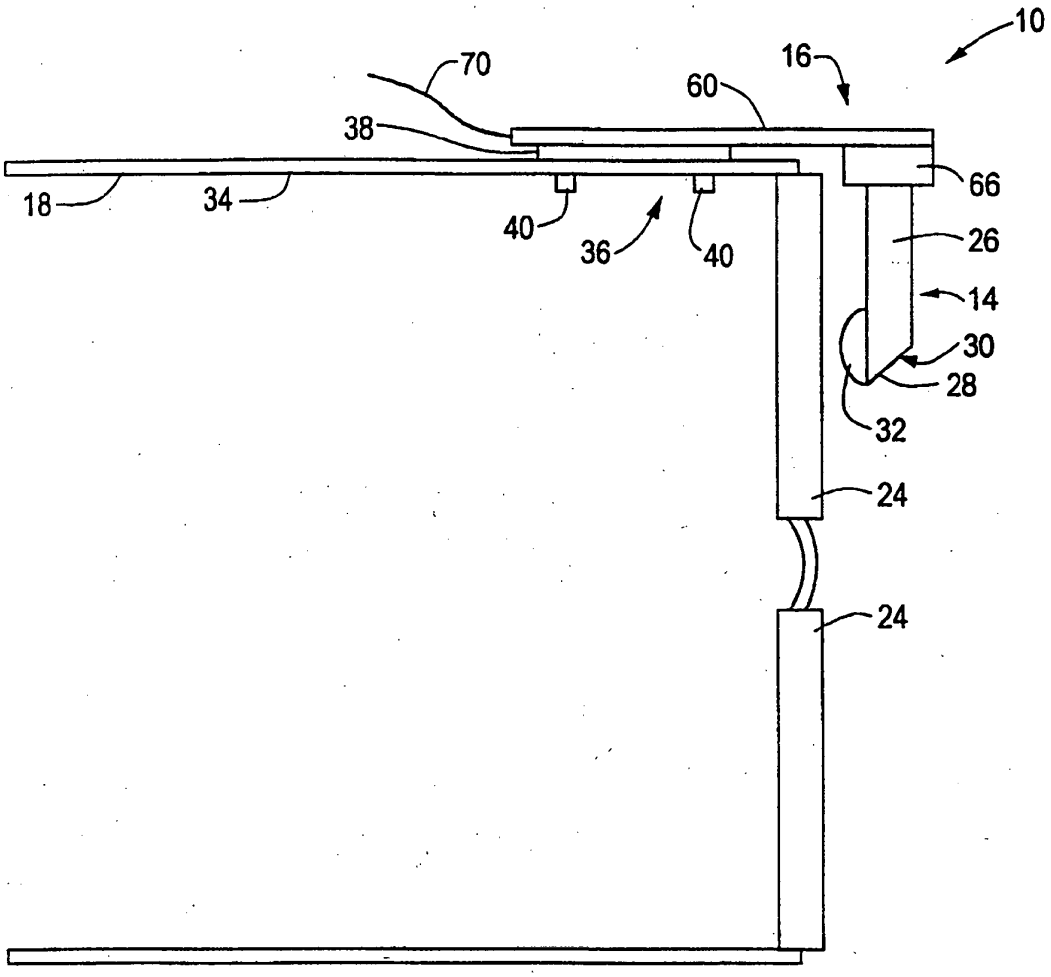

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FIG. 1

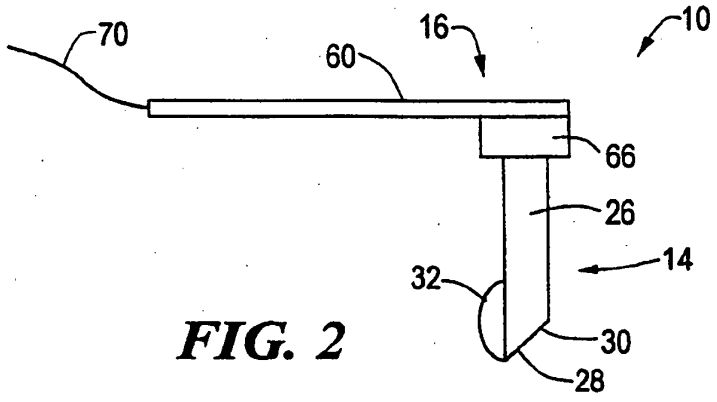

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FIG. 2

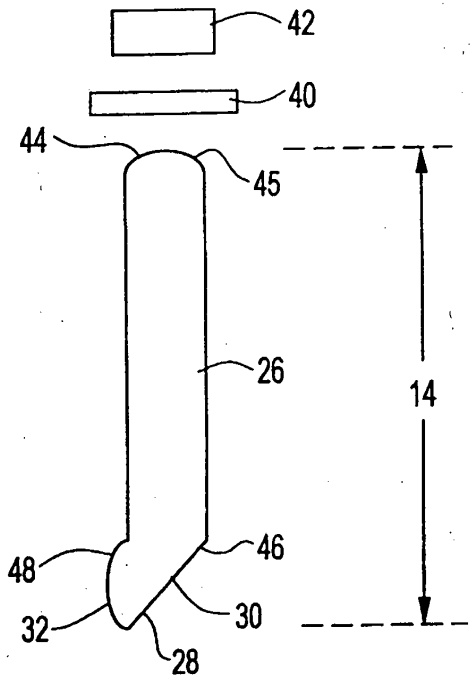


FIG. 3

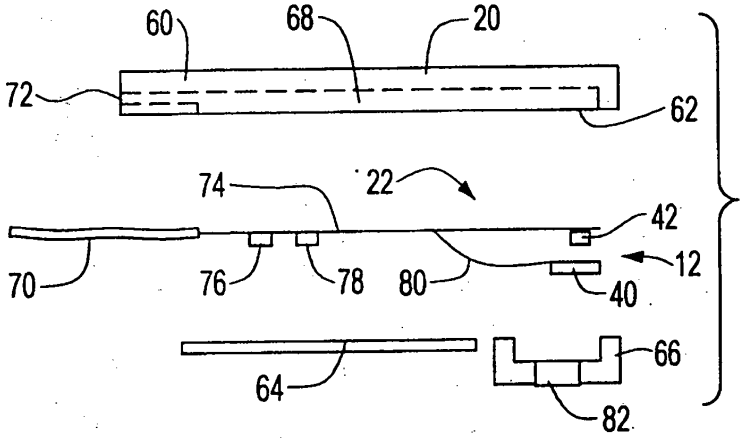


FIG. 4

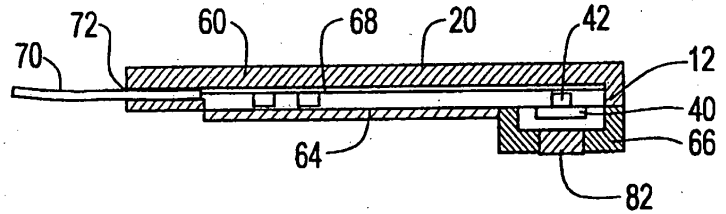


FIG. 5

EP 1 027 626 B1

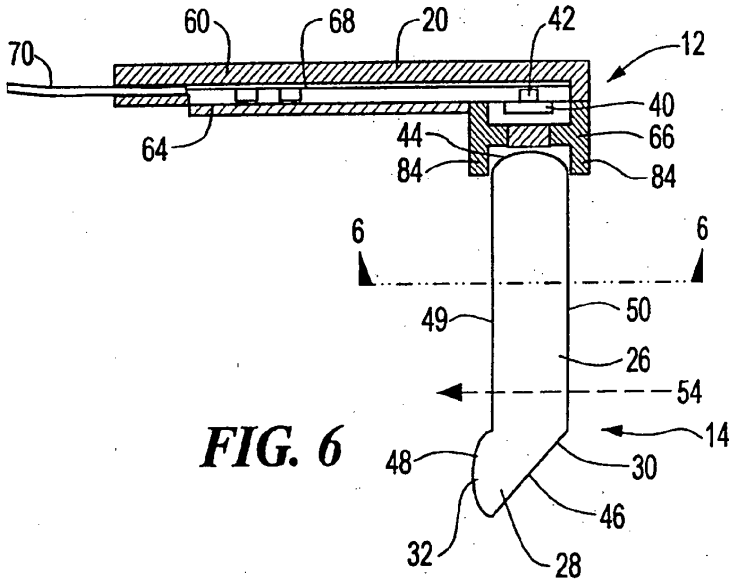


FIG. 6

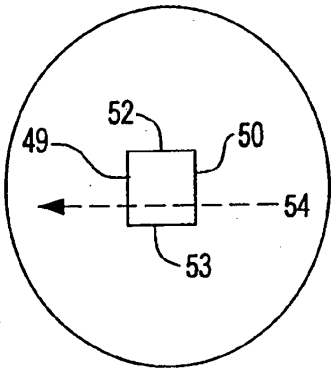


FIG. 6a

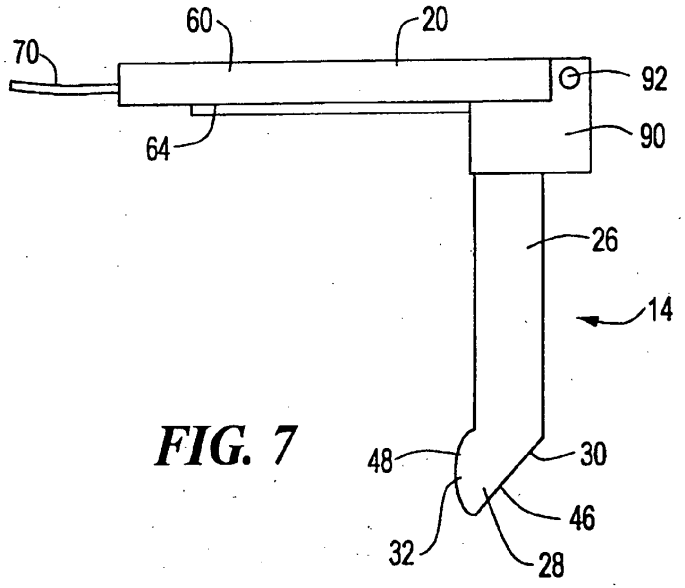


FIG. 7

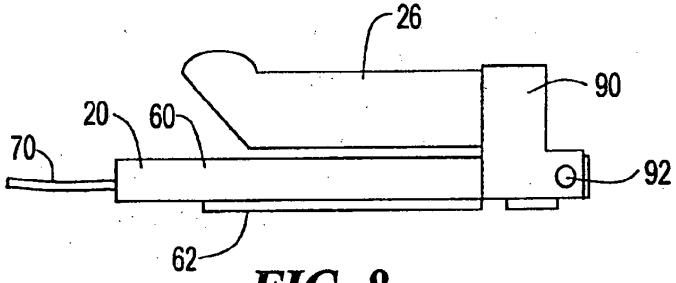


FIG. 8

EP 1 027 626 B1

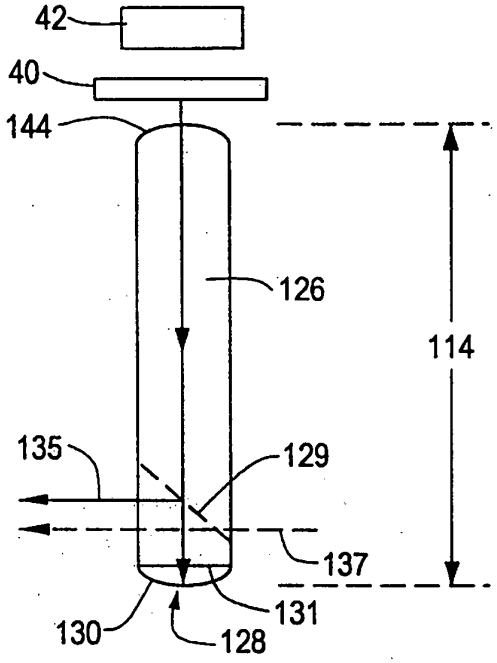

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FIG. 9

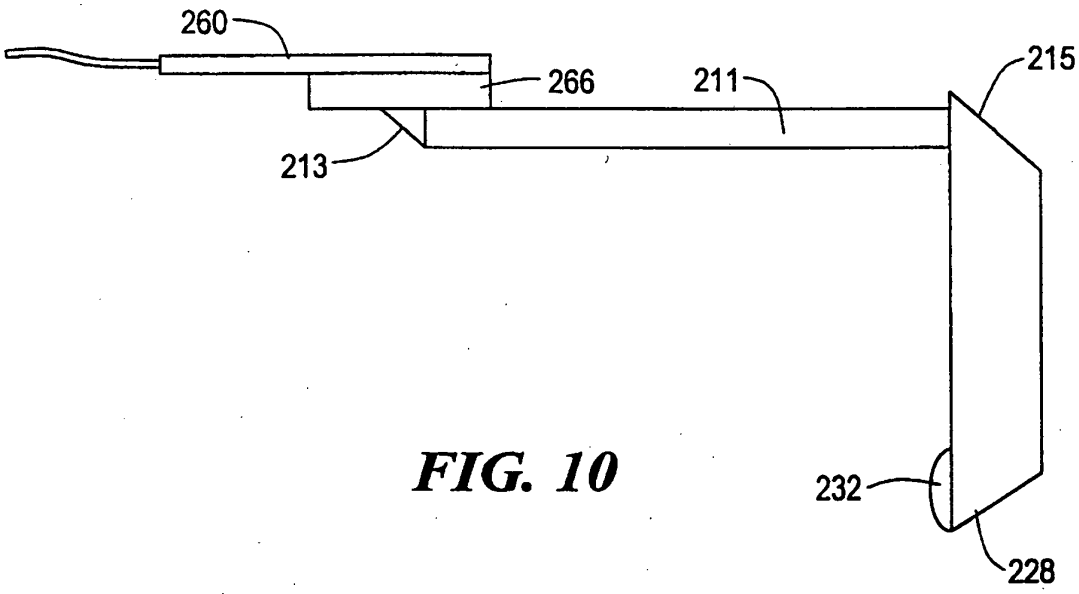

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FIG. 10

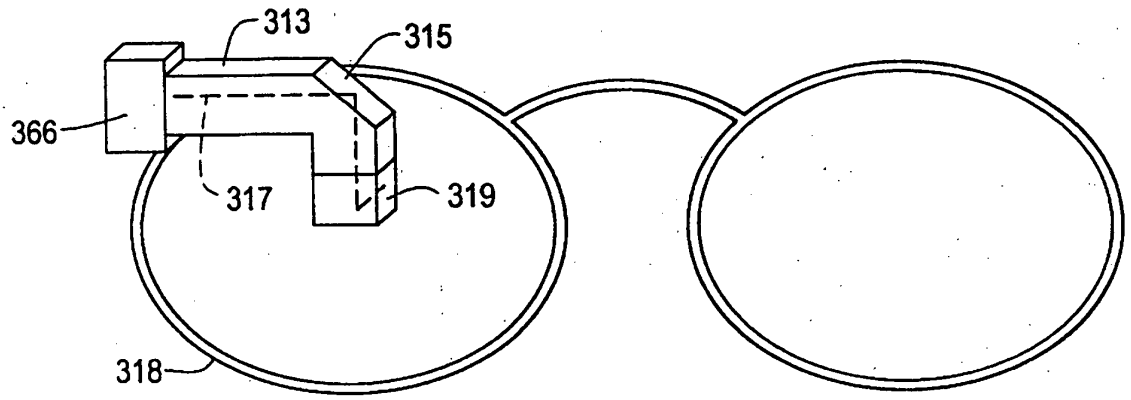


FIG. 11

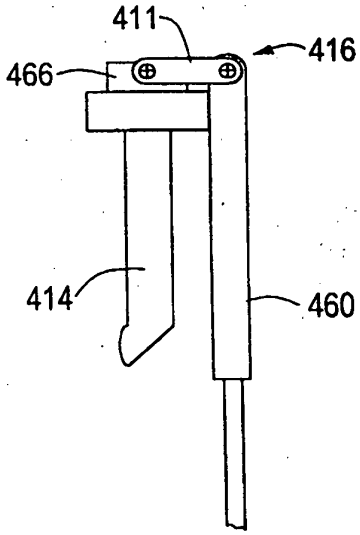


FIG. 12

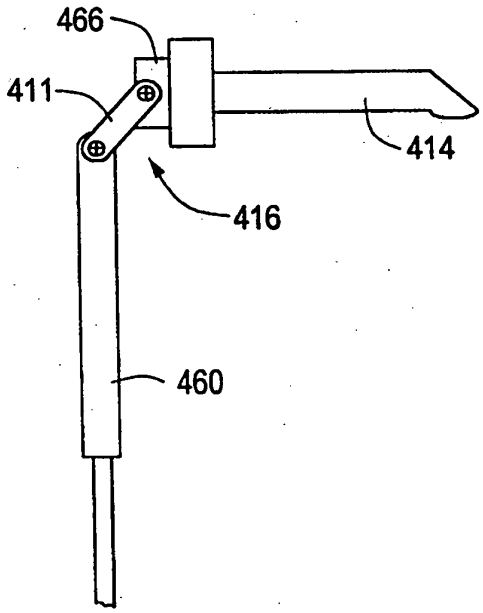


FIG. 13

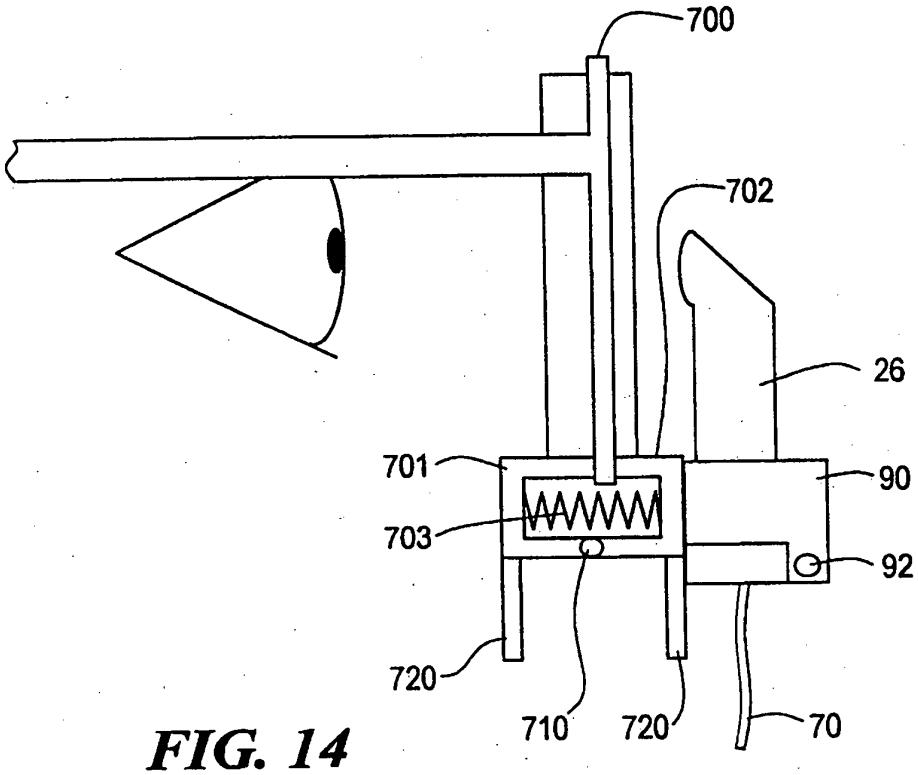


FIG. 14

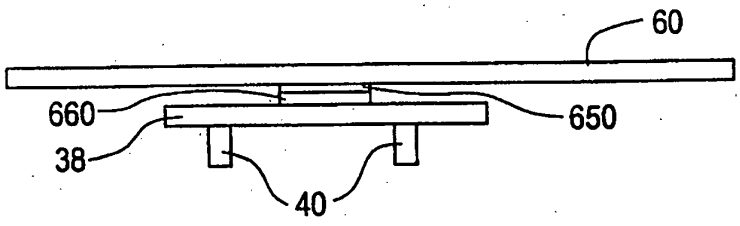


FIG. 15

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 4867551 A **[0001]**
- US 5369415 A **[0005]**
- WO 08844098 A **[0008]**
- US 5715337 A **[0013] [0017]**

Electronic Acknowledgement Receipt	
EFS ID:	47007456
Application Number:	17942347
International Application Number:	
Confirmation Number:	1038
Title of Invention:	WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT
First Named Inventor/Applicant Name:	Thomas A. Howell
Customer Number:	34071
Filer:	Peter P. Tong/Angela Nijim
Filer Authorized By:	Peter P. Tong
Attorney Docket Number:	IPVCP006X1C8
Receipt Date:	11-NOV-2022
Filing Date:	12-SEP-2022
Time Stamp:	12:33:51
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	IPVCP006X1C8_IDSTrans_11-22.pdf	19766 faaf8166fc1e329c4d0e75c9be2d6aed4bb8f2a4	no	2

Warnings:

Information:					
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			Total Files Size (in bytes):	709866	

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If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: HOWELL et al.	Attorney Docket No.: IPVCP006X1C8
Application No.: 17/942,347	Examiner: DOCKET CENTRAL
Filed: September 12, 2022	Group: OPAP
Title: WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT	

INFORMATION DISCLOSURE STATEMENT
37 CFR §§1.56 AND 1.97(b)

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

The references listed in the attached PTO Form 1449, copies of which are attached, may be material to examination of the above-identified patent application. Applicants submit these references in compliance with their duty of disclosure pursuant to 37 CFR §§1.56 and 1.97. The Examiner is requested to make these references of official record in this application.

This Information Disclosure Statement is not to be construed as a representation that a search has been made, that additional information material to the examination of this application does not exist, or that these references indeed constitute prior art.

This Information Disclosure Statement is: (i) filed within three (3) months of the filing date of the above-referenced application, (ii) believed to be filed before the mailing date of a first Office Action on the merits, or (iii) believed to be filed before the mailing of a first Office Action after the filing of a Request for Continued Examination under §1.114.

Accordingly, it is believed that no fees are due in connection with the filing of this Information Disclosure Statement. However, if it is determined that any fees are due, the Commissioner is hereby authorized to charge such fees to Deposit Account 50-3874(Order No. IPVCP006X1C8).

Respectfully submitted,

/Peter P. Tong/

Peter P. Tong
Registration No. 35,757

4010 Moorpark Avenue
Suite 211
San Jose, CA 95117

UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
17/942,347	09/12/2022	Thomas A. Howell	IPVCP006X1C8

CONFIRMATION NO. 1038

34071
IPVENTURE, INC.
4010 Moorpark Avenue
Suite 211
San Jose, CA 95117

PUBLICATION NOTICE

OC000000137453243

Title:WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT

Publication No.US-2023-0057654-A1
Publication Date:02/23/2023

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Public Records Division. The Public Records Division can be reached by telephone at (571) 272-3150 or (800) 972-6382, by facsimile at (571) 273-3250, by mail addressed to the United States Patent and Trademark Office, Public Records Division, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently https://portal.uspto.gov/pair/PublicPair. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Office of Data Managment, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 17/942,347	Filing Date 09/12/2022	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $100 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $480 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	04/07/2023	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 8	Minus	** 20	= 0		x $100 =	0
	Independent (37 CFR 1.16(h))	* 1	Minus	*** 3	= 0		x $480 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/DEBORAH D SCOTT/
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: HOWELL et al.	Attorney Docket No.: IPVCP006X1C8
Application No.: 17/942,347	Examiner: ELAHEE MD S.
Filed: September 12, 2022	Group: 2653
Title: WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT	

INFORMATION DISCLOSURE STATEMENT
37 CFR §§1.56 AND 1.97(b)

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

The references listed in the attached PTO Form 1449, copies of which are attached, may be material to examination of the above-identified patent application. Applicants submit these references in compliance with their duty of disclosure pursuant to 37 CFR §§1.56 and 1.97. The Examiner is requested to make these references of official record in this application.

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Accordingly, it is believed that no fees are due in connection with the filing of this Information Disclosure Statement. However, if it is determined that any fees are due, the Commissioner is hereby authorized to charge such fees to Deposit Account 50-3874(Order No. IPVCP006X1C8).

Respectfully submitted,

/Peter P. Tong/

Peter P. Tong
Registration No. 35,757

4010 Moorpark Avenue
Suite 211
San Jose, CA 95117

Electronic Acknowledgement Receipt	
EFS ID:	47807507
Application Number:	17942347
International Application Number:	
Confirmation Number:	1038
Title of Invention:	WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT
First Named Inventor/Applicant Name:	Thomas A. Howell
Customer Number:	34071
Filer:	Peter P. Tong/Angela Nijim
Filer Authorized By:	Peter P. Tong
Attorney Docket Number:	IPVCP006X1C8
Receipt Date:	07-APR-2023
Filing Date:	12-SEP-2022
Time Stamp:	17:39:18
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	IPVCP006X1C8_PrelAmdTrans_4-23.pdf	17579 6f3d61791fc252dfbca4fdf4ec7d46e23d4afe46	no	1

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Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	IPVCP006X1C8_1449_4-23.pdf	28337 7762a21ace35eb0caef7234446c52c0a6b48bf3d	no	2
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3	Foreign Reference	JP-2002-511706A.pdf	2904875 17231b8d89f40b47b6ba4c762164605d5758a30f	no	44
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4	Foreign Reference	KR-20020044416A_Choi.pdf	3969556 b524031330747d959f93732d39445693c5048287	no	47
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5	Foreign Reference	WO0124576A1.pdf	4902952 8bbb8004fca106f3fc795ffa01689caa3268df49	no	66
Warnings:					
Information:					
6	Preliminary Amendment	IPVCP006X1C8_PrelAmd_4-23.pdf	29895 b2544fafcc137a95adf8cf0be0841d76e60511aa	no	5
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Information:					
7	Information Disclosure Statement (IDS) Form (SB08)	IPVCP006X1C8_IDSTrans_4-23.pdf	19712 cd64e2bbd6a52e4221e3d0ca61430f611fc58205	no	2
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National Stage of an International Application under 35 U.S.C. 371

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: HOWELL et al.

Application No.: 17/942,347

Filed: September 12, 2022

Title: WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT

Attorney Docket No.: IPVCP006X1C8

Examiner: ELAHEE, MD S.

Group: 2653

PRELIMINARY AMENDMENT TRANSMITTAL

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Transmitted herewith is an Amendment in the above-identified application.

The fee has been calculated as shown below.

	Claims After Amendment		Highest Previously Paid For	Present Extra	Small Entity Rate Fee	Large Entity Rate Fee
Total Claims	8	MINUS	20	00	x 40 =	x 100 =
Independent Claims	1	MINUS	3	00	x 192 =	x 480 =
Multiple Dependent Claim Present and Fee Not Previously Paid					$	$
				Total	$0.00	$

☐ Applicant(s) hereby petition for a _____- month extension(s) of time to respond to the aforementioned Office Action.

☒ Applicant(s) believe that no (additional) Extension of Time is required; however, if it is determined that such an extension is required, Applicant(s) hereby petition that such an extension be granted and authorize the Commissioner to charge the required fees for an Extension of Time under 37 CFR 1.136 to Deposit Account No. 50-3874 (Order No. IPVCP006X1C8).

☒ Any fees due are being paid electronically herewith.

☒ Please charge any additional fees required to facilitate filing the enclosed response, to Deposit Account No. 50-3874 (Order No. IPVCP006X1C8).

Respectfully submitted,

/Peter P. Tong/

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Reg. No. 35,757

Form 1449 (Modified)	Atty. Docket No.	IPVCP006X1C8
	Application No.:	17/942,347
Information Disclosure Statement By Applicant	Applicant	HOWELL et al.
	Filing Date	September 12, 2022
	Group	2653
(Use Several Sheets if Necessary)		Page 1 of 2

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Examiner Initial	No.	Patent No.	Date	Patentee	Class	Sub-class	Filing Date
	1.	2002/0136414 A1	Sep-20	Jordan et al.			
	2.	2003/0064746 A1	Apr-03	Rader et al.			
	3.	2003/0091200 A1	May-03	Pompei			
	4.	2004/0005069 A1	Jan-04	Buck			
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	24.	11,536,988 B2	Dec-22	Howell et al.			
	25.	11,630,331 B2	Apr-23	Howell et al.			

Examiner	Date Considered

Examiner: Initial citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Form 1449 (Modified) **Information Disclosure Statement By Applicant** (Use Several Sheets if Necessary)	Atty. Docket No.	IPVCP006X1C8
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		Page 2 of 2

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Init.		Document No.	Date	Country	Class	Subclass	Translation Yes	Translation No
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		KR 2002-0044416 A	Jun-02	Korea			X	
		WO 01/24576 A1	Apr-01	WIPO				

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	A	Notice of Allowance for U.S. Patent Application No. 17/484,080, dated January 31, 2023.
	B	Notice of Allowance for U.S. Patent Application No. 17/949,029, dated March 1, 2023.
	C	Notice of Allowance for U.S. Patent Application No. 17/873,104, dated December 16, 2022.
	D	Notice of Allowance for U.S. Patent Application No. 17/873,104, dated March 22, 2023.
	E	Notice of Allowance for U.S. Patent Application No. 17/395,509, dated December 19, 2022.
	F	Office Action for U.S. Patent Application No. 16/182,969, dated January 24, 2023.
	G	Office Action for U.S. Patent Application No. 16/424,018, dated November 25, 2022.
	H	Notice of Allowance for U.S. Patent Application No. 16/424,018, dated February 21, 2023.

Examiner	Date Considered

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Dual mode receiver for receiving satellite signal and terrestrial signal in digital broadcasting system

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INVENTOR INFORMATION

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Abstract

SUMMARY A dual mode receiver for receiving a QPSK modulated satellite signal and a multi-carrier modulated (MCM) terrestrial signal is provided. The dual-mode receiver has a complex architecture that includes a minimum number of filters selected to facilitate both QPSK and MCM demodulation.

Description

DETAILED DESCRIPTION OF THE INVENTION
BACKGROUND OF THE INVENTION The present invention relates to a receiver for use in a digital broadcasting system having a combined architecture for receiving both satellite and terrestrial signals, such as the proposed Digital Voice over Radio Service (DARS). .
[0002] US-A-5,600,672 relates to a communication system capable of extracting first and second data streams from a received signal of a receiving side. One of the data streams can be selected for further processing, including analog-to-digital conversion, filtering, carrier recovery, phase synchronization, and

decoding.
[0003] US-A-4,355,401 discloses a radio device having a receiving unit for receiving an analog signal and a digitally modulated carrier wave signal. First and second demodulators for demodulating analog and digital signals, respectively, are provided. The determination circuit determines whether the received signal is an analog FM wave or a digital FM wave in response to the output of the clock recovery circuit. Depending on the decision, the demodulated analog signal or the demodulated digital signal is selectively carried by the switching means.
[0004] EP-A-0574273 shows a receiver having an AM-FM combined demodulator. The receiver has a common oscillator and a mixer circuit. When the analog modulated signal is received, the frequencies of the common oscillator and the local oscillator of the mixer circuit are controlled using a frequency error detector. The receiver further includes a modulator in which a demodulator for an analog modulation signal and a demodulator for a digital modulation signal are connected in parallel. A digital modulation signal discriminator is connected to the digital modulation signal demodulator, and switches the receiver to an appropriate demodulation mode.
[0005] EP-A-0 769 873 describes a modulation signal such as quadrature amplitude modulation and a vestigial sideband R
An RF receiver adapted to receive one or more F input signals or the like. The RF signal is passband filtered, downconverted using three bandpass filters and two mixers, and the output of the third bandpass filter is applied to a sample and hold circuit. The output of the sample and hold circuit is coupled to an analog-to-digital converter via a low-pass filter, whose output is
It is applied to a Hilbert filter that demodulates the sampled signal and generates a baseband signal.
[0006] Groshong R. et. Al., "Undersampling Techniques Simplify Digital Radio", Electronic Desi
gn (Electronic Design), Vol. 39, No. 10, May 23, 1991, Nos. 67-68,
On pages 70, 73-75, 78, a broadband input filter, a first IF mixer,
A typical heterodyne receiver comprising a first IF narrowband filter, a second IF mixer having a fixed oscillation frequency, a second selectable IF filter, and separate demodulators for AM and FM. Machine is listed.
SUMMARY OF THE INVENTION It is an object of the present invention to provide an apparatus and method for receiving broadcast signals, which enables reception of satellite signals and terrestrial signals using a receiver with reduced complexity.
[0008] The above object is achieved by a receiver according to claim 1 and a method according to claim 11. The broadcast system overcomes the obstacles to receiving line of sight (LOS) satellite signals in fixed and mobile radio receivers by using one or more terrestrial repeaters. The terrestrial repeater uses a QPSK-modulated time division multiplexing system (
TDM) receives a satellite signal, performs baseband processing on the satellite signal, and retransmits the satellite signal via multi-carrier modulation (MCM). A digital filter is employed that satisfies the requirements for QPSK satellite signal reception and reduces receiver complexity by acting as a downsampling filter prior to MCM demodulation of the terrestrial signal.
FIG. 1 illustrates a digital broadcast system 10 that includes at least one geostationary satellite 12 that receives a line-of-sight (LOS) satellite signal at a wireless receiver, generally indicated at 14. For the purpose of time and / or spatial diversity, another geosynchronous satellite 16 can be provided in a different orbital position as described below with respect to FIG. The system 10 further comprises at least one terrestrial repeater 18 for retransmitting satellite signals in a geographic area 20 where LOS reception is obscured by high rise buildings, hills and other obstacles. Radio receiver 14 is preferably configured for dual mode operation to receive both satellite and terrestrial signals and to select one of the signals as a receiver output.
The broadcast segment 22 and the terrestrial repeater segment 24 of the system 10 will be described with reference to FIG. The broadcast segment, as shown in block 26, divides the broadcast channel into 3.68 megabits per second (Mbps) time division multiplex (TD)
M) Preferably, encoding into a bitstream. The TDM bitstream contains 96 16 kilobits per second (kbps) prime rate channels and additional information for synchronization, demultiplexing, broadcast channel control and services. Broadcast channel coding preferably includes MPEG audio coding, forward error correction (FEC) and multiplex. The obtained T

The DM bit stream is transmitted via satellite uplink 30 after being modulated using quarter-phase shift keying (QPSK) modulation as shown in block 28.
With continued reference to FIG. 2, the terrestrial repeater segment includes a satellite downlink 32 and a demodulator 34 that performs QPSK demodulation to obtain a baseband TDM bitstream. Puncturing and delay block 36 reduces the TDM bit rate from 3.68 Mbps to 3.067 Mbps by removing selectable bits that can be reinserted at the wireless receiver, and reduces the time between transmissions from satellites 12 and 16. If there is a diversity delay, the entire TDM bit stream is delayed by the delay amount. The delayed and reduced rate bit stream is then multi-carrier modulated in block 38 and then amplified by amplifier 39 and transmitted from terrestrial repeater tower 40. Multi-carrier modulation converts a 3.067 Mbps TDM bit stream in the time domain into
Preferably, it includes splitting into 432 parallel paths each carrying 7100 bits / sec. Each bit is the imaginary (I) component of a complex number and the real (Q)
It is paired with two-bit symbols, each identified as a component. Therefore,
The complex symbol rate is 3550 symbols / second. The 432 parallel complex numbers are the inverse fast Fourier transform of 512 coefficients with 2 .sup.n inputs and outputs (
IFFT) operation is provided as a frequency coefficient input to a discrete Fourier inverse transform converter, which is preferably performed. Here, n = 9, and the 80 input coefficients are set to zero. The output of the IFFT is a set of 432 QPSK orthogonal sine coefficients, which support a symbol rate of 3550 / sec and make up 432 narrowband orthogonal carriers with a symbol period of 280 microseconds. I have.
FIG. 3 shows a frequency plan of the full diversity two satellite broadcasting system 10. In a preferred embodiment of the present system 10, satellites 12 and 16 of FIG. 1 broadcast the same programs A and B, respectively. Programs A and B are transmitted via "after" satellites 16 after transmission by "early" satellites 12. The frequency plan allocates a frequency band to each of the four QPSK modulated satellite signals indicated by reference numerals 42, 44, 46 and 48 in FIG. Further, two frequency bands 50 and 52 are included in the multi-carrier modulated program A and B signals transmitted from the terrestrial repeater. And retransmit this signal with sufficient delay to time synchronize the signal from the earlier satellite 12 with that transmitted by the later satellite 16. In the frequency plan, the channel separation is relatively small, with each of the six frequency bands 42-52 occupying about 2.07 megahertz (MHz) in the entire 12.5 MHz frequency bandwidth.
Referring to FIG. 4, a first arm 54 receives a QPSK signal from the preceding satellite 12 and a second arm receives a QPSK signal from the succeeding satellite 16 and receives an MCM signal from the terrestrial repeater 18. A dual-mode wireless receiver including an arm 56 and a combiner 58 that generates a receiver output from two received signals will be described. With the two arms 54 and 56, full diversity reception is possible. As a dual mode receiver arm for receiving satellite signals and terrestrial signals, QPSK / MCM of a wireless receiver
An arm 56 is used. The QPSK signals received from satellites 12 and 16 are:
Demodulated in blocks 60 and 62, respectively. Also, the MCM signal from the terrestrial repeater 18 (consisting of a delay and multi-carrier modulation of the signal transmitted by the satellite 12 above) is demodulated as shown in block 64. The depuncturing unit 66 re-inserts bits into the demodulated signal from the terrestrial repeater,
Increase the bit rate to the rate of the original TDM bit stream.
The QPSK / MCM receiver arm 56 is configured to detect when a terrestrial repeater signal is present, as shown at block 67, and replace the terrestrial repeater signal instead of a later signal from the satellite 16. Selection is made via the selector 68. In a broadcast system having at least one satellite and at least one terrestrial repeater, the band 50 of FIG.
The terrestrial signals at and 52 may be absent or negligible if the wireless receiver is in a rural area outside the range of the terrestrial repeater. If the wireless receiver is mobile and the user is using it while approaching an urban or urban area, both satellite and terrestrial signals can be received. On the other hand, when the wireless receiver is mobile and used while driving in an urban area, it is impossible to receive the LOS signal from the satellite, and in many cases, only the ground signal can be received. When the strength of the terrestrial signal exceeds a predetermined threshold, the dual mode receiver arm 56 of the wireless receiver switches from receiving a signal from the satellite 16 to receiving a signal from the terrestrial repeater 18. The details of the QPSK demodulators 60 and 62, the MCM demodulator 64, the

depuncturing unit 66, the terrestrial detector 67, and the selector 68 shown in FIG. 4 will be described later. The signal at the output of the QPSK demodulator 60 at the receiver arm 54 and the signal at the output of the selector 68 at the receiver arm 56 are TDM demultiplexed, as shown in blocks 70 and 72 of FIG. The decoded baseband bit stream is decoded. As shown in block 74, the bit stream reproduced from satellite 12 at receiver arm 54 is delayed by the amount of delay between broadcasts from earlier satellite 12 and later satellite 16 and the bit stream is received by receiver arm 56. Time synchronized with the generated bitstream. The signals from the receiver arms 54 and 56 are then post-detection diversity coupled (post-de-
After performing tection diversity combining, MPEG audio decoding is performed in block 78. It is understood that the radio receiver does not need to support satellite diversity, and therefore can be implemented only with the QPSK / MCM arm 56 without using the QPSK arm 54. In such a wireless receiver, the post-detection coupler 58 can also be omitted.

As shown in FIG. 3, the level of the terrestrial signal can be substantially higher than the satellite signal, eg, on the order of 30 decibels (dB) above the satellite signal. As mentioned above, the channel separation in the frequency plan is relatively small. For this reason, when a terrestrial signal exists in an adjacent channel as shown in FIG. 3, when decoding a satellite signal, it is necessary to perform filtering with a high attenuation of a stop band. Typically, such filtering is avoided by increasing the frequency separation between the satellite and terrestrial signal channels. If the separation is sufficient, a channel filter is used to suppress adjacent channels.

According to one embodiment of the invention, channel selection is performed using a filter that does not totally suppress adjacent channels. As will be described below, the presence of terrestrial repeater frequency bands 50 and 52 at the bottom of the frequency plan (and adjacent to frequency bands 46 and 48 of later satellites 16, respectively) allows the satellite signal or terrestrial to receiver output. Signal selection is simplified. Filtering will be described with QPSK demodulation followed by MCM demodulation, followed by filtering in a combined QPSK / MCM dual mode receiver arm (FIG. 12) configured according to a preferred embodiment of the present invention.

FIG. 5 shows a schematic block diagram of the QPSK satellite signal demodulation QPSK satellite signal receiver arm 80. An antenna 82 and a low noise amplifier (LNA) 84 on the wireless receiver side receive the signal at a carrier frequency of about 2.3 gigahertz (GHz). This signal is downconverted by mixer 86 and local oscillator 88 to a first intermediate frequency (IF) of about 135 MHz. The signal from mixer 86 is provided to a low loss surface acoustic wave (SAW) intermediate frequency (IF) filter 90, and to a second mixer 92 and a local oscillator 94, which are downconverted to a second IF of about 3.68 MHz. Is done.

For a strong SAW filter with better adjacent channel suppression, a weak or “leaky” SAW filter is preferred. As shown in FIG. 6, the terrestrial channel 50 immediately adjacent to the satellite channel 46 is partially within the SAW filter passband, and the attenuation of the interference channel 50 is only about 6 dB. Strong SAW

While filters can better remove adjacent channels (eg, channel 50), strong SAW filters can introduce phase distortion and have a weak S

It is more expensive to implement than an AW filter.

The QPSK satellite signal arm 80 of FIG. 5 includes a sampler 96 that samples the received signal at the output of the SAW filter 90 at a sampling rate that is four times the second IF. An analog-to-digital (A / D) converter 100 performs A / D conversion of the sampled signal, and a digital filter 102 removes adjacent channels (eg, channel 50) from the digitized satellite signal. Digital filter 102 is preferably matched to the broadcast station's transmit filter. The digital filter 102 may have a stop band attenuation of 30 dB or more depending on the SAW filter 90 and a signal-to-noise ratio (SNR) after the SAW filter 90. The output of the digital filter 102 is processed via a sampling switch and a latch element 104,

Recover the TDM signal from the SK modulation.

Digital filter 102 is preferably a root raised cosine (RRC) filter that is common in QPSK modulation and demodulation. In a preferred embodiment, the RRC filter has a sampling rate four times the IF and eight times the symbol rate transmitted in satellite signals from the originating broadcaster. In addition, a roll-off rate of (= 0.15 is selected. As shown in FIG. 7, the frequency response of the RRC filter has a pass band ripple of 0.1 dB and a stop band ripple of 40 dB. 3 representing the ideal RRC frequency response, the result of the Remez algorithm, and the RRC frequency response after coefficient quantization

Provides two plots. Such an RRC filter specification can be realized by a 136-tap linear phase finite impulse

response (FIR) filter having a fixed point coefficient of 10 bits and a word length of 16 bits.
[0023]MCM demodulation of ground signal FIG. 8 shows an MCM demodulator. At the time of MCM demodulation, radio receiver using FFT
IFFT implementing filter bank and MCM modulation at terrestrial repeater as described above
Corresponding to The input of the FFT shown in FIG.
Sampled according to parameters. The sampling frequency is
MCM symbol frequency F corresponding to the number of MCM symbols transmitted every second
from.sub.s Depends on. Furthermore, the sampling frequency depends on the FFT length and each MCM symbol.
Depending on the guard interval length associated with the The sampling frequency is F.sub.Four= F.sub.s.sup.*FFTLEN.sup.*(1 + GUARDLEN_REL) is preferable.
Here, FTTLEN corresponds to the FFT length (for example, 512), and GUARD
LEN_REL is the effective length or symbol period (eg, 280 microseconds)
Corresponding to the guard interval length for.sub.sCorresponds to the MCM symbol frequency
I do. MCM symbol frequency F.sub.sIs divided by the number of bits per MCM symbol.
Bit rate. As an example, the MCM signal bit rate is 3.067 mega
Bits / second (Mbps), and the number of bits per symbol is up to 864.
Or 432.
With continued reference to FIG. 8, an MCM signal of about 2.3 GHz
And received by a wireless receiver via a low noise amplifier (LNA) 108 and the mixer 11
0 and down-converted by the local oscillator 112 to an IF of about 135 MHz.
After that, it is processed by the SAW filter 114. The signal is output to the SAW filter 11
4 to avoid aliasing components. SAW filter bandwidth
Sampling frequency in width meets Nyquist criterion for sampling signal
. The received MCM signal is then converted to a second mixer 116 and a second local oscillator.
Using 118, it is down-converted to a second IF of about 4.60 MHz. Faith
The signal is sampled by the sampler 120 at a frequency above the bandwidth of this signal, ie, F.sub.Two > = 2.sup.*F.sub.1At a sampling frequency of Required sampling cycle
The wave number is higher than the desired terrestrial signal bandwidth as shown in FIG.
4 times higher than the bandwidth of the desired signal). Following the A / D conversion in block 122,
An adjacent channel is suppressed using the digital filter 124. Digital filter
124 indicates that the level of the adjacent satellite channel 46 is significantly lower than the terrestrial signal 50 (
That is, it is low on the order of 30 dB).
Filter. The adjacent satellite channel 46 is simply an A / D converter.
It appears as noise after conversion and downsampling. Digital low pass filter
The spectrum obtained after the ring is shown in FIG. Where the bandwidth is F.sub.ThreeIs equivalent to is there. The signal then has a lower sampling frequency F.sub.Four> = 2.sup.*F.sub.ThreeRepresented by
Down-sampling is performed. Frequency F.sub.TwoAnd F.sub.FourIs F.sub.FourIs N.sup.*F.sub.Two Where N is an integer, for example, four.
The output of digital low-pass filter 124 after downsampling in block 126 is subjected to an FFT as part of the MCM demodulation process as shown in FIG.
Supplied to The samples are converted to vectors by a serial-to-parallel conversion, then converted to the frequency domain by FFT, and then decoded via an inverse mapping process. The mapping process converts the output of the FFT in the form of a complex-valued data vector into an output bitstream.
Dual mode receiver QPSK modulation is an efficient method for satellite broadcasting, while MCM modulation is effective for terrestrial broadcasting. A system that uses satellite broadcasting in rural and suburban areas, for example, in a city center where satellite signals are shielded by high-rise buildings, requires a merged receiver to receive both satellite and terrestrial signals in a terrestrial broadcasting system It is said.
One possible dual mode receiver is shown in FIG. This dual mode receiver can be used as a satellite / ground arm 56 in the wireless receiver 14 of FIG. If the satellite and terrestrial signals use the same

frequency, a common tuner 129 can be used. The QPSK arm 130 and MCM arm 132 of the dual mode receiver can be the same as the QPSK demodulator and MCM demodulator described above with respect to FIGS. 5 and 8, respectively.
According to a preferred embodiment of the present invention, for example, a dual mode receiver implementing a satellite / terrestrial arm of a wireless receiver is implemented using a combined architecture for QPSK modulation and MCM demodulation. This common architecture is shown in FIG. The dual mode receiver shown in FIG. 12 requires only one SAW filter and one digital filter, and is suitable for reducing the cost and complexity of the receiver as compared with the receiver shown in FIG.
Referring to FIG. 12, antenna 134 and LNA 1 for receiving satellite and terrestrial signals, preferably at a frequency in the range of 2.332 to 2.345 GHz,
36 are provided. Received satellite and terrestrial signals are weak or "leaky" SAW
The filter is supplied to the same SAW filter 132, which is preferably a filter. As described above, a weak SAW filter is preferable to a strong SAW filter that is excellent in suppressing adjacent channels, because a strong SAW filter may cause phase distortion and is expensive to implement. . As shown in FIG. 6, the passband of a weak SAW filter attenuates terrestrial signals in adjacent channels by only about 6 dB. This partial suppression of the adjacent channel is preferable in that it enables detection of a terrestrial signal.
The dual mode receiver is configured to select a received terrestrial signal above the received satellite signal for receiver output whenever the terrestrial signal exceeds a predetermined threshold. Thus, dual mode receivers essentially search for terrestrial signals at all times and select satellite signals only when there is no terrestrial signal.
In the illustrated embodiment, two voltage controlled local oscillators 140 and 1
42, along with corresponding mixers 144 and 146, are provided with a selectively tuned superheterodyne phase-locked loop (PLL) 139 to divide the QPSK and MCM signals into two different second signals as described above with respect to FIGS. IF (
That is, they are down-converted to 3.68 MHz and 4.60 MHz, respectively. For example, oscillators 140 and 142 can both be locked to a single reference oscillator at 14.72 MHz and a phase comparator frequency of 230 kHz can be used.
At mixer 144, satellite and terrestrial signals in different frequency bands are mixed with different local oscillator input frequencies and these signals are downconverted to the same IF of about 135 MHz. For example, the mixer input frequency is F .sub.LO1
Is F .sub.terr -F .sub.IF , and F .sub.terr -2.07 MHz-F .sub.IF in a satellite signal.
At mixer 146, the sampling frequency depends on whether the receiver is using a terrestrial signal or a satellite signal for the receiver output. Mixer 146 is preferably retuned to achieve a second IF that is 1/4 of the sampling frequency used. The sampling frequency used is MCM
It is preferably an integral multiple of 2.3 MHz for terrestrial signals and an integral multiple of 1.84 MHz for QPSK / TDM satellite signals. Therefore, the mixer 146
Is retuned to facilitate simplification of I / Q generation. Feedback data from the terrestrial detection circuit described below is supplied to a superheterodyne PLL circuit 139, and depending on whether a sufficiently strong terrestrial signal has been detected and whether it is being used for a receiver output instead of a satellite signal. By the local oscillators 140 and 1
42 is controlled.
The digital filter 148 of FIG. 12 also downsamples the MCM signal (eg, the RRC filter described above with respect to FIGS. 5 and 7) as required for QPSK demodulation. Sampling frequency F .sub.4 = N .sup.* 2.3 MHz, where N = 8) Implemented to meet the requirements of the digital filter used before FFT processing.
When the receiver is first powered up, the receiver configures local oscillators 140 and 142 to down convert the satellite signal to a second 3.68 MHz IF. The sampling and A / D conversion of the satellite signal in blocks 150 and 152 are as described above. In the RRC filter, a sampling rate four times the IF (or eight times the symbol rate) is used. The passband of the RRC filter is configured such that the filter does not pass energy of adjacent terrestrial signals. If a terrestrial signal of sufficient energy is present in channel 50 adjacent to the satellite signal carried by the SAW filter, a difference in signal energy can be detected between the input and output of the RRC filter. This is performed by the ground signal detector 154 of FIG.

The ground signal detector 154 compares the signal energy at the input of the filter with the signal energy at the output of the filter. If the energy at the input of the filter is very high compared to the output of the filter (eg, 3 times higher, depending on the SAW filter frequency response), it is assumed that a terrestrial signal has been received.
When a terrestrial signal is present in an adjacent channel, a signal is generated by terrestrial signal detector 154 retuning local oscillators 144 and 146 to downconvert the terrestrial signal. Therefore, the center frequency of the terrestrial signal is shifted by about 2.07 MHz, and the second IF becomes 4.60 MHz.
Sampling and A / D
Following conversion, the terrestrial signal is applied to a digital filter 148 of the RRC type. The digital filter passes the MCM terrestrial signal to block 156 because the roll-off frequency of digital filter 148 is selected to meet the requirements of both QPSK demodulation and MCM demodulation, and the terrestrial and satellite signal bandwidths are similar. After down-sampling, an FFT process is performed in block 158. The output of the digital filter 148 is also supplied to the sampling switch and latch element 1.
60 to reproduce the TDM signal from the QPSK modulation performed at the broadcast station. Next, the switch 162 is used to select an output signal from either the sampling switch and the latch element 160 or the FFT 158, and the TDM demultiplexing and decoding circuit 164 and the post-detection diversity combiner 58 (FIG. 4).
Further processing via). The operation of the switch 162 is controlled by the ground signal detector 154.
Thus, at the bottom of the frequency plan (FIG. 3), adjacent to the satellite signal frequency bands 46 and 48, are the terrestrial repeater frequency bands 50 and 52 so that the satellite signal or terrestrial signal to receiver output is Signal selection becomes easier. Since a part of the adjacent ground signal remains in the output of the SAW filter during the reception of the satellite signal, the ground signal can be detected by comparing the signal powers.
While the preferred embodiments have been chosen to describe the invention, various changes and modifications can be made without departing from the scope of the invention as set forth in the appended claims. Will be understood by those skilled in the art.
[Brief description of the drawings]
FIG. 1 shows a digital broadcasting system for transmitting satellite signals and terrestrial signals.
FIG. 2 is a block diagram showing a broadcast segment and a terrestrial repeater segment of the digital broadcasting system according to the preferred embodiment of the present invention.
FIG. 3 shows a frequency plan of a satellite signal and a terrestrial signal in a full diversity broadcasting system according to a preferred embodiment of the present invention.
FIG. 4 is a block diagram of a satellite and terrestrial signal receiver configured in accordance with a preferred embodiment of the present invention.
FIG. 5 is a block diagram of a 1/4 phase shift keyed (QPSK) satellite signal receiver arm configured in accordance with a preferred embodiment of the present invention.
FIG. 6 shows the frequency response of a surface acoustic wave (SAW) filter for satellite and terrestrial signals according to a preferred embodiment of the present invention.
FIG. 7 shows a frequency response of a digital filter of a satellite signal according to a preferred embodiment of the present invention.
FIG. 8 is a block diagram of a multi-carrier modulated (MCM) terrestrial signal receiver arm configured in accordance with a preferred embodiment of the present invention.
FIG. 9 is a diagram showing M after surface acoustic wave filtering according to a preferred embodiment of the present invention;
4 shows a frequency response of a CM ground signal.
FIG. 10 shows the frequency response of an MCM ground signal after digital filtering according to a preferred embodiment of the present invention.
FIG. 11 is a block diagram of a receiver configured to receive both QPSK satellite signals and MCM terrestrial signals.
FIG. 12 shows a QPSK satellite signal and an MCM according to a preferred embodiment of the present invention.
FIG. 2 is a block diagram of a receiver having a composite architecture for receiving and demodulating terrestrial signals.

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Claims

1. A receiver configured to receive both broadcast signals of a first signal type and a second signal type, and to select and output one of the broadcast signals of the signal type, A first oscillator and a mixer circuit for down-converting both broadcast signals of one signal type and the second signal type to a first intermediate frequency, a center frequency corresponding to the first intermediate frequency, and the first signal A first filter having a frequency response selected to carry at least a portion of the broadcast signal of the type and the broadcast signal of the second signal type; and a broadcast signal of the first signal type and the broadcast signal. A second oscillator and a mixer circuit for down-converting the broadcast signal of the second signal type to a second intermediate frequency; and the broadcast signal and the mixer circuit of the first signal type. Sampling and analog-converting the broadcast signal of the fine the second signal type into digital signals - and the digital conversion circuit, the sampling and analog - is connected to the output of the digital conversion circuit,
Phase shift keying, ie the digital signal generated from the broadcast signal of the first signal type which is PSK modulated, and the broadcast signal of the second signal type which is modulated according to a second modulation scheme different from the PSK modulation A second filter for filtering the digital signal generated from the second signal type, and determining whether a characteristic of the second signal type exceeds a predetermined threshold value, and A signal detection circuit for generating an output signal for controlling the operation of the oscillator and the mixer circuit, wherein the first oscillator and the mixer circuit generate the first intermediate frequency by mixing the broadcast signal. A signal detection circuit configured to use one of a first and a second input frequency according to the output signal; A first signal demodulation device connected to the first filter for processing the first signal type; a second signal demodulation device connected to the second filter for processing the second signal type; A switching element for selecting one of the outputs of the signal demodulation device and the second signal demodulation device according to the output signal from the signal detection element.
2. A third filter is used in generating the broadcast signal of the first signal type, wherein the second filter has a frequency response of a matched filter corresponding to the third filter. The receiver of claim 1, wherein the receiver is configured.
3. The method of claim 2, wherein the second modulation scheme is multi-carrier modulation, ie, MCM, and wherein the second filter is configured to have a frequency response that facilitates MCM and PSK demodulation. The receiver according to 1.
4. The frequency response corresponds to a fast Fourier transform length of MCM demodulation and a sampling frequency adapted to MCM demodulation corresponding to at least one of a guard interval length used during MCM modulation. The receiver described.
5. The second signal type is a multi-carrier modulated signal demodulated using a down-sampling and fast Fourier transform process, and wherein the second filter is configured to perform the down-sampling and the second signal type of the second signal type. The receiver of claim 1, configured to perform in accordance with the fast Fourier transform process as well as filter parameters selected to facilitate PSK demodulation of the first signal type.
6. The filter of claim 1, wherein the second filter is a root raised cosine filter having a frequency response selected to facilitate demodulation of both the first signal type and the second signal type. Receiver.

7. The reception of claim 6, wherein the second filter is a matched filter configured to substantially correspond to a third filter at a broadcast station that generated the first signal type. Machine.
8. The receiver according to claim 1, wherein the first filter is a leakage filter selected from the group consisting of a surface acoustic wave filter and a ceramic filter.
9. The second signal type has a higher signal level than the first signal type, and the signal detection circuit detects the second signal level at the input / output of the second filter.
The receiver of claim 1, wherein the receiver is configured to determine a difference in signal level of a signal type.
10. A method for determining whether the characteristic of the second signal type exceeds a predetermined threshold value, wherein the characteristic value is connected to the second filter, and when the characteristic exceeds the predetermined threshold value. A signal detection circuit for controlling the second oscillator and the mixer circuit to perform down-conversion using the third intermediate frequency and generating an output signal for controlling the operation of the second oscillator and the mixer circuit
The receiver according to claim 1, further comprising:
11. A method for receiving and selecting from broadcast signals transmitted on first and second frequency channels, comprising: receiving a signal on a carrier frequency; and a broadcast signal on the second frequency channel. Depends on whether or not exceeds a predetermined threshold, using one of the first and second input frequencies to convert the received signal to a first
Down-converting to an intermediate frequency of; and filtering said received signal to carry said broadcast signal on both said first and second frequency channels; and said first frequency channel and said second
Down-converting the broadcast signal in a frequency channel to a second intermediate frequency; sampling and converting the broadcast signal into a digital signal; and filtering the digital signal, wherein the digital signal is The digital signal generated from the channel is phase shift keyed, ie, PSK modulated, and the filtering step is performed using a root raised cosine filter to facilitate PSK demodulation, generated from the second frequency channel. The day The digital signal is modulated according to a second modulation scheme different from the PSK modulation, and the filtering is performed using the root raised cosine filter; and wherein the filtering is performed from the first frequency channel. Demodulating a filtered digital signal and demodulating the filtered signal generated from the second frequency channel; and the demodulated signal or the second frequency generated from the first frequency channel. Selecting the demodulated signal generated from a channel based on whether the broadcast signal on the second frequency channel exceeds a predetermined threshold;
A method that includes
12. The filtering step comprises filtering the root raised cosine filter to have a frequency response of a matched filter corresponding to a third filter used to generate the broadcast signal on the first frequency channel. The method of claim 11, comprising the step of selecting.
13. The method of claim 11, wherein said second modulation scheme is multi-carrier modulation or MCM, and wherein said providing step comprises selecting said frequency response to facilitate MCM demodulation.
14. The frequency response is selected according to a sampling frequency of MCM demodulation corresponding to at least one of a fast Fourier transform length used for MCM demodulation and a guard interval length during MCM modulation. 14. The method of claim 13, comprising steps.
15. The broadcast signal on the second frequency channel has a higher signal level than the broadcast signal on the first frequency channel, and further compares the signal level of the digital signal before and after the filtering step. Determining whether the characteristic of the broadcast signal in the second frequency channel exceeds a predetermined threshold value; and determining whether the broadcast signal in the second frequency channel has been detected. Generating a detection signal indicative of: adjusting the input frequency to a local oscillator according to the detection signal, and mixing the received signal in the first and second frequency channels with the first signal. 14. The method of claim 11, comprising: downconverting to an intermediate frequency of.

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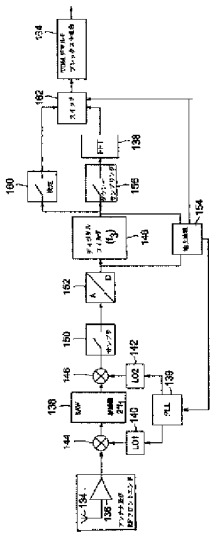
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最終頁に続く

(54)【発明の名称】　ディジタル放送システムにおいて衛星信号および地上信号を受信するデュアルモード受信機

(57)【要約】
ＱＰＳＫ変調される衛星信号およびマルチキャリア変調される（ＭＣＭ）地上信号を受信するデュアルモード受信機が提供される。本デュアルモード受信機は、ＱＰＳＫおよびＭＣＭ復調をともに促進するように選択される最小数のフィルタを備えるえる複合アーキテクチャを有する。



【特許請求の範囲】

【請求項１】

第１信号タイプおよび第２信号タイプの放送信号をともに受信し、かつ前記信号タイプの一方の放送信号を選択して出力するように構成される受信機であって、

前記第１信号タイプおよび前記第２信号タイプの前記放送信号をともに第１の中間周波数にダウンコンバートする第１の発振器およびミクサ回路と、

前記第１の中間周波数に対応する中心周波数と、前記第１信号タイプの前記放送信号および前記第２信号タイプの前記放送信号の少なくとも一部を搬送するように選択される周波数応答と、を有する第１のフィルタと、

前記第１信号タイプの前記放送信号および前記第２信号タイプの前記放送信号を第２の中間周波数にダウンコンバートする第２の発振器およびミクサ回路と、

前記第１信号タイプの前記放送信号および前記第２信号タイプの前記放送信号をディジタル信号に変換するサンプリングおよびアナログーディジタル変換回路と、

前記サンプリングおよびアナログーディジタル変換回路の出力に接続される、位相シフトキーイング、すなわちＰＳＫ変調される前記第１信号タイプの前記放送信号から生成される前記ディジタル信号と、ＰＳＫ変調と異なる第２の変調方式にしたがって変調される前記第２信号タイプの前記放送信号から生成される前記ディジタル信号をフィルタリングする第２のフィルタと、

前記第２のフィルタに接続され、前記第２信号タイプの標数が所定のしきい値を越えるかを判定し、かつ前記第１の発振器およびミクサ回路の動作を制御する出力信号を生成する信号検出回路であって、前記第１の発振器およびミクサ回路が、前記放送信号を混合することによって前記第１の中間周波数を生成するために、前記出力信号によって第１および第２の入力周波数の一方を使用するように構成される信号検出回路と、

前記第２のフィルタに接続され、前記第１信号タイプを処理する第１の信号復調装置と、

前記第２のフィルタに接続され、前記第２信号タイプを処理する第２の信号復

調装置と、
前記第１の信号復調装置および前記第２の信号復調装置の一方の出力を、前記信号検出素子からの前記出力信号に応じて選択するスイッチング素子と、
を備える受信機。
【請求項２】
前記第１信号タイプの前記放送信号を生成する際に第３のフィルタが使用され、前記第３のフィルタに対応する整合フィルタの周波数応答を有するように前記第２のフィルタが構成される、請求項１記載の受信機。
【請求項３】
前記第２の変調方式は、マルチキャリア変調、すなわちＭＣＭであり、前記第２のフィルタは、ＭＣＭおよびＰＳＫ復調を促進するような周波数応答を有するように構成される、請求項１記載の受信機。
【請求項４】
前記周波数応答は、ＭＣＭ復調の高速フーリエ変換長と、ＭＣＭ変調中に使用されるガードインターバル長の少なくとも１つに対応するＭＣＭ復調に合わせたサンプリング周波数に対応する、請求項３記載の受信機。
【請求項５】
前記第２信号タイプは、ダウンサンプリングおよび高速フーリエ変換処理を使用して復調されるマルチキャリア変調信号であり、前記第２のフィルタが、前記第２信号タイプの前記ダウンサンプリングおよび前記高速フーリエ変換処理ならびに前記第１信号タイプのＰＳＫ復調を促進するように選択されるフィルタパラメタにしたがって実行するように構成される、請求項１記載の受信機。
【請求項６】
前記第２のフィルタは、前記第１信号タイプおよび前記第２信号タイプの両方の復調を促進するように選択される周波数応答を有するルートレイズドコサインフィルタである、請求項１記載の受信機。
【請求項７】
前記第２のフィルタは、前記第１信号タイプを生成した放送局にある第３のフィルタに実質的に対応するように構成される整合フィルタである、請求項６記載

の受信機。

【請求項８】

前記第１のフィルタは、表面弾性波フィルタおよびセラミックフィルタからなる群から選択される漏洩フィルタである、請求項１記載の受信機。

【請求項９】

前記第２信号タイプは、前記第１信号タイプより高い信号レベルであることを特徴とし、前記信号検出回路が、前記第２のフィルタの入出力における前記第２信号タイプの信号レベルの差を決定するように構成される、請求項１記載の受信機。

【請求項１０】

前記第２のフィルタに接続され、前記第２信号タイプの標数が、所定のしきい値を越えるか否かを判定し、かつ前記所定のしきい値を越えている場合に前記第３の中間周波数を用いてダウンコンバートを実行するよう前記第２の発振器およびミクサ回路を制御し前記第２の発振器およびミクサ回路の動作を制御するための出力信号を生成する信号検出回路をさらに備える、請求項１記載の受信機。

【請求項１１】

第１および第２の周波数チャネルで伝送される放送信号から受信し、かつ選択する方法であって、

キャリア周波数で信号を受信するステップと、

前記第２の周波数チャネルにおける放送信号が所定のしきい値を越えるか否かによって、第１および第２の入力周波数の一方を使用して、前記受信信号を第１の中間周波数にダウンコンバートするステップと、

前記受信信号をフィルタリングして、前記第１および第２の周波数チャネルの両方において前記放送信号を搬送するステップと、

前記第１の周波数チャネルおよび前記第２の周波数チャネルにおける前記放送信号を第２の中間周波数にダウンコンバートするステップと、

前記放送信号をディジタル信号にサンプリングして変換するステップと、

前記ディジタル信号をフィルタリングするステップであって、前記第１の周波数チャネルから生成される前記ディジタル信号が、位相シフトキーイング、すな

わちＰＳＫ変調され、ＰＳＫ復調を促進するように前記フィルタリングステップがルートレイズドコサインフィルタを用いて実施され、前記第２の周波数チャネルから生成される前記ディジタル信号は、ＰＳＫ変調と異なる第２の変調方式にしたがって変調され、かつそのフィルタリングが、前記ルートレイズドコサインフィルタを用いて実施される、フィルタリングステップと、

前記第１の周波数チャネルから生成される前記フィルタリングされたディジタル信号を復調し、かつ前記第２の周波数チャネルから生成される前記フィルタリングされた信号を復調するステップと、

前記第１の周波数チャネルから生成される前記復調信号または前記第２の周波数チャネルから生成される前記復調信号を、前記第２の周波数チャネルにおける前記放送信号が所定のしきい値を越えるか否かによって選択されるステップと、を含む方法。

【請求項１２】

前記フィルタリングステップは、前記第１の周波数チャネルで前記放送信号を生成するために使用される第３のフィルタに対応する整合フィルタの周波数応答を有するように前記ルートレイズドコサインフィルタを選択するステップを含む、請求項１１記載の方法。

【請求項１３】

前記第２の変調方式はマルチキャリア変調すなわちＭＣＭであって、前記提供ステップは、ＭＣＭ復調を促進するように前記周波数応答を選択するステップを含む、請求項１１記載の方法。

【請求項１４】

前記選択ステップは、ＭＣＭ復調に使用される高速フーリエ変換長とＭＣＭ変調中のガードインターバル長の少なくとも１つに対応するＭＣＭ復調のサンプリング周波数に応じて、前記周波数応答を選択するステップを含む、請求項１３記載の方法。

【請求項１５】

前記第２の周波数チャネルにおける前記放送信号は、前記第１の周波数チャネルにおける前記放送信号より高い信号レベルを有し、さらに

前記フィルタリングステップの前後に前記ディジタル信号の信号レベルを比較して、前記第２の周波数チャネルにおける前記放送信号の標数が所定のしきい値を越えるか否かを判定するステップと、

前記第２の周波数チャネルにおける前記放送信号が検出されているか否かを示す検出信号を生成するステップと、

前記検出信号にしたがって局部発振器に対する入力周波数を調整して、前記第１および第２の周波数チャネルにおける前記受信信号を混合することによって前記受信信号を前記第１の中間周波数にダウンコンバートするステップと、

を含む、請求項１１記載の方法。

【発明の詳細な説明】

【０００１】

［発明の背景および概要］

本発明は、提案されるディジタル音声無線サービス（ＤＡＲＳ）等、衛星信号と地上信号の両方を受信する複合アーキテクチャを有するディジタル放送システムにおいて使用される受信機に関する。

【０００２】

ＵＳ－Ａ－５，６００，６７２は、第１および第２のデータストリームを受信側の受信信号から取り出すことが可能な通信システムに関連する。データストリームの一方を選択して、アナログ－ディジタル変換、フィルタリング、キャリア再生、位相同期化および復号を含むさらなる処理を行うことができる。

【０００３】

ＵＳ－Ａ－４，３５５，４０１は、アナログ信号およびディジタル角変調されたキャリア波信号を受信する受信部を有する無線装置を開示している。アナログ信号およびディジタル信号をそれぞれ復調する第１および第２の復調器が提供されている。決定回路は、クロック再生回路の出力に応答して、受信信号がアナログＦＭ波であるか、またはディジタルＦＭ波であるかを決定する。決定に応じて、復調されたアナログ信号または復調されたディジタル信号は、スイッチング手段により選択的に搬送される。

【０００４】

ＥＰ－Ａ－０５７４２７３は、ＡＭ－ＦＭ結合の復調器を有する受信機を示す。受信機は、共通発振器とミクサ回路とを有する。アナログ変調信号が受信されると、共通発振器およびミクサ回路の局部発振器の周波数は、周波数誤差検出器を利用して制御される。受信機は、さらに、アナログ変調信号の復調器と、ディジタル変調信号の復調器とが並列接続されている変調器を含む。ディジタル変調信号復調器にはディジタル変調信号弁別器が接続され、受信機を適切な復調モードに切り換える。

【０００５】

ＥＰ－Ａ－０７６９８７３は、直交振幅変調等の変調信号および残留側波帯Ｒ

Ｆ入力信号等を１つ以上受信するように適合されるＲＦ受信機に関する。ＲＦ信号は、通過帯域フィルタリングされ、３個のバンドパスフィルタおよび２個のミクサを用いてダウンコンバートされ、第３のバンドパスフィルタの出力がサンプル及びホールド回路に印加される。サンプル及びホールド回路の出力は、ローパスフィルタを介してアナログーディジタルコンバータに結合され、その出力が、サンプリングされた信号を復調し、かつベースバンド信号を生成するヒルベルトフィルタに印加される。

【０００６】

Groshong R. et. al.の「アンダーサンプリング技術はディジタル無線を簡単にする(Undersampling Techniques Simplify Digital Radio)」Electronic Design（電子設計）、第３９巻、第１０号、１９９１年5月２３日、第６７～６８、７０、７３～７５、７８頁には、広帯域入力フィルタと、第１のＩＦミクサと、第１のＩＦ狭帯域フィルタと、固定発振周波数を有する第２のＩＦミクサと、選択可能な第２のＩＦフィルタと、ＡＭ用とＦＭ用の別個の復調器と、を備える典型的なヘテロダイン受信機が記載されている。

【０００７】

［発明の概要］

本発明の目的は、複雑性を低減した受信機を用いて衛星信号および地上信号の受信を可能にする、放送信号の受信装置および方法を提供することである。

【０００８】

上記目的は、請求項１記載の受信機および請求項１１記載の方法により達成される。

【０００９】

本放送システムは、地上中継器を１つ以上使用することによって、固定式および移動式無線受信機における見通線（ＬＯＳ：line of sight）衛星信号受信に対する障害物を克服する。地上中継器は、ＱＰＳＫ変調された時分割多重方式（ＴＤＭ）衛星信号を受信し、衛星信号のベースバンド処理を実行し、マルチキャリア変調（ＭＣＭ）を介して衛星信号を再送信する。ＱＰＳＫ衛星信号受信の要件を満たすとともに地上信号のＭＣＭ復調前にダウンサンプリングフィルタとし

て動作することによって受信機の複雑性を低減するディジタルフィルタが採用される。

【００１０】

［発明の実施の形態］

図１は、全体的に１４で示す無線受信機において見通線（ＬＯＳ）衛星信号受信を行う少なくとも１つの静止衛星１２を備えるディジタル放送システム１０を示す。時間および／または空間的ダイバーシチの目的で、図３について後述する異なる軌道位置にある別の静止衛星１６を設けることができる。システム１０は、ＬＯＳ受信が、高層建造物、丘および他の障害物によって掩蔽される地理的エリア２０において衛星信号の再送信を行う少なくとも１つの地上中継器１８をさらに備える。無線受信機１４は、衛星信号と地上信号の両方を受信し、かつ上記信号の一方を受信機出力として選択するためのデュアルモード動作のために構成されることが好ましい。

【００１１】

システム１０の放送セグメント２２および地上中継器セグメント２４について、図２を参照して説明していく。放送セグメントは、ブロック２６に示すように、放送チャネルを、３．６８メガビット／秒（Ｍｂｐｓ）時分割多重方式（ＴＤＭ）ビットストリームにエンコードすることを含むことが好ましい。ＴＤＭビットストリームは、９６個の１６キロビット／秒（ｋｂｐｓ）プライムレートチャネルと、同期化、デマルチプレックス、放送チャネルコントロールおよびサービスの追加情報とを含む。放送チャネル符号化は、ＭＰＥＧ音声コード化、順方向誤り訂正（ＦＥＣ）およびマルチプレックスを含むことが好ましい。得られたＴＤＭビットストリームは、ブロック２８に示すように１／４位相シフトキーイング（ＱＰＳＫ）変調を用いて変調された後、衛星アップリング３０を介して送信される。

【００１２】

引き続き図２を参照して、地上中継器セグメントは、衛星ダウンリンク３２と、ＱＰＳＫ復調を実行してベースバンドＴＤＭビットストリームを獲得する復調器３４と、を備える。パンクチャリングおよびディレイブロック３６は、無線受

信機において再挿入可能な選択ビットを除去することによってＴＤＭビットレートを３．６８Ｍｂｐｓから３．０６７Ｍｂｐｓに低下させ、かつ、衛星１２および１６からの伝送間に時間ダイバーシチ遅延があれば、その遅延量だけＴＤＭビットストリーム全体を遅延する。遅延され、かつ低下されたレートビットストリームは、次に、ブロック３８においてマルチキャリア変調を施された後、増幅器３９により増幅され、地上中継器タワー４０から送信される。マルチキャリア変調は、時間ドメインにおける３．０６７ＭｂｐｓのＴＤＭビットストリームを、それぞれ７１００ビット／秒を搬送する４３２個のパラレルパスに分割することを含むことが好ましい。各ビットは、複素数の虚数（Ｉ）成分および実数（Ｑ）成分としてそれぞれ識別される２ビットシンボルのペアにされる。したがって、複素数シンボルレートは、３５５０シンボル／秒である。４３２個のパラレル複素数番号は、2^n個の入力および出力による５１２係数の高速フーリエ逆変換（ＩＦＦＴ）演算を用いて実行されることが好ましい離散フーリエ逆変換コンバータに対する周波数係数入力として提供される。ここでｎ＝９であり、８０個の入力係数はゼロに設定されている。ＩＦＦＴの出力は、４３２個のＱＰＳＫ直交正弦係数の集合であり、これが、３５５０／秒のシンボルレートをサポートし、かつ２８０マイクロ秒のシンボル期間を有する４３２個の狭帯域の直交キャリアを構成している。

【００１３】

フルダイバーシチの２衛星放送システム１０の周波数プランを図３に示す。本システム１０の好ましい実施の形態において、図１の衛星１２および１６は、同一番組ＡおよびＢをそれぞれ放送する。番組ＡおよびＢを、「先の」衛星１２が送信した後、「後の」衛星１６を介して送信する。周波数プランは、図３において４２、４４、４６および４８でそれぞれ示す４個のＱＰＳＫ変調の衛星信号のそれぞれに周波数帯域を割り当てる。さらに、地上中継器から送信されたマルチキャリア変調済みの番組ＡおよびＢ信号には、２個の周波数帯域５０および５２が割り当てられ、先の衛星１２からの信号を後の衛星１６により送信されたものと時間同期化するのに十分な遅延でこの信号を再送信する。周波数プランにおいて、チャネル分離は、比較的小さく、６個の周波数帯域４２～５２のそれぞれが

、約２．０７メガヘルツ（ＭＨｚ）を１２．５ＭＨｚの周波数帯域幅全体の中で占有している。

【００１４】

図４を参照して、ＱＰＳＫ信号を先の衛星１２から受信する第１アーム５４と、ＱＰＳＫ信号を後の衛星１６から受信し、かつＭＣＭ信号を地上中継器１８から受信する第２アーム５６と、２つの受信信号から受信機出力を生成する結合器５８と、を備えるデュアルモード無線受信機を説明する。２つのアーム５４および５６により、フルダイバーシチ受信が可能である。衛星信号および地上信号の受信を行うデュアルモード受信機アームとして、無線受信機のＱＰＳＫ／ＭＣＭアーム５６が用いられる。衛星１２および１６から受信されるＱＰＳＫ信号は、ブロック６０および６２においてそれぞれ復調される。また、地上中継器１８からのＭＣＭ信号（先の衛星１２により送信された信号の遅延およびマルチキャリア変調されたものからなる）も、ブロック６４に示すように復調される。デパンクチャリングユニット６６は、地上中継器からの復調信号にビットを再挿入し、ビットレートを元のＴＤＭビットストリームのレートに増大する。

【００１５】

ＱＰＳＫ／ＭＣＭ受信機アーム５６は、ブロック６７に示すように地上中継器信号がいつ存在するかを検出するように構成され、後の衛星１６からの信号の代わりに地上中継器信号を選択器６８を介して選択する。少なくとも１つの衛星と少なくとも１つの地上中継器とを有する放送システムにおいて、図３の帯域５０および５２における地上信号は、無線受信機が地上中継器のレンジ外の地方エリアにある場合には無くてもよいか、または無視できる。無線受信機が移動式であって、ユーザが都会または都市エリアに接近中に使用している場合、衛星および地上信号が、ともに受信可能である。一方、無線受信機が移動式であって、都会で運転中に使用している場合、衛星からのＬＯＳ信号の受信が不可能であるため多くの事例において地上信号しか受信できない。地上信号の強度が所定のしきい値を越えると、無線受信機のデュアルモード受信機アーム５６は、衛星１６からの信号の受信から地上中継器１８からの信号の受信に切り替わる。図４に図示のＱＰＳＫ復調器６０および６２、ＭＣＭ復調器６４、デパンクチャリングユニッ

ト６６、地上検波器６７ならびに選択器６８については、さらに詳細を後述する。

【００１６】

受信機アーム５４におけるＱＰＳＫ復調器６０の出力の信号、および受信機アーム５６における選択器６８の出力の信号は、図４のブロック７０および７２に示すように、ＴＤＭデマルチプレックスされ、復号されて、ベースバンドビットストリームを再生する。ブロック７４に示すように、受信機アーム５４において衛星１２から再生されたビットストリームは、先の衛星１２と後の衛星１６からの放送間の遅延量だけ遅延され、ビットストリームを受信機アーム５６により生成されるビットストリームと時間同期化させる。受信機アーム５４および５６からの信号は、次に、ブロック５８に示すように検出後ダイバーシチ結合(post-detection diversity combining)を施された後、ブロック７８においてＭＰＥＧ音声復号される。なお、無線受信機は、衛星ダイバーシチをサポートする必要はないため、ＱＰＳＫアーム５４を用いずにＱＰＳＫ／ＭＣＭアーム５６のみで実施可能であることが理解される。かかる無線受信機において、検出後結合器５８も省略することができる。

【００１７】

図３に示すように、地上信号のレベルは、実質的に衛星信号より高く、たとえば、衛星信号より３０デシベル（ｄＢ）のオーダで高くすることができる。上述したように、周波数プランにおけるチャネル分離は比較的小さい。このため、図３に示すように地上信号が隣接チャネルに存在する場合、衛星信号を復号する際には、ストップバンド高減衰量をともなうフィルタリングが必要となる。通常は、かかるフィルタリングは、衛星信号チャネルと地上信号チャネルとの周波数分離を増大することによって回避される。分離が十分の場合、隣接チャネルを抑止するためにチャネルフィルタが使用される。

【００１８】

本発明の１つの実施形態によれば、チャネル選択は、隣接チャネルを全体的に抑止しないフィルタを用いて実施される。後述するように、周波数プランの下部に（および後の衛星１６の周波数帯域４６および４８にそれぞれ隣接して）地上

中継器周波数帯域５０および５２があることで、受信機出力に対する、衛星信号または地上信号の選択が簡易になる。フィルタリングについては、ＱＰＳＫ復調、次いでＭＣＭ復調とともに説明した後、本発明の好ましい実施の形態にしたがって構成される結合ＱＰＳＫ／ＭＣＭデュアルモード受信機アーム（図１２）におけるフィルタリングを説明する。

【００１９】

ＱＰＳＫ衛星信号復調

ＱＰＳＫ衛星信号受信機アーム８０の概略ブロック図を図５に示す。無線受信機側のアンテナ８２および低雑音増幅器（ＬＮＡ）８４は、約２．３ギガヘルツ（ＧＨｚ）のキャリア周波数で信号を受信する。この信号は、ミクサ８６および局部発振器８８により約１３５ＭＨｚの第１の中間周波数（ＩＦ）にダウンコンバートされる。ミクサ８６からの信号は、低損失の表面弾性波（ＳＡＷ）中間周波数（ＩＦ）フィルタ９０、そして第２のミクサ９２および局部発振器９４に供給され、約３．６８ＭＨｚの第２のＩＦにダウンコンバートされる。

【００２０】

より優れた隣接チャネル抑止性を有する強力なＳＡＷフィルタに対しては、弱または「漏洩」ＳＡＷフィルタが好ましい。図６に図示するように、衛星チャネル４６に直に隣接している地上チャネル５０は、一部がＳＡＷフィルタパスバンド内に存在し、この干渉チャネル５０の減衰量は僅か約６ｄＢである。強ＳＡＷフィルタの方が隣接チャネル（たとえば、チャネル５０）をより良好に除去可能であるが、強ＳＡＷフィルタは、位相ひずみを招く可能性があるとともに、弱ＳＡＷフィルタに比べて実施が高価である。

【００２１】

図５のＱＰＳＫ衛星信号アーム８０は、ＳＡＷフィルタ９０の出力において受信信号を、第２のＩＦの４倍のサンプリングレートでサンプリングするサンプラ９６を含む。アナログ－ディジタル（Ａ／Ｄ）コンバータ１００は、サンプリングされた信号のＡ／Ｄ変換を実行し、ディジタルフィルタ１０２は、ディジタル化された衛星信号から隣接チャネル（たとえば、チャネル５０）を除去する。ディジタルフィルタ１０２は、好ましくは放送局の送信フィルタに整合される。デ

ィジタルフィルタ１０２は、ＳＡＷフィルタ９０、およびＳＡＷフィルタ９０の後の信号対雑音比（ＳＮＲ）によっては、ストップバンド減衰量が３０ｄＢ以上であってもよい。そしてディジタルフィルタ１０２の出力は、サンプリングスイッチおよびラッチ素子１０４を介して処理され、放送局において実行されるＱＰＳＫ変調からＴＤＭ信号を回収する。

【００２２】

ディジタルフィルタ１０２は、好ましくはＱＰＳＫ変調および復調において一般的なルートレイズドコサイン（ＲＲＣ）フィルタである。好ましい実施の形態において、ＲＲＣフィルタは、サンプリングレートが、ＩＦの４倍であり、かつ発信放送局からの衛星信号において送信されるシンボルレートの８倍である。さらに、（＝０．１５のロールオフ率が選択される。図７に示すように、ＲＲＣフィルタの周波数応答は、パスバンドリップルが０．１ｄＢ、ストップバンドリップルが４０ｄＢである。図７は、理想的なＲＲＣ周波数応答、レメズアルゴリズム(Remez algorithm)の結果、および係数量子化後のＲＲＣ周波数応答を表す３つのプロットを提供する。かかるＲＲＣフィルタ仕様は、１０ビットの固定点係数と１６ビットのワード長を有する１３６タップの線形位相有限インパルス応答（ＦＩＲ）フィルタにより実現できる。

【００２３】

地上信号のＭＣＭ復調

図８にＭＣＭ復調器を示す。ＭＣＭ復調の際、ＦＦＴを利用して無線受信機でフィルタバンクを実施し、地上中継器でのＭＣＭ変調に関して上述したＩＦＦＴに対応する。図８に図示したＦＦＴの入力は、ＭＣＭ伝送に選択される多数のパラメタにしたがってサンプリングされる。サンプリング周波数は、地上中継器から１秒ごとに伝送されるＭＣＭシンボルの数に対応するＭＣＭシンボル周波数F_sに依存する。さらに、サンプリング周波数は、ＦＦＴ長および各ＭＣＭシンボルに関連するガードインターバル長に依存する。サンプリング周波数は、$F_4 = F_s^* FFTLEN^* (1 + GUARDLEN_REL)$であることが好ましい。ここで、ＦＦＴＬＥＮは、ＦＦＴ長（たとえば、５１２）に対応し、ＧＵＡＲＤＬＥＮ＿ＲＥＬは、有効長またはシンボル期間（たとえば、２８０マイクロ秒）

に対するガードインターバル長に対応し、F_sは、ＭＣＭシンボル周波数に対応する。ＭＣＭシンボル周波数F_sは、１ＭＣＭシンボルあたりのビット数で割ったビットレートである。一例として、ＭＣＭ信号ビットレートは３．０６７メガビット／秒（Ｍｂｐｓ）としてもよく、１シンボルあたりのビット数は８６４または４３２としてもよい。

【００２４】

引き続き図８を参照して、約２．３ＧＨｚのＭＣＭ信号が、アンテナ１０６および低雑音増幅器（ＬＮＡ）１０８を介して無線受信機で受信され、ミクサ１１０および局部発振器１１２により約１３５ＭＨｚのＩＦにダウンコンバートされた後、ＳＡＷフィルタ１１４によって処理される。信号は、ＳＡＷフィルタ１１４により帯域制限されてエイリアシング成分を回避する。ＳＡＷフィルタの帯域幅におけるサンプリング周波数は、サンプリング信号のナイキスト基準を満たす。受信されたＭＣＭ信号は、次に、第２のミクサ１１６および第２の局部発振器１１８を用いて、約４．６０ＭＨｚの第２のＩＦにダウンコンバートされる。信号は、サンプラ１２０により、この信号の帯域幅より高い周波数、すなわち$F_2>=2*F_1$のサンプリング周波数でサンプリングされる。所要のサンプリング周波数は、図９に示すように、所望の地上信号の帯域幅に比べて高い（たとえば、所望の信号の帯域幅より４倍高い）。ブロック１２２のＡ／Ｄ変換に続いて、ディジタルフィルタ１２４を用いて隣接チャネルを抑止する。ディジタルフィルタ１２４は、隣接する衛星チャネル４６のレベルが地上信号５０より大幅に低い（すなわち、３０ｄＢのオーダで低い）ため、バンドパスフィルタに対してローパスフィルタとすることができる。隣接する衛星チャネル４６は、単に、Ａ／Ｄ変換およびダウンサンプリング後のノイズとして現れる。ディジタル低域フィルタリング後に得られるスペクトルを図１０に示す。ここで、帯域幅はF_3と等価である。次に信号には、より低いサンプリング周波数$F_4>=2*F_3$によって表されるようにダウンサンプリングが施される。周波数F_2およびF_4は、F_4が$N*F_2$に等しくなるように選択され、ここで、Ｎはたとえば４といった整数である。

【００２５】

ブロック１２６においてダウンサンプリングした後のディジタルローパスフィ

ルタ１２４の出力は、図８に示すようにＭＣＭ復調プロセスの一部としてＦＦＴに供給される。サンプルは、シリアル－パラレル変換によりベクトルに変換され、次にＦＦＴにより周波数ドメインに変換された後、逆マッピングプロセスを介して復号される。マッピングプロセスは、複素数値を有するデータベクトルの形式のＦＦＴの出力を出力ビットストリームに変換する。

【００２６】

デュアルモード受信機

ＱＰＳＫ変調は衛星放送にとって効率のよい方法であり、一方、ＭＣＭ変調は地上放送に有効である。地方および郊外エリアに衛星放送を採用し、たとえば高層建造物により衛星信号が遮蔽される都心には地上放送を採用するシステムにおいて、衛星信号と地上信号の両方を受信するために併合受信機が必要とされる。１つの可能なデュアルモード受信機を図１１に示す。このデュアルモード受信機は、図１の無線受信機１４における衛星／地上アーム５６として利用可能である。衛星信号および地上信号が同一周波数を使用する場合、共通チューナ１２９が使用できる。デュアルモード受信機のＱＰＳＫアーム１３０およびＭＣＭアーム１３２は、図５および図８に関して上述したＱＰＳＫ復調器およびＭＣＭ復調器とそれぞれ同一にすることができる。

【００２７】

本発明の好ましい実施の形態によれば、たとえば、無線受信機の衛星／地上アームを実施するデュアルモード受信機は、ＱＰＳＫ変調とＭＣＭ復調のための複合アーキテクチャを用いて実施される。この共通アーキテクチャを図１２に示す。図１２に示すデュアルモード受信機は、１個のＳＡＷフィルタと１個のディジタルフィルタで済み、図１１に示したものに比べて受信機のコストおよび複雑性を低減するために好適である。

【００２８】

図１２を参照して、２．３３２～２．３４５ＧＨｚの範囲の周波数であることが好ましい衛星および地上信号を受信するためにアンテナ１３４およびＬＮＡ１３６が設けられる。受信された衛星および地上信号は、弱または「漏洩」ＳＡＷフィルタであることが好ましい同一のＳＡＷフィルタ１３２に供給される。前述

したように、隣接チャネル抑止に優れている強ＳＡＷフィルタより弱ＳＡＷフィルタの方が好ましいが、これは、強ＳＡＷフィルタは、位相ひずみを招く可能性があるとともに、実施が高価であることによる。図６に示すように、弱ＳＡＷフィルタのパスバンドは、隣接チャネルにおける地上信号を僅か約６ｄＢだけ減衰する。この隣接チャネルの一部抑止は、地上信号の検出を可能にするという点で好適である。デュアルモード受信機は、地上信号が所定のしきい値を越える度に、受信された衛星信号を上回る受信された地上信号を受信機出力用に選択するように構成される。したがって、デュアルモード受信機は、本質的に地上信号を常時サーチし、地上信号が存在しない場合のみ衛星信号を選択する。

【００２９】

図示の実施の形態において、２個の電圧制御された局部発振器１４０および１４２を対応するミクサ１４４および１４６とともに、選択的に同調するスーパーヘテロダイン位相ロックループ（ＰＬＬ）１３９が設けられ、図５および図８に関して上述したように、ＱＰＳＫおよびＭＣＭ信号を２個の異なる第２のＩＦ（すなわち、それぞれ３．６８ＭＨｚと４．６０ＭＨｚ）にダウンコンバートする。たとえば、発振器１４０および１４２をともに１４．７２ＭＨｚの１つの参照発振器にロックし、２３０ｋＨｚの位相比較器周波数を使用することができる。ミクサ１４４において、周波数帯域が異なる衛星および地上信号は、異なる局部発振器入力周波数と混合され、これらの信号は約１３５ＭＨｚの同一ＩＦにダウンコンバートされる。たとえば、ミクサ入力周波数は、地上信号においてF_{LO1}が$F_{terr}-F_{IF}$、衛星信号において$F_{terr}-2.07MHz-F_{IF}$である。

【００３０】

ミクサ１４６において、サンプリング周波数は、受信機が受信機出力に地上信号を使用しているか、または衛星信号を使用しているかによって異なる。ミクサ１４６は、使用されるサンプリング周波数の１／４である第２のＩＦを達成するように再同調されることが好ましい。使用されるサンプリング周波数は、ＭＣＭ地上信号において２．３ＭＨｚの整数倍であり、ＱＰＳＫ／ＴＤＭ衛星信号において１．８４ＭＨｚの整数倍であることが好ましい。したがって、ミクサ１４６を再同調することで、Ｉ／Ｑ生成の単純化が容易になる。後述する地上検波回路

からのフィードバックデータは、スーパーヘテロダインＰＬＬ回路１３９に供給され、十分に強力な地上信号が検出されたか否かによって、そして衛星信号の代わりに受信機出力に使用されているか否かによって、局部発振器１４０および１４２の動作を制御する。

【００３１】

図１２のディジタルフィルタ１４８は、ＱＰＳＫ復調に必要とされる整合フィルタ（たとえば、図５および図７に関して上述したＲＲＣフィルタ）の周波数応答もまた、ＭＣＭ信号をダウンサンプリングして（たとえば、サンプリング周波数$F_4=N^*2.3MHz$において、ただしＮ＝８）ＦＦＴ処理する前に使用されるディジタルフィルタの要件を満たすように実施される。受信機がまず電源投入されると、受信機は、衛星信号を３．６８ＭＨｚの第２のＩＦにダウンコンバートするように局部発振器１４０および１４２を構成する。ブロック１５０および１５２における衛星信号のサンプリングおよびＡ／Ｄ変換は、前述の通りである。ＲＲＣフィルタにおいて、ＩＦの４倍（またはシンボルレートの８倍）のサンプリングレートが使用される。ＲＲＣフィルタのパスバンドは、当該フィルタが隣接する地上信号のエネルギーを通過させないような構成である。十分なエネルギーの地上信号が、ＳＡＷフィルタによって搬送される衛星信号に隣接するチャネル５０に存在する場合、信号エネルギーの差が、ＲＲＣフィルタの入出力間で検出できる。これは、図１２の地上信号検出器１５４により実施される。地上信号検出器１５４は、フィルタの入力側の信号エネルギーと、フィルタの出力側の信号エネルギーとを比較する。フィルタの入力側のエネルギーがフィルタ出力側に比べて非常に高い（たとえば、ＳＡＷフィルタ周波数応答にもよるが、３倍のオーダで高い）場合、地上信号が受信されていると推定される。

【００３２】

地上信号が隣接チャネルに存在する場合、地上信号検出器１５４が局部発振器１４４および１４６を再同調して地上信号をダウンコンバートすることによって信号が生成される。したがって、地上信号の中心周波数は、約２．０７ＭＨｚだけシフトされ、第２のＩＦは４．６０ＭＨｚになる。サンプリングおよびＡ／Ｄ変換に続いて、地上信号は、ＲＲＣタイプのディジタルフィルタ１４８に印加さ

れる。ディジタルフィルタ１４８のロールオフ周波数がＱＰＳＫ復調とＭＣＭ復調の要件をともに満たすように選択され、かつ地上および衛星信号の帯域幅は同様であるため、ディジタルフィルタは、ＭＣＭ地上信号をブロック１５６に渡してダウンサンプリングした後、ブロック１５８においてＦＦＴ処理を行う。また、ディジタルフィルタ１４８の出力もサンプリングスイッチおよびラッチ素子１６０に供給され、放送局において実行されるＱＰＳＫ変調からＴＤＭ信号を再生する。次に、スイッチ１６２を用いて、サンプリングスイッチおよびラッチ素子１６０またはＦＦＴ１５８のいずれか一方から出力信号を選択し、ＴＤＭデマルチプレックスおよび復号回路１６４および検出後ダイバーシチ結合器５８（図４）を介してさらに処理する。スイッチ１６２の動作は、地上信号検出器１５４により制御される。

【００３３】

したがって、周波数プラン（図３）の下部に、衛星信号の周波数帯域４６および４８に隣接して、地上中継器周波数帯域５０および５２があることで、受信機出力に対する、衛星信号または地上信号の選択がし易くなる。隣接する地上信号の一部が、衛星信号の受信中にＳＡＷフィルタの出力に残っているため、信号パワーの比較により地上信号を検出することができる。

【００３４】

本発明を説明するために有利な実施の形態を選んできたが、添付の特許請求の範囲に記載される本発明の範囲から逸脱することなく、各種の変更および変形をし得ることが当業者には理解されるであろう。

【図面の簡単な説明】

【図１】

図１は、衛星信号および地上信号の伝送を行うディジタル放送システムを示す。

【図２】

図２は、本発明の好ましい実施の形態に係るディジタル放送システムの放送セグメントおよび地上中継器セグメントを示すブロック図である。

【図３】

図３は、本発明の好ましい実施の形態に係るフルダイバーシチ放送システムにおける衛星信号および地上信号の周波数プランを示す。

【図４】

図４は、本発明の好ましい実施の形態にしたがって構成される衛星信号および地上信号の受信機のブロック図である。

【図５】

図５は、本発明の好ましい実施の形態にしたがって構成される１／４位相シフトキーイングされた（ＱＰＳＫ）衛星信号の受信機アームのブロック図である。

【図６】

図６は、本発明の好ましい実施の形態に係る衛星信号および地上信号の表面弾性波（ＳＡＷ）フィルタの周波数応答を示す。

【図７】

図７は、本発明の好ましい実施の形態に係る衛星信号のディジタルフィルタの周波数応答を示す。

【図８】

図８は、本発明の好ましい実施の形態にしたがって構成されるマルチキャリア変調された（ＭＣＭ）地上信号の受信機アームのブロック図である。

【図９】

図９は、本発明の好ましい実施の形態に係る表面弾性波フィルタリング後のＭＣＭ地上信号の周波数応答を示す。

【図１０】

図１０は、本発明の好ましい実施の形態に係るディジタルフィルタリング後のＭＣＭ地上信号の周波数応答を示す。

【図１１】

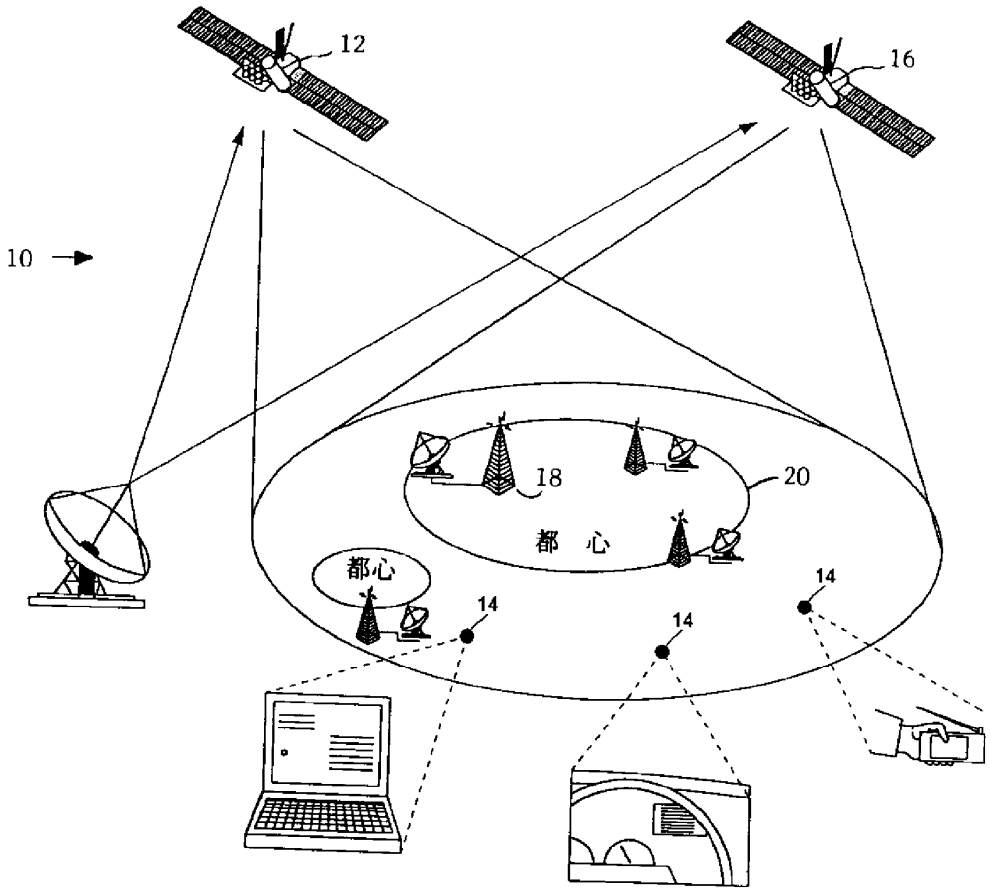
図１１は、ＱＰＳＫ衛星信号とＭＣＭ地上信号の両方を受信するように構成される受信機のブロック図である。

【図１２】

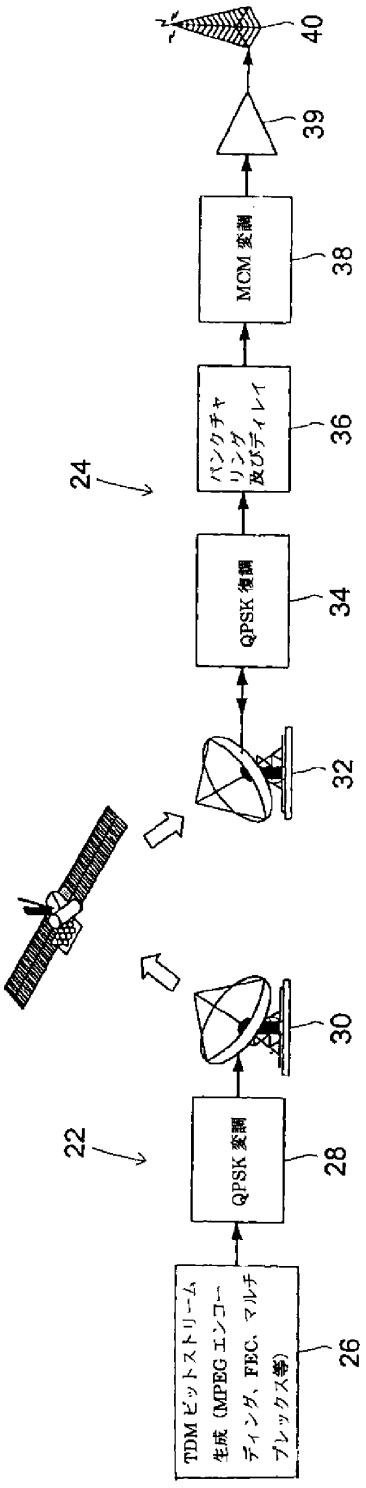
図１２は、本発明の好ましい実施の形態に係るＱＰＳＫ衛星信号およびＭＣＭ地上信号を受信して復調する複合アーキテクチャを有する受信機のブロック図で

ある。

【図１】

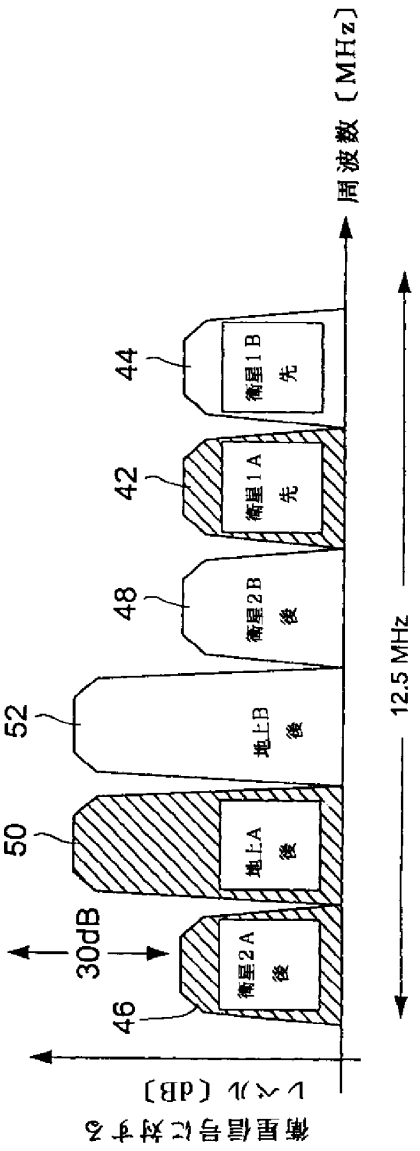


【図２】

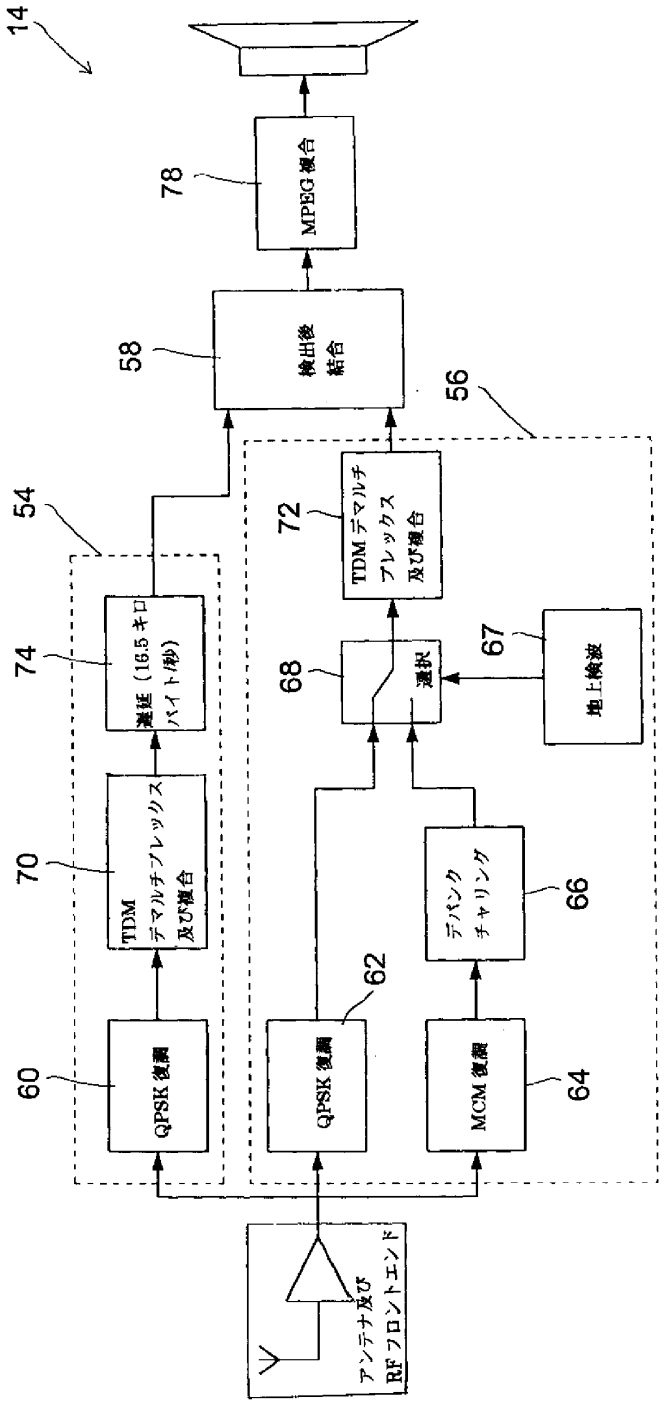


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【図３】

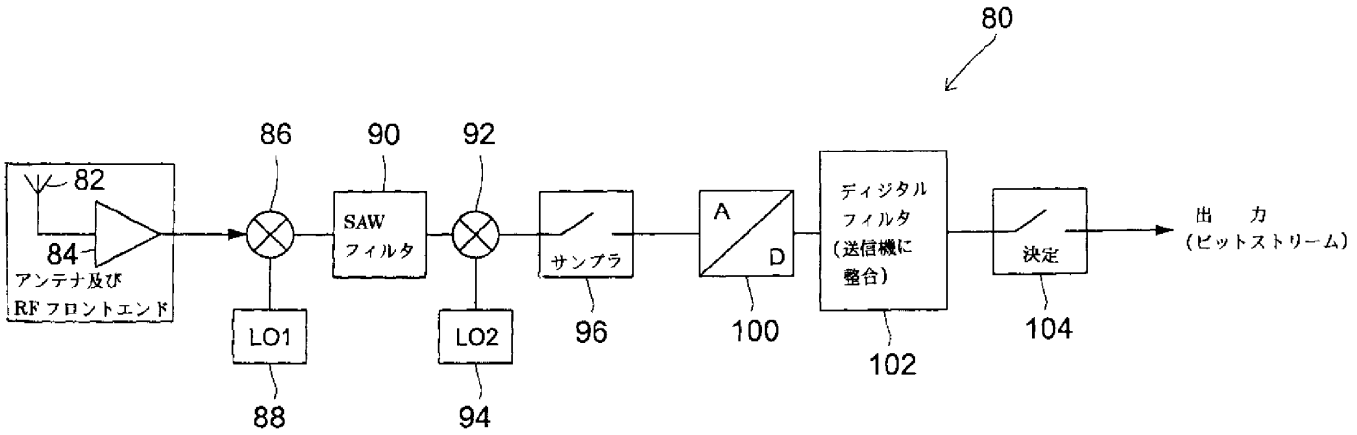

衛星信号に対するレベル〔dB〕
周波数〔MHz〕
12.5 MHz
30dB
46
衛星2A 後
50
地上A 後
52
地上B 後
48
衛星2B 後
42
衛星1A 先
44
衛星1B 先

【図４】

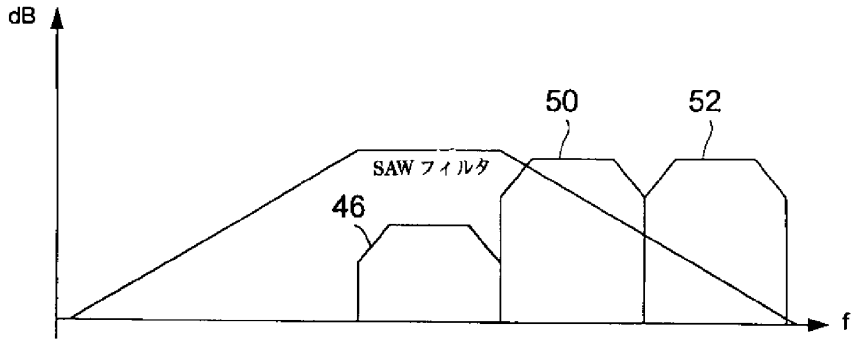


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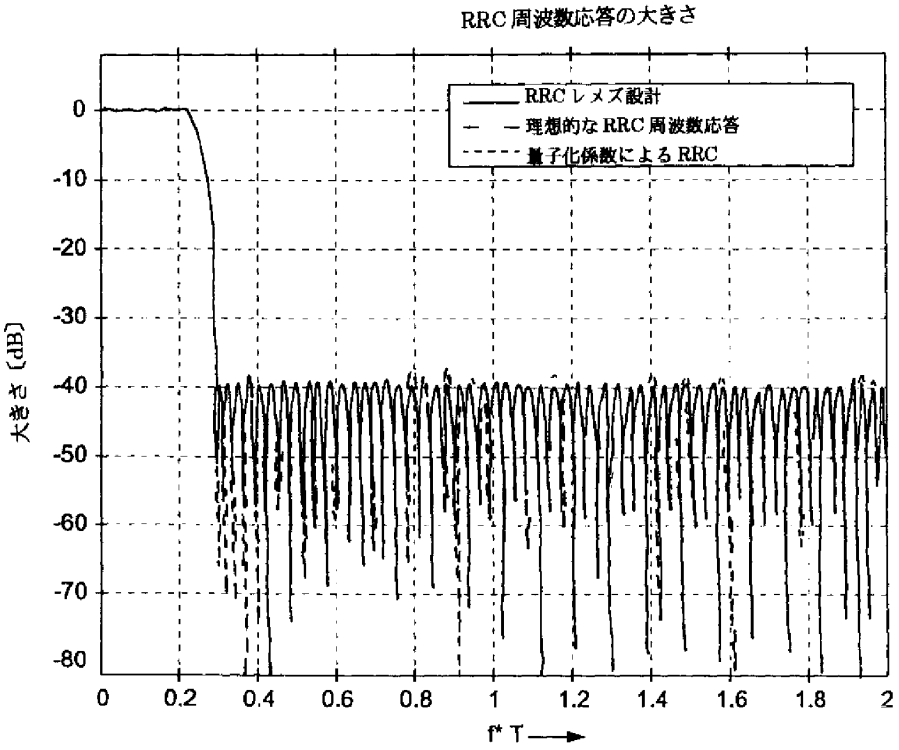
【図5】


80
82
84
アンテナ及び
RF フロントエンド
86
LO1
88
90
SAW
フィルタ
92
LO2
94
サンプラ
96
A
D
100
ディジタル
フィルタ
(送信機に
整合)
102
決定
104
出　力
(ビットストリーム)

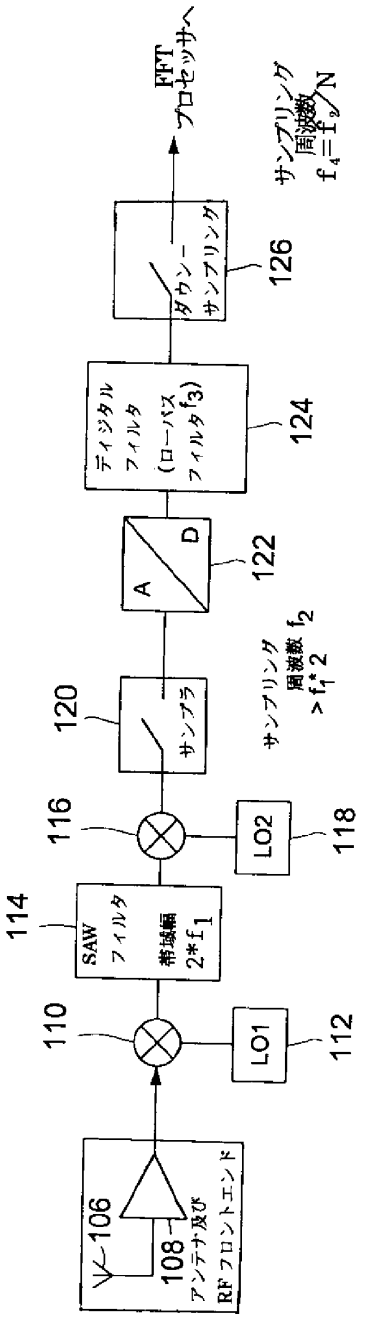
【図６】


dB
50
52
SAW フィルタ
46
f

【図７】

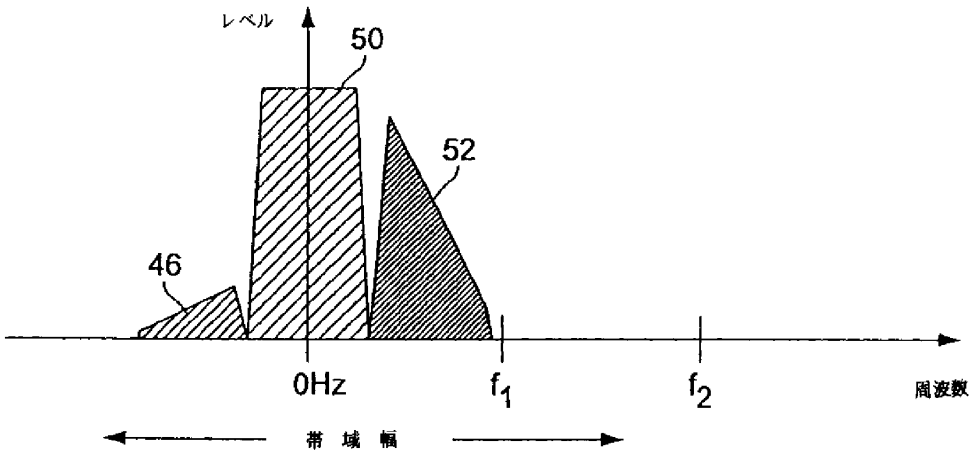

RRC 周波数応答の大きさ
RRC レメズ設計
理想的な RRC 周波数応答
量子化係数による RRC
大きさ [dB]
0
-10
-20
-30
-40
-50
-60
-70
-80
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
f* T

【図８】

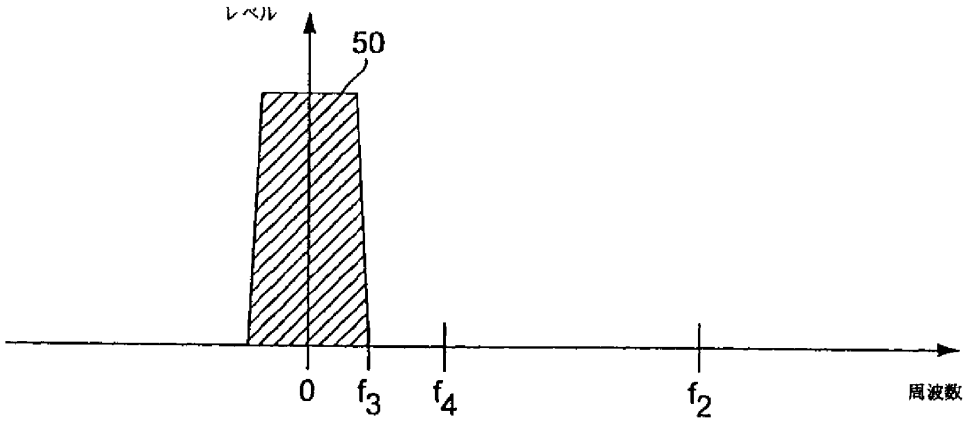


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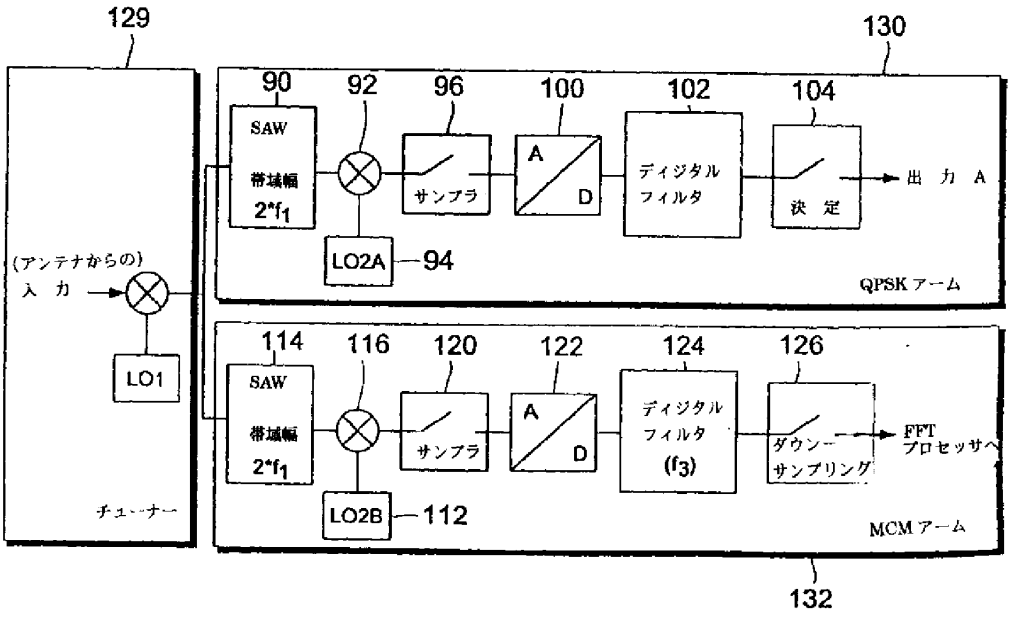
【図９】



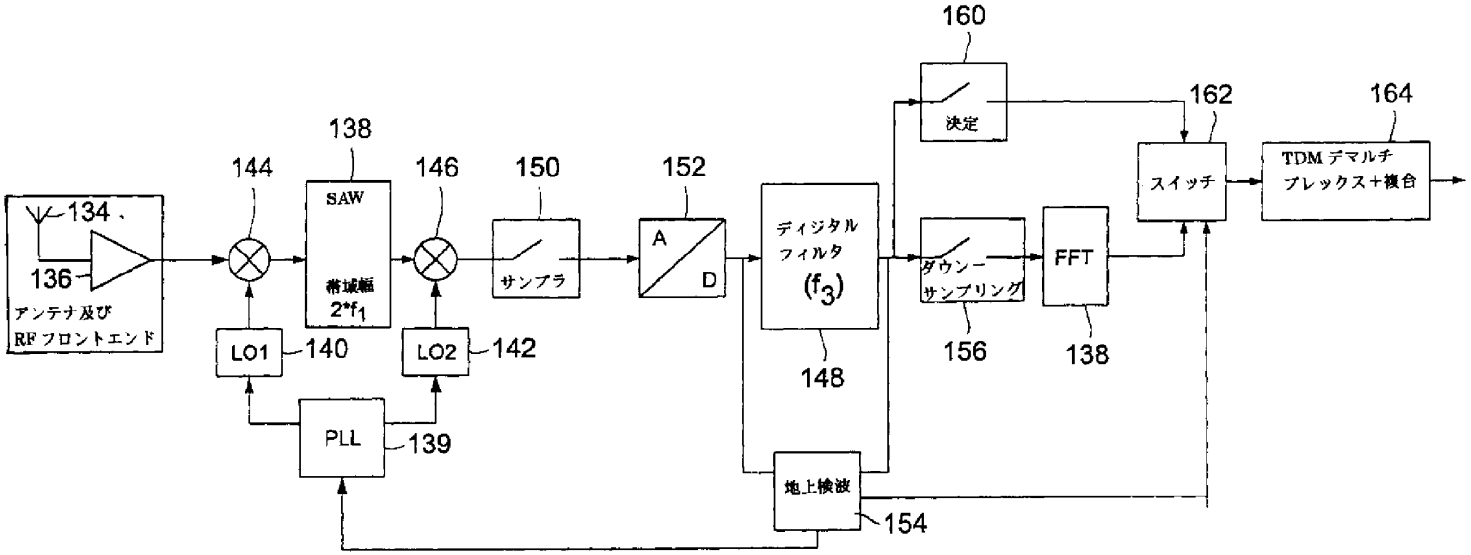
【図１０】



【図１１】


129
130
90
92
96
100
102
104
SAW
帯域幅
2*f1
サンプラ
A
D
ディジタル
フィルタ
決 定
出 力 A
(アンテナからの)
入 力
LO2A
94
QPSK アーム
LO1
114
116
120
122
124
126
SAW
帯域幅
2*f1
サンプラ
A
D
ディジタル
フィルタ
(f3)
ダウン
サンプリング
FFT
プロセッサへ
LO2B
112
チューナー
MCM アーム
132

【図１２】


160
決定
162
164
138
144
146
150
152
SAW
帯域幅
2*f1
134
136
アンテナ及び
RFフロントエンド
サンプラ
A
D
ディジタル
フィルタ
(f3)
スイッチ
TDMデマルチ
プレックス＋複合
ダウン－
サンプリング
FFT
LO1
140
LO2
142
PLL
139
148
156
138
地上検波
154

【国際調査報告】

INTERNATIONAL SEARCH REPORT

Inte. ional Application No
PCT/EP 98/02168

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H04L27/00 H04H1/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 H04L H04H H04B H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 600 672 A (OSHIMA MITSUAKI ET AL) 4 February 1997 see abstract see column 55, line 26 - line 55 see column 76, line 61 - column 78, line 6 see claim 12 see figures 138,156	1,3,6, 10,12,15
A	US 4 355 401 A (IKOMA MASAO ET AL) 19 October 1982 see abstract see column 2, line 27 - line 46 see column 4, line 29 - line 42 see figures 1,3	1,5,6, 10,15

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
1 December 1998	07/12/1998

Name and mailing address of the ISA	Authorized officer
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page 1 of 2

INTERNATIONAL SEARCH REPORT

Inte onal Application No
PCT/EP 98/02168

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category '	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	GROSHONG R ET AL: "UNDERSAMPLING TECHNIQUES SIMPLIFY DIGITAL RADIO" ELECTRONIC DESIGN, vol. 39, no. 10, 23 May 1991, pages 67-68, 70, 73 - 75, 78, XP000234611 see the whole document	1,10
A	EP 0 769 873 A (PARADYNE CORP) 23 April 1997 see abstract see claims 3-5 see figure 1	1

1

Form PCT/ISA/210 (continuation of second sheet (July 1992)

INTERNATIONAL SEARCH REPORT

information on patent family members

Inter nal Application No
PCT/EP 98/02168

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Personal wireless communication apparatus and method having a hearing compensation facility

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YOON GIL WON	N/A	N/A	N/A	KR

DATE FILED
2000-12-06

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TYPE	CPC	DATE
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CPCI	H04M1/72478	2021-01-01

Abstract

PURPOSE: A personal wireless communication apparatus and method having a hearing sense compensation function is provided to compensate the level and characteristic of a sound provided to users according to a hearing sense characteristic of each user. CONSTITUTION: A decoding unit(10) decodes a demodulated voice signal and outputs the decoded result. A hearing sense compensating unit(12) modifies a level of the decoded result inputted from the decoding unit(10) according to a hearing sense characteristic of a user and outputs a digital voice signal having the modified level. A digital/analog converting unit(14) converts the digital voice signal outputted from the hearing sense compensating unit(12) into an analog voice signal, and provides the analog voice signal to the user.

Description

INVENTION-TITLE
BACKGROUND-ART
BACKGROUND OF THE INVENTION 1. Field of the Invention The present invention relates to personal wireless communication devices, such as mobile phone devices, and the like, and more particularly, to personal wireless communication devices and methods having an auditory correction function.
The main purpose of the conventional cellular phone apparatus is to transmit / receive high quality sound close to the original sound with a small amount of data. Accordingly, techniques related to vocoder—voice coder (EVC), enhanced variable rate codec (EVRC), adaptive multirate codec (AMR), and the like have been developed.
On the other hand, modern people have some hearing impairments due to environmental factors, and it is difficult to avoid obstacles such as high frequency hearing loss due to aging. In addition, some people have hearing loss due to congenital or acquired diseases. Thus, regardless of whether the user of the mobile telephone apparatus that listens to the sound is the owner of the normal hearing characteristics or the

abnormal hearing characteristics, the users have their own hearing characteristics. Here, the abnormal auditory characteristic refers to a hearing impairment in which a dynamic range of a sound that can recognize a sound is reduced, which will be described later in detail.
However, the conventional mobile phone apparatus has a problem in that a sound corresponding to the hearing characteristics of the user cannot be provided because it does not have a sound correction function according to the hearing characteristics of the user. In particular, although sound correction is essential for users who are deaf or hard of hearing due to elderly people or hearing impairments, such a conventional mobile telephone apparatus cannot provide a sound correction function.
TECHNICAL-FIELD
SUMMARY OF THE INVENTION The present invention has been made in an effort to provide a personal wireless communication device having an auditory correction function for correcting a volume and a characteristic of a sound to be provided to a user according to hearing characteristics of each user.
Another object of the present invention is to provide a personal wireless communication method having an auditory correction function performed in the personal wireless communication device.
DISCLOSURE
TECH-SOLUTION

A personal wireless communication device having an auditory correction function according to the present invention for achieving the above object includes: a decoder for decoding a digital voice signal received and demodulated from the outside and outputting a decoded result; The size of the decoded result is modified according to the user's hearing characteristics, and the digital audio signal output from the auditory corrector and the audio corrector outputting the digital speech signal having the modified size is converted into an analog voice signal. It is preferably composed of a digital to analog converter provided to the user.

In accordance with another aspect of the present invention, there is provided a personal wireless communication method having an auditory correction function, the method including decoding a digital voice signal received and demodulated from the outside, and converting the magnitude of the decoded result signal into a user's hearing characteristics. And correspondingly modifying to obtain a digital voice signal having a modified magnitude, and converting the digital voice signal having the modified magnitude into an analog voice signal and providing the same to the user.

Hereinafter, a configuration and operation of a personal wireless communication device having an auditory correction function according to the present invention and a wireless communication method performed in the device will be described with reference to the accompanying drawings.

1 is a block diagram of a personal wireless communication device having an auditory correction function according to the present invention, which includes a decoding unit 10, an auditory correction unit 12, and a digital to analog converter (DAC) 14. It consists of.

FIG. 2 is a flowchart for describing a personal wireless communication method having an auditory correction function according to the present invention performed by the apparatus shown in FIG. 1, and the method of decoding a speech signal (step 20) and the magnitude of the decoded result. Is transformed according to the auditory characteristics of the user (steps 22 to 26) and converting the modified signal into an analog signal (step 28).

First, the decoding unit 10 shown in FIG. 1 inputs and decodes a digital voice signal received and demodulated from the outside through the input terminal IN1, and outputs the decoded result to the hearing correction unit 12 (step 20).).

After the twentieth step, the hearing correction unit 12 transforms the size of the decoded result input from the decoder 10 in accordance with the hearing characteristics of the user input through the input terminal IN2, and has a digital voice having the modified size. The signal is output to the digital / analog converter 14 (steps 22 to 26).

Prior to describing the twenty-second to twenty-sixth stages, the general auditory characteristics of humans are discussed as follows.

FIG. 3 is a graph illustrating general hearing characteristics of humans, in which the vertical axis represents sound pressure and the horizontal axis represents frequency. Here, reference numeral 44 denotes a sound pressure distribution for speech, and reference numeral 46 denotes a sound pressure distribution for music.

The smallest loudness that a human can hear (HT: Hearing Threshold) and the maximum loudness (UCL: UnComfortable Hearing Level) that can cause ear pain or cause hearing problems. Is called the discomfort threshold). Here, the range between HT and UCL is called the 'sound intensity range'. In addition, audible and unpleasant thresholds vary from person to person, and these thresholds come in various forms, particularly in the case of severe hearing loss. As shown in FIG. 3, the HT 42 of the non-normal person with abnormal hearing is higher than the HT 40 of the normal person with normal hearing, and the UCL 48 of the non-normal person is higher than the UCL 50 of the normal person. Going down is a common phenomenon.

4A to 4C are graphs illustrating various auditory characteristics. FIG. 4A illustrates average hearing characteristics of a normal person, FIG. 4B illustrates average hearing characteristics of an abnormal person with conductive hearing loss, and FIG. 4C Average auditory characteristics of non-normal persons with sensorineural loss are shown. 4b to 4c, the dotted line represents the normal HT of the normal user, and the solid line represents the HT of the normal or abnormal user and the back sensory level (the sound pressure for each frequency detected by the user with the same loudness in the form of a contour line). Represent each.

The hearing characteristics of the abnormal user having the conductive hearing impairment shown in FIG. 4B are increased compared to the normal user shown in FIG. 4A, and the contours of the same shape as in the normal case are maintained for each frequency and sound pressure. . In the case of conductive hearing loss, the distortion of sound according to frequency is small and it is difficult to hear the sound in the entire frequency range. On the other hand, the HT and the sensory level for each frequency and sound pressure of the non-normal user with the aural hearing loss shown in FIG. 4C show an example in which hearing ability is lost in the high frequency region compared to the normal person. In this case, compensation according to frequency is required, and the present invention is particularly effective for auditory compensation in this case.

Therefore, the hearing correction unit 12 shown in FIG. 1 performs the twenty-second to twenty-sixth steps, and the personal wireless communication device has a dynanmic range of sound that can be heard by the user for each frequency. Transform according to the user's hearing characteristics. For example, the hearing correction unit 12 may convert the intensity range 60 of a sound that can be heard by a normal user into the intensity range 62 of a sound that can be heard by an abnormal user, as shown in FIG. 4C for a 4 KHz frequency signal. It transforms. Here, the deformation that reduces the intensity range of the sound, which is the input signal, from 60 to 62 is referred to as 'compression'.

The twenty-second through twenty-sixth steps performed by the auditory corrector 12 shown in FIG. 1 will be described below with reference to the accompanying drawings.

FIG. 5 is a block diagram of a preferred embodiment of the auditory correction unit 12 shown in FIG. 1 according to the present invention, and includes first to Mth band pass filters (BPFs) 72, 74,. And a filter bank 70 comprising 76, a unit 80 composed of first to Mth signal converting units 82, 84, ..., and 86, and a signal synthesizing unit 90.

First, after the twentieth step, the band pass filters 72, 74, ..., and 76 of the filter bank 70 may decode the decoded result input from the decoder 10 through the input terminal IN3 for each desired frequency band. The filtered results are output to the first to Mth signal converters 82, 84,... And 86 as first to Mth band

signals (step 22). For example, the m th (1 m M) band pass filter 72, 74,... Or 76 filters the decoded result in the desired m th frequency band and filters the filtered result as the m th band signal. The signal is output to the signal converters 82, 84, ... or 86. Here, the number M of band pass filters may be 4 to 8, and each band pass filter may be implemented as an octave band filter. At this time, M and the width of each band pass filter may be fixed. As described above, the reason for filtering the decoded result for each desired frequency band is to adjust the gain of the decoded result differently for each frequency band, since a user's hearing abnormality or auditory difference generally appears different for each frequency.

After the twenty-second step, the unit 80 consisting of the first to Mth signal converting units 82, 84,..., And 86 measures the magnitude of each of the first to Mth band signals, and measures the magnitude. Each of them is transformed in correspondence to the user's auditory characteristics input through the input terminal IN2, and the band signals having the modified magnitudes are output to the signal synthesis unit 90 as the first to Mth transform band signals (step 24).). For example, the m-th signal converter 82, 84, ... or 86 measures the magnitude of the m-th band signal, transforms the measured magnitude corresponding to the auditory characteristics input through the input terminal IN2, The m th conversion band signal having the magnitude is output to the signal synthesizing unit 90.

The configuration and operation of a preferred embodiment according to the present invention of each signal converter 82, 84, ..., or 86 shown in FIG. 5 will be described below.

FIG. 6 is a block diagram of an exemplary embodiment of the m-th signal converter shown in FIG. 5 and includes a signal measuring unit 100 and a gain controlling unit including a size measuring unit 106 and a size determining unit 108. 102 and the amplifier 104.

FIG. 7 is a flowchart illustrating an operation according to an exemplary embodiment of the present invention for generating an m-th conversion band signal in the m-th signal converter shown in FIG. 5, and measuring the magnitude of the m-th band signal. Step (120), adjusting the measured magnitude (122-130) and changing the gain of the m-th band signal corresponding to the adjusted magnitude and auditory characteristics (step 132 and 134). S).

First, after the twenty-second step, the signal magnitude adjusting unit 100 of the m-th signal converter 82, 84,..., Or 86 shown in FIG. 6 passes through the m-th BPF 72, 74,. .. or 76) measure the magnitude of the m-th band signal input from the sensor, detect whether the measured magnitude of change is large, and gradually increase or decrease the magnitude of the m-th band signal in response to the detected result. To the gain control unit 102 (steps 120 to 130).

Here, the role of the signal amplitude adjusting unit 100 will be described.

Even if the signal amplitude adjusting unit 100 shown in FIG. 6 is not provided, the sound is moderately loud when the volume of the sound provided to the user by the hearing correction unit 12 is small, and the sound is too loud when the loudness of the sound is too large. Decreases moderately. However, when the magnitude of the signal suddenly increases or decreases suddenly, a very loud sound or a very small sound may be output. That is, when a small sound corresponding to the input signal suddenly changes loud, a signal having a magnitude smaller than that of the input signal should be output. However, in this case, suddenly reducing the loudness may reduce the distinction of the language, and also, if the instantaneous loudness is a meaningful sound, for example, a necessary car horn, such a meaningful sound may be properly presented to the user. Problems failing to deliver. In order to solve these problems, the signal amplitude adjusting unit 100 described above is provided.

To this end, the size measuring unit 106 of the signal size adjusting unit 100 shown in FIG. 6 measures the size of the m-th band signal input from the m-th BPF through the input terminal IN4 after the twenty-second step, and measures the measured size. Is output to the size determining unit 108 (step 120).

8A and 8B are graphs showing the input and output of the magnitude measuring unit 106, and FIG. 8A shows an exemplary waveform diagram of the 20K sampled m-band signal input to the magnitude measuring unit 106, and FIG. 8B Represents the magnitude of the m-th band signal output from the magnitude measuring unit 106, that is, the envelope, and the horizontal axis represents time n, and the vertical axis represents the magnitude of the m-th band signal. .

According to a preferred embodiment of the present invention, the magnitude measuring unit 106 measures the envelope of the m-th band signal shown in FIG. 8A as the magnitude, and measures the measured magnitude shown in FIG. 8B as the magnitude determining unit 108. You can print However, calculating the envelope accurately requires a lot of computation and results in time-delayed results. Therefore, according to another exemplary embodiment of the present invention, the magnitude measuring unit 106 measures an absolute value instead of an envelope of the m-th band signal, and measures the absolute value as the measured magnitude of the m-th band signal. Or output to 108. Therefore, the magnitude measuring unit 106 can effectively measure the magnitude of the m-th band signal despite a small amount of calculation.

After step 120, the size determiner 108 measures the sample size [A (n)] measured at a certain sample time n by the size measuring unit 106 with respect to the m-th band signal (n-1).) Is compared with the magnitude [A (n-1)], and the magnitude of the m-th band signal is gradually increased or decreased in response to the comparison result, and is output to the gain control unit 102 (122-130). Steps).

FIG. 9 is a block diagram of a preferred embodiment of the size determining unit 108 shown in FIG. 6 according to the present invention. The first and second buffers 150 and 156, the comparing unit 152, and the first and second buffers are shown. Two selectors 154 and 166, first and second multipliers 158 and 162, a subtractor 160 and an adder 164.

10A and 10B show waveform diagrams of signals input to the filter bank 70 shown in FIG. 5, and FIG. 10B shows waveform diagrams of signals output from the signal combiner 90 shown in FIG. 5, respectively.

The first buffer 150 illustrated in FIG. 9 inputs and buffers the size A measured by the size measuring unit 106, and outputs the buffered result to the comparator 152. Therefore, when A (n) is input to the first buffer 150, the buffered result output from the first buffer 150 becomes A (n-1). At this time, the comparator 152 measures the size A (n) measured by the size measuring unit 106 at a certain sample time n for the m-th band signal at a sample previous time n-1. It is determined whether the first threshold value Th1 is larger than the size A (n-1), which is the result of being buffered in the first buffer 150, and the determined result is a result of detecting the degree of change of the measured size. In operation 122, it is output. That is, in step 122, the comparator 152 determines whether the size measured by the size measuring unit 106 has suddenly increased. For example, it is determined whether the measured magnitude [A] has suddenly increased from A (a) to A (b).

11 (a) and 11 (b) are waveform diagrams for explaining the first predetermined attack time and the second predetermined release time, and FIG. 11 (a) shows the filter bank shown in FIG. 70 is a timing diagram showing a signal input in the form of a square wave, and FIG. 11B is a timing diagram showing a signal output from the signal synthesizing unit 90 shown in FIG. 5 in the form of a square wave.

If the magnitude A (n) 182 measured as shown in FIG. 10A is greater than or equal to A (n-1) 180 by the first threshold Th1, the magnitude of the signal as shown in FIG. 10B. [A (n)] is gradually reduced, and an m-th band signal having a finally determined magnitude [Mag (n)] expressed as in Equation 1 is obtained, and the flow proceeds to step 132 (step 124).

[1]

Here, the predetermined attack time T .sub.r is smaller than the level 190 when the magnitude of the m-th band signal finally decreases as shown in FIG. 11B with respect to the magnitude measured by the magnitude measuring unit 106. It means the time required to reach the level 192 as high as the first predetermined level. Here, the level 190 corresponds to the level when the output of the size determining unit 108 is stabilized. The first predetermined level may be 2 dB as shown in FIG. 11 (b).

However, the comparator 152 determines that if A (n) is not greater than the first threshold Th1 greater than A (n-1), then A (n) is greater than the second threshold Th2 than A (n-1). It is determined whether or not the error is small (step 126). That is, the comparator 152 determines whether the size measured by the size measuring unit 106 is sharply reduced. For example, it is determined whether the measured size [A] has changed from A (b) to A (a) as shown in FIG. 10A. If A (n) 186 is less than a second threshold Th2 than A (n-1) 184 as shown in FIG. 10A, the measured size [A] as shown in FIG. (n)] is gradually increased to obtain the m-th band signal having the finally increased magnitude [Mag (n)] represented by Equation 2, and proceeds to step 132 (step 128).

[2]

Here, the predetermined release time T .sub.f is lower than the level 194 when the magnitude of the m-th band signal is finally increased as shown in FIG. 11B with respect to the magnitude measured by the magnitude measuring unit 106. 2 means the time required to reach the level 196 as low as a predetermined level. Here, the level 194 corresponds to the level when the output of the size determining unit 108 is stabilized. The second predetermined level may be 2 dB as shown in FIG. 11 (b).

In order to perform steps 124 and 128, the size determiner 108 may include a first selector 154, first and second multipliers 158 and 162, a subtractor 160, and an adder 164.) And the second buffer 156 may be provided.

Here, the first selector 154 selectively outputs one of the predetermined attack time T .sub.r or the predetermined release time T .sub.f in response to the comparison result of the comparison unit 152. That is, when it is determined that A (n) is greater than A (n-1) by the first threshold value Th1 based on the result compared by the comparator 152, the first selector 154 may determine a predetermined attack time (T .sub.r) is selected and output, and when it is determined that A (n) is less than or equal to A (n-1) by the second threshold Th2, the predetermined release time T .sub.f is selected and output. At this time, the first multiplier 158 multiplies the result buffered by the second buffer 156 [Mag (n-1)] and the output of the first selector 154 and adds the multiplied result to the adder (164). The subtractor 160 subtracts the output of the first selector 154 from a predetermined value, for example, '1', and outputs the subtracted result to the second multiplier 162. The multiplier 162 multiplies the output of the subtractor 160 by the output A (n) of the size measuring unit 106, and outputs the multiplied result to the adder 164. The adder 164 adds the results multiplied by the first and second multipliers 158 and 162, and adds the added result to the size represented by the above-described equation (1) or 2, which is varied at the sample time (n). Mag (n)]. At this time, the second buffer 156 buffers the output of the adder 164 and outputs the buffered result Mag (n-1) to the first multiplier 158.

Meanwhile, according to one preferred embodiment of the present invention, if A (n) is determined not to be less than or equal to the second threshold Th2 than A (n-1), that is, the level of A (n) is A (If it is determined that it is not suddenly larger or abruptly smaller than the level of n-1), the magnitude [Mag (n-1)] which is finally larger or smaller at one sample previous time (n-1) is determined by which sample time (Finally, in step n), it is determined as the larger or smaller size Mag (n) and the process proceeds to step 132 (step 130). To this end, the size determiner 108 responds to the output of the adder 164 or one of the results buffered in the first buffer 150 [A (n-1)] in the comparison unit 152. In addition, a second selector 166 may be further provided to the gain control unit 102 and output as Mag (n). That is, the second selector 166 may have A (n) less than or equal to A (n-1) by the second threshold value Th2 or the first threshold value Th1 based on the result of comparison by the comparator 152. If it is determined to be large, the output of the

adder 164 is selected and output to the gain controller 102. However, the second selector 166 does not have A (n) greater than A (n-1) or more than the first threshold value Th1 through the result of comparison by the comparator 152, and A (n) If it is determined that the second threshold Th2 is not less than A (n-1), the result buffered in the first buffer 150 [Mag (n-1)] is output to the gain controller 102.

According to another preferred embodiment of the present invention, when A (n) is determined to be no more than the second threshold Th2 less than A (n-1), that is, the level of A (n) is A (n) When it is judged that it is not suddenly larger or abruptly smaller than the level of -1), the measured magnitude [A (n)] is varied as in Equation 1 or 2 above, and the variable magnitude [Mag (n) The signal having] may be output to the gain control unit 102. In this case, the size determiner 108 does not need to provide the second selector 106 shown in FIG. That is, the first selector 154 of the size determiner 108 does not increase the level of A (n) more rapidly than the level of A (n-1) through the result of comparison in the comparator 152. If it is determined that it is not suddenly small, any one of the predetermined attack time T .sub.r and the predetermined release time T .sub.f can be selectively output.

On the other hand, in step 124, 128, or 130, the size of the m-th band signal is varied using the magnitude [Mag (n)] and auditory characteristics of the m-th band signal output from the size determining unit 108; The m th band signal having the variable size is determined as the m th conversion band signal, and the flow proceeds to step 26 (steps 132 and 134). To this end, the gain control unit 102 shown in FIG. 6 generates an agent generated by using the magnitude (Mag (n)) of the m-th band signal output from the signal amplitude adjusting unit 100 and the auditory characteristics input through the input terminal IN2. The m gain control signal is output to the amplifier 104 (step 132). Here, the m-th signal converter may not provide the signal amplitude adjusting unit 100 unlike in FIG. 6, in which case, the m-th band signal input through the input terminal IN4 is directly applied to the gain controller 102. do. Therefore, instead of inputting the magnitude [Mag (n)] of the m-th band signal output from the signal magnitude adjusting unit 100, the gain control unit 102 receives the m control unit from the m-th BPF 72, 74, ... or 76. The m-th gain control signal may be generated by directly inputting the m-band signal and using the magnitude of the input m-th signal and the auditory characteristics input through the input terminal IN2. At this time, the amplifier 104 varies the magnitude of the m-th band signal input through the input terminal IN4 in response to the m-th gain control signal output from the gain control unit 102, and the m-th band having the variable size. The signal is output to the signal synthesis unit 90 through the output terminal OUT3 as the m th conversion band signal (step 134).

Meanwhile, the band signal compression process according to the present invention performed in steps 132 and 134 will be described in detail as follows.

12 is a graph illustrating a band signal compression process according to the present invention, where the horizontal axis represents the magnitude Xm of the signal input to the gain control unit 102 and the vertical axis represents the magnitude of the signal output from the gain control unit 102. (Ym) is shown. Here, the dotted line portion of the curve 212 represents the actual auditory characteristic for the abnormal user, and the solid line portion represents the approximate auditory characteristic for the abnormal user.

Assume that each HT and UCL of the normal user 210 and the deaf user 212 having a hearing impairment in the m th frequency band is given as shown in FIG. 12. At this time, the gain control unit 102 and the amplifier unit 104 inputs an input signal having an amplitude Xm within the dynamic range 214 of the normal user according to an auditory characteristic input through the input terminal IN2. It compresses and outputs a signal having a magnitude Ym in the dynamic range 216. Here, the auditory characteristic is composed of knee points A1, A2, A3, A4, A5 and A6 shown in FIG. The knee point corresponds to a point on the X and Y coordinates where the X-axis is the magnitude of the m-th band signal or the output of the size determining unit 108, and the Y-axis is the magnitude of the m-th conversion band signal. Here, A1 represents the HT of the abnormal user corresponding to the HT of the normal user, A5 represents the UCL of the abnormal user corresponding to the UCL of the normal user, and A2, A3 and A4 represent characteristics of the intermediate stage, respectively. In FIG. 12, five knee points were used to show auditory characteristics.

However, taking into account the shape and complexity of the auditory characteristic curve 212 shown in FIG. 12, the number of knee points can be determined. The number of preferred knee points is generally about 3-4.

The gain control unit 102 shown in FIG. 6 uses the knee points A1, A2, A3, A4 and A5, which input the magnitude of the signal Xm input from the size determining unit 108 through the input terminal IN2. Interpolation, and there may be various interpolation methods. One of the interpolation methods, the linear interpolation method, is as follows.

In the linear interpolation method, the gain controller 102 linearly connects the input knee points to generate a solid line portion of the curve 212 illustrated in FIG. 12, that is, an approximated auditory characteristic curve of an abnormal user. At this time, when an input signal having a magnitude Xm between HT and UCL shown in FIG. 12 is input, the gain control unit 102 outputs an output Y (Xm) corresponding to the magnitude of the input signal Xm. Find using the solid line portion of curve 212.

FIG. 13 is a graph illustrating a band signal compression process according to the present invention, in which the horizontal axis represents the magnitude Xm of the signal input to the gain control unit 102 and the vertical axis represents the magnitude of the signal output from the gain control unit 102. (Ym) is shown, respectively.

For example, it is assumed that the level Xm of the signal input to the gain control unit 102 exists between HT and B2 as shown in FIG. At this time, the gain control unit 102 obtains an output signal [Y (HT)] suitable for the user's auditory characteristic when Xm is HT, and output signal [Y (B2)] suitable for the user's auditory characteristic when Xm is B2.], And when Xm is a value between HT and B2, an output signal [Y (Xm)] suitable for the user's hearing characteristics is obtained. The gain control unit 102 outputs the m-th gain control signal corresponding to the output signal Y (HT), Y (B2) or Y (Xm) to the amplifier 104. At this time, the amplifier 104 controls the gain Gm of the m-th band signal input through the input terminal IN4 in response to the m-th gain control signal, and the gain is controlled [Y (HT), Y (B2) or Y (Xm)] is output as the m th conversion band signal through the output terminal OUT3.

As a result, in steps 132 and 134, the knee points A1 to A5 are inputted from the outside, and they are linearly connected, and from the connected line segment, the general equation Ym = sXm + I (where s means slope, I denotes the intercept of the Y axis.) And Ym corresponding to the corresponding Xm from the general equation.

After the twenty-fourth step, the signal synthesizing unit 90 synthesizes the first through the M-th conversion band signals output from the first through the M-th signal converters 82, 84,. Is outputted to the digital / analog converter 14 through the output terminal OUT2 (step 26).

After the twenty-sixth step, the digital voice signal having the modified magnitude output from the hearing correction unit 12 which is a result synthesized by the signal synthesizer 90 is converted into an analog voice signal by the digital / analog converter 14, The converted analog voice signal is provided to the user through the output terminal OUT1 (step 28).

On the other hand, according to an embodiment of the present invention, the auditory compensation unit 12 may be directly applied to the auditory properties previously obtained from the outside. According to this embodiment, when the user has severe hearing loss, the personal wireless communication device according to the present invention can correct the band signal by using the ideal auditory characteristics accurately measured in an external auditory laboratory equipped with all the equipment. . In this case, the auditory characteristic may be directly applied to the hearing correction unit 12 through an external interface (not shown), which will be described later, and the hearing correction unit 12 may be directly operated by a user directly operating a key of the key input unit (not shown). May be applied to.

According to another exemplary embodiment of the present invention, the hearing compensator 12 may receive an auditory characteristic determined by a user by listening to sounds corresponding to a plurality of auditory characteristics previously given and stored from the outside. To this end, the personal wireless communication device according to the present invention shown in FIG. 1 is one of a plurality of auditory characteristics stored in a storage unit (not shown) and a storage unit (not shown) for inputting and storing a plurality of auditory characteristics from the outside. May further include a selection unit (not shown) for selectively outputting the signal in response to the selection signal. Here, each auditory characteristic (1, 2, 3, 4, 5, 6, ... n ') in the auditory characteristic table stored in the storage unit (not shown) are the knee points A1 and A2 as shown in Table 1 below. , A3, A4 and A5).

Auditory Characteristics Selection Auditory characteristic variables F1 = 500 Hz F2 = 1000 Hz F3 = 2000Hz FM = XHz A1 A2 A3 A1 A2 A3 A1 A2 A3 A4 A5 A1 A2 A3 A4 One 23 133 576 66 154 877 45 534 1242 3455 4568 10 30 53 100 2 32 132 867 56 245 987 55 345 1424 3453 6758 20 40 167 238 3 34 124 978 76 134 677 67 353 1342 3545 6865 20 45 176 567 4 65 145 567 87 276 566 46 465 1423 3453 6786 14 42 156 865 5 78 156 978 78 145 867 54 355 1234 3453 6866 15 56 276 348 6 56 187 896 98 186 866 46 322 1234 3453 8666 17 23 187 297 n ' 76 167 987 78 228 867 35 214 1244 3533 7455 20 54 287 345

In Table 1, each of F1, F2, ..., and F (M) represents the center frequency of each frequency band. At this time, the user determines a selection signal by listening to sounds corresponding to a plurality of auditory characteristics stored in a storage unit (not shown), so that the corresponding auditory characteristic is applied to the auditory correcting unit 12 through the input terminal IN2. . Here, the process of obtaining the auditory characteristic table shown in Table 1 will be described.

Investigating the auditory characteristics of general users can be classified into several categories. For example, auditory characteristics can be broken down by age or user's environment. That is, the elderly have hearing characteristics with high frequency hearing loss and narrow dynamic range, those who are frequently exposed to a certain kind of noise show similar hearing characteristics, and those who frequently listen to music through headphones and the like are similar to each other. Hearing characteristics. Thus, using this phenomenon, several representative auditory characteristics can be obtained as shown in Table 1.

In this case, the user selects an auditory characteristic suitable for the user from among several auditory characteristics pre-stored in the storage unit (not shown) and provides the auditory characteristic to the personal wireless communication device according to the present invention. That is, the user is sequentially provided with a standard voice signal corresponding to several stored auditory characteristics, and the user selects an auditory characteristic suitable for the user through the multiple standard voice signals, and selects the selected auditory characteristic for the individual according to the present invention. Applied to a wireless communication device.

According to still another preferred embodiment of the present invention, the personal wireless communication device according to the present invention may further include an auditory characteristic tester (not shown) which inspects the auditory characteristic of the user by itself. This makes it possible to simply check the hearing characteristics of the user himself of the mobile telephone apparatus when the personal radio communication apparatus according to the present invention is applied to the mobile telephone apparatus. In this case, the auditory characteristic inspector (not shown) may be built in the auditory corrector 12 or may be separately provided outside the auditory corrector 12. In addition, the auditory characteristic test performed by the auditory characteristic inspector (not shown) is performed only once before performing the twenty-fourth step illustrated in FIG. 2 and continues to use the inspected result until the auditory characteristic of the user is changed.

Hereinafter, a configuration and an operation of an auditory characteristic test method and an auditory characteristic test unit (not shown) according to the present invention will be described with reference to the accompanying drawings.

FIG. 14 is a flowchart illustrating an auditory characteristic checking method according to the present invention, in which a first frequency band is selected (steps 240 and 242) when an auditory characteristic is required, and an audible threshold for a corresponding frequency band (Steps 244 to 250), determining a knee point for the corresponding frequency band (steps 252 to 256), and determining a discomfort threshold for the corresponding frequency band (step Steps 258 to 262) and determining corresponding other frequency bands (steps 264 and 266).

FIG. 15 is a block diagram of a preferred embodiment of the auditory characteristic inspecting unit according to the present invention for performing the auditory characteristic inspecting method shown in FIG. 14. The first, second, and third knee point determination units 280, 282 and 284 and a control unit 286.

First, the controller 286 continuously determines whether an auditory inspection request signal for requesting auditory characteristics examination is input from the outside through the input terminal IN6, and generates the determined result as a control signal (step 240). If measurement of the auditory characteristic is required from the outside, the first frequency band is selected from the first to Mth frequency bands (step 242). To this end, when the first knee point determiner 280 recognizes that the auditory characteristic is requested from the outside through a control signal generated from the controller 286, the first knee point among the first to Mth frequency bands is determined. The test signal corresponding to is input through input terminal IN5. Here, the test signal corresponds to a pure tone signal corresponding to the center frequency of the m-th frequency band or a complex signal in which frequency components within the m-th frequency band are added together.

After operation 242, the first knee point determiner 280 determines an audible threshold of the m-th frequency band, and outputs a knee point A1 corresponding to the determined audible threshold (steps 244 to 250). field).

To this end, after step 242, the first knee point determiner 280 generates a test signal having a predetermined minimum magnitude input through the input terminal IN5 through the output terminal OUT4 (step 244). After operation 244, the user determines whether a sound corresponding to the test signal output through the output terminal OUT4 can be heard (operation 246). If the user cannot hear the sound, the test signal is increased in magnitude by a third predetermined level and the flow proceeds to step 246 (step 248). That is, when it is determined that the user cannot hear the sound through the first state signal input through the input terminal IN7, the first knee point determiner 280 increases the size of the test signal by a third predetermined level and increases it. The new test signal with the set level is output again through the output terminal OUT4. Accordingly, the user determines whether a sound corresponding to the new test signal can be heard and applies the determined result to the first knee point determiner 280 through the input terminal IN7 as the first state signal. However, when it is determined that the user can hear the sound through the first state signal input through the input terminal IN7, the first knee point determiner 280 determines the size of the test signal corresponding to the sound as an audible threshold. In operation 250, the knee point A1 corresponding to the audible threshold value is output.

After operation 250, the second knee point determiner 282 determines the knee point of the m-th frequency band providing a comfortable feeling to the user, and outputs the determined knee point A3 (steps 252 to 256).).

To this end, after step 250, the user determines whether the sound corresponding to the test signal output through the output terminal OUT5 provides a comfortable feeling (step 252). If the sound corresponding to the test signal does not provide a comfortable feeling, the test signal is increased in magnitude by the fourth predetermined level and the process proceeds to step 252 (step 254). That is, when it is determined that the user cannot feel comfortable through the second state signal input through the input terminal IN8, the second knee point determiner 282 increases the magnitude of the test signal by a fourth predetermined level. , Output a new test signal with increased level through output terminal OUT5. Accordingly, the user determines whether the sound corresponding to the new test signal provides a comfortable feeling, and

applies the determined result to the second knee point determiner 282 as a second state signal through the input terminal IN8. However, when it is determined that the user is provided with a comfortable feeling in response to the second state signal input through the input terminal IN8, the second knee point determiner 282 may test the test signal corresponding to the sound providing the comfortable feeling. The knee point A3 determined by using the size of P is output (step 256). Here, the second knee point determination unit 282 may include the knee point A2 corresponding to a sound slightly smaller than the sound corresponding to the knee point A3 determined in step 256 and the knee point A4 corresponding to a slightly louder sound. May be further determined further. However, clinically determining five or more knee points is less meaningful and difficult to measure. Therefore, three needle points (A1, A3 and A5) are preferable.

After operation 256, the third knee point determination unit 284 determines the knee point corresponding to the discomfort threshold of the m-th frequency band, and outputs the determined knee point A5 (steps 258 to 262).

To this end, after step 256, the user determines whether the sound corresponding to the test signal output through the output terminal OUT6 is too loud (step 258). That is, the user determines whether the sound is too loud to hear properly, or whether the sound is too loud so that the ear is sore or if the user feels that no more loud sound is output. If the sound corresponding to the test signal is not too loud, the test signal is increased in magnitude by the fifth predetermined level and the process proceeds to step 258 (step 260). That is, when it is recognized that the user determines that the sound is not too loud through the third state signal input through the input terminal IN9, the third knee point determiner 284 increases the magnitude of the test signal by the fifth predetermined level. , Output a new test signal with increased level through output terminal OUT6. Accordingly, the user determines whether the sound corresponding to the new test signal is too loud and applies the determined result to the third knee point determiner 284 as a third status signal through the input terminal IN9. However, when the third knee point determination unit 284 recognizes that the user determines that the sound is too loud through the third state signal input through the input terminal IN9, the third knee point determination unit 284 determines the magnitude of the test signal corresponding to the loud sound as an unpleasant threshold. In operation 262, the knee point A5 corresponding to the determined discomfort threshold value is output.

After operation 262, the controller 286 determines whether the corresponding m-th frequency band is the M-th frequency band that is the last frequency band, and determines the first, second, and third knee point determination units 280, 282, and the determined result. 284) (Step 264). If the m th frequency band is the M th frequency band, the auditory characteristic test is terminated. To this end, the controller 286 controls the first, second and third knee point determination units 280, 282, and 284 so that the knee points are no longer determined. That is, the controller 286 prevents the test signal from being applied to the first, second and third knee point determination units 280, 282, and 284. However, if the m th frequency band is not the M th frequency band, m is increased by 1 and the flow proceeds to a step 244 (step 266). That is, steps 244 to 262 may be performed for the m + 1th frequency band. In this case, the controller 286 controls the first, second and third knee point determination units 280, 282, and 284 to generate a corresponding knee point. That is, the controller 286 controls the test signal for the m + 1 th frequency band to be input to each knee point determiner through the input terminal IN5.

Here, the test signal for the m-th frequency band input to the first, second and third knee point determination units 280, 282, and 284 may be applied from the outside through the input terminal IN5, or the controller 286. May be directly applied to each knee point determining unit.

Hereinafter, when the personal radio communication apparatus shown in FIG. 1 corresponds to a portable telephone apparatus, the configuration and operation of the portable telephone apparatus having the hearing correction function according to the present invention will be described as follows.

FIG. 16 is a block diagram of a portable telephone apparatus having an auditory correction function according to the present invention. The voice input unit 300 may be implemented as a microphone 302 or

the voice output unit may be implemented as a speaker 306. 304), Analog to Digital Converter (ADC) 310, DAC 14, Coder 316, Decoder 10, Central Processor 322, Modulation Demodulator 324, Hearing The correction unit 12, the display unit 328, the key input unit 326, and the input / output unit 330 are configured.

The decoder 10, the hearing corrector 12, and the DAC 14 shown in Figs. 16 and 1 are identical and perform the same function. In addition, the input / output unit 330 serves as the external interface unit described above.

The voice input unit 300 illustrated in FIG. 16 converts the voice input from the user into an analog voice signal and outputs the analog signal to the ADC 310. The voice input unit 300 may be implemented as a microphone 302. At this time, the ADC 310 converts the analog signal output from the voice input unit 300 into a digital form, and outputs the converted result to the coder 316. The encoder 316 encodes the output of the ADC 310 and outputs the encoded result to the central processing unit 322. Here, the central processing unit 322 adds additional information such as a header or an error correction code to the result coded by the coder 316, and outputs the additional information to the demodulator 324. The modulator 324 modulates a signal output from the central processing unit 322 and transmits the modulated result as a radio frequency (RF) signal through an antenna (not shown) through the output terminal OUT7.

The demodulator 324 demodulates the analog voice signal received through an antenna (not shown) and input through the input terminal IN10, and outputs the demodulated result to the central processing unit 322. The central processing unit 322 only takes necessary information from the demodulated result and then outputs it to the decoding unit 10. As described above, the decoding unit 10 decodes the audio signal and outputs the decoded result to the hearing correction unit 12. The hearing correction unit 12 deforms the magnitude of the decoded result in response to the hearing correction request signal output from the central processing unit 322 and outputs the decoded result to the DAC 14. Here, the key input unit 326 outputs the first key input signal to the central processing unit 322 when the user requests hearing correction, and the central processing unit 322 is connected to the first key input signal generated from the key input unit 326. In response, the hearing correction request signal is output to the hearing correcting unit 12. Therefore, when hearing correction is required from the outside, the hearing correction unit 12 outputs the decoded result to the DAC 14 after compressing the decoded result as described above, but does not compress the decoded result unless the hearing correction is required from the outside. It outputs to DAC 14 as it is without. At this time, the hearing correction unit 12 may input the hearing characteristics of the user input through the input / output unit 330 corresponding to the external interface unit (not shown) through the central processing unit 322 as described above. have.

The DAC 14 converts the digital signal output from the hearing correction unit 12 into an analog signal and outputs it to the audio output unit 304. In this case, the voice output unit 304 provides an analog voice signal output from the DAC 14 to the user as a sound, and for this purpose, may be implemented as a speaker 306. Here, the key input unit 326 generates a second key input signal and outputs the second key input signal to the central processing unit 322 when the user requests the inspection of the auditory characteristic. At this time, the central processing unit 322 outputs an auditory examination request signal to the auditory characteristics inspecting unit (not shown) in response to the second key input signal. Accordingly, an auditory characteristic inspector (not shown) that is separately provided or may be built in the auditory corrector 12 or the central processing unit 322 inspects the auditory characteristic illustrated in FIG. 14 in response to the auditory audit request signal. Do the method. In addition, the central processing unit 322 illustrated in FIG. 16 may provide the user with the current state of the apparatus illustrated in FIG. 16 through the display unit 328 or the input / output unit 330. The ADC 310 and the DAC 14 illustrated in FIG. 16 correspond to a coder (CODEC: CODE-DECoder) of a general mobile phone, and the coder 316 and the decoder 10 correspond to a VOCODER of a general mobile phone. Corresponding.

ADVANTAGEOUS-EFFECTS

As described above, the personal wireless communication device and method having the hearing correction function according to the present invention is that the sound is finally recognized by the hearing

characteristics of the individual, so that the input signal does not have a hearing impaired user or hearing impairment However, it has the effect of providing a comfortable and discriminating sound to the user by correcting to suit the hearing characteristics of each user having different auditory characteristics.

Claims

A decoder which decodes the demodulated digital voice signal received from the outside and outputs the decoded result;
An auditory corrector configured to modify a size of the decoded result input from the decoder according to a user's auditory characteristic, and output a digital speech signal having the modified size; And
And a digital / analog converter configured to convert the digital voice signal output from the hearing corrector into an analog voice signal and provide the digital voice signal to the user.
The method of claim 1, wherein the hearing correction unit
First to M-th band pass filters for filtering the decoded result for each desired frequency band and outputting the filtered results as first to M-th band signals;
Measuring magnitudes of each of the first to Mth band signals, modifying each of the measured magnitudes corresponding to the auditory characteristics, and outputting band signals having the modified magnitudes as first to Mth transform band signals First to Mth signal conversion units; And
A signal synthesizer configured to synthesize the first to Mth transform band signals and output the synthesized result;
The synthesized result is converted into an analog signal by the digital / analog converter and provided to the user.
The method of claim 2, wherein the m (1≤m≤M) signal conversion unit
A signal magnitude adjusting unit which measures the magnitude of the m-th band signal, detects a degree of change in the measured magnitude, and gradually increases or decreases the magnitude of the m-th band signal in response to the detected result;
A gain controller configured to output an m-th gain control signal by using the magnitude and the auditory characteristic of the m-th band signal having a magnitude larger or smaller in the signal magnitude adjusting unit; And
And an amplifying unit configured to vary the magnitude of the m-th band signal in response to the m-th gain control signal, and output an m-th band signal having a variable size as the m-th conversion band signal.
Personal wireless communication device having a.
The method of claim 3, wherein the signal amplitude adjusting unit
A magnitude measuring unit measuring and outputting a magnitude of the m-th band signal; And
The magnitude [A (n-1)] measured at a sample time n-1 at a sample time n by the magnitude measurement unit with respect to the m-th band signal. And a magnitude determining unit for gradually increasing or decreasing the magnitude of the m-th band signal in response to the compared result corresponding to the sensed result and outputting the result to the gain control unit. Personal wireless communication device having a.
5. The auditory correction function of claim 4, wherein the magnitude measuring unit measures an absolute value of the m th band signal, and outputs the absolute value to the magnitude determining unit as the measured magnitude of the m th band signal. Having a personal wireless communication device.
The method of claim 5, wherein the size determination unit
A first buffer configured to input and buffer the output of the size measuring unit;
A comparison unit comparing the output A (n) of the size measuring unit with the result buffered in the first buffer A (n-1) and outputting the compared results as the sensed results;
A first selector for selectively outputting one of a predetermined attack time or a predetermined release time in response to a result compared by the comparison unit;
A first multiplier;
A subtraction unit for subtracting an output of the first selection unit from a predetermined value and outputting a subtracted result;
A second multiplier configured to multiply the output of the subtractor by the output A (n) of the magnitude

measuring unit, and output a multiplied result;
An adder which adds the results multiplied by the first and second multipliers and outputs the added result as a variable magnitude [Mag (n)] at a certain sample time n; And
A second buffer configured to buffer the output of the adder and output the buffered result to the first multiplier,
And the first multiplier multiplies the result buffered in the second buffer and the output of the first selector.
The method of claim 6, wherein the size determiner
And a second selector for selectively outputting either the output of the adder or the result [A (n-1)] buffered in the first buffer to the gain controller in response to the result compared by the comparator. A personal wireless communication device having an auditory correction function.
8. The method according to claim 6 or 7, wherein the predetermined attack time is a time required to reach a level higher by a first predetermined level than a level when the output of the size determining unit with respect to the output of the size measuring unit is stabilized. T .sub.r corresponds to T .sub.r , and the predetermined release time corresponds to T .sub.f , which is a time required to reach a level lower by a second predetermined level than the level when the output of the size determining unit to the output of the size measuring unit is stabilized. Personal wireless communication device having a hearing correction function, characterized in that.
The device of claim 1, wherein the personal wireless communication device is
And an external interface unit for inputting the user's hearing characteristics from the outside and outputting the hearing characteristics of the user to the hearing correction unit.
The device of claim 2, wherein the personal wireless communication device is
Personal hearing device having an auditory correction function, characterized in that it further comprises an auditory characteristic tester for inspecting the auditory characteristic of the user itself.
The device of claim 1, wherein the personal wireless communication device is
A storage unit for previously inputting and storing an auditory characteristic table having information on a plurality of auditory characteristics; And
And a third selector for selectively outputting one auditory characteristic in response to a selection signal in the auditory characteristic table stored in the storage.
And the user determines the selection signal by listening to sounds corresponding to the plurality of auditory characteristics.
The m-th signal converter of claim 2 or 10.
Linearly connecting knee points representing the auditory characteristics and finding the magnitude of the m th conversion band signal corresponding to the magnitude of the m th band signal on the connected line;
The knee point is a personal wireless communication device having an auditory correction function, characterized in that the X-axis is the magnitude of the m-th band signal, the Y-axis corresponds to a point on the X and Y coordinates of the magnitude of the m-th conversion band signal .
The method of claim 12, wherein the auditory characteristic test unit
The audible threshold value of the m-th frequency band input in response to a control signal among the first to M-th frequency bands corresponding to the first to Mth band signals is determined, and the knee point corresponding to the determined home threshold value is determined. A first knee point determiner for outputting a;
A second knee point determination unit which determines the knee point (s) providing a comfortable feeling to the user of the mth frequency band and outputs the determined knee point (s);
A third knee point determination unit which determines a discomfort threshold of the mth frequency band and outputs a knee point corresponding to the determined discomfort threshold; And
The control signal is generated in response to the user requesting an examination of the auditory characteristics, and the first, second, and the second correspond to whether the knee points for the first to Mth frequency bands are all obtained. And a control unit for controlling the knee point determination of third knee point determination units, wherein the auditory characteristic is comprised of the knee points.
The method of claim 13, wherein the second knee point determiner
And a knee point corresponding to a slightly smaller sound and a knee point corresponding to a slightly louder sound than the sound corresponding to the knee point to be output.
12. The device of claim 1, 9, 10 or 11, wherein the personal wireless communication device

A voice input unit converting the voice input from the user into an analog voice signal and outputting the voice signal;
An analog / digital converter for converting the voice signal in analog form into a digital form and outputting the converted result;
A coder for encoding and outputting an output of the analog / digital converter;
A modulator for modulating the encoded result;
A demodulator for demodulating a voice signal received from the outside and outputting a demodulated result;
A voice output unit for providing the analog voice signal output from the digital / analog converter to the user as sound;
A central processor configured to input the encoded result to the modulator, input the demodulated result to output the demodulated digital voice signal to the decoder, and output an auditory correction request signal in response to a first key input signal ; And
And a key input unit configured to output the first key input signal when the user requests hearing correction.
And the hearing correcting unit deforms the magnitude of the decoded result in response to the hearing correction request signal.
16. The device of claim 15, wherein in the personal wireless communication device
The key input unit generates a second key input signal when the user requests the test of the auditory characteristic, the central processing unit outputs an auditory test request signal in response to the second key input signal, and the auditory characteristic checker And the auditory characteristic of inspecting the hearing characteristic in response to the hearing test request signal.
(a) decoding the demodulated digital speech signal received from the outside;
(b) modifying the magnitude of the decoded result signal corresponding to a user's hearing characteristics to obtain a digital speech signal having the modified magnitude; And
(c) converting the digital voice signal having the modified magnitude into an analog voice signal and providing the same to the user.
18. The method of claim 17, wherein step (b)
(b1) dividing the result decoded in step (a) for each desired frequency band to obtain first to Mth band signals;
(b2) modifying the magnitudes of the first to Mth band signals corresponding to the auditory characteristics and obtaining the first to Mth transform band signals which are band signals having the modified magnitudes; And
(b3) synthesizing the first to Mth transform band signals, and proceeding to step (c),
And the synthesized result is converted into an analog signal and provided to a user.
19. The method of claim 18, wherein step (b2) comprises: for each m (1 m M) band signal,
(b21) after the step (b1), measuring the magnitude of the m-th band signal;
(b22) gradually increasing or decreasing the magnitude of the m-th band signal corresponding to the measured change in magnitude; And
(b23) varying the size of the m-th band signal by using the magnitude of the m-th band signal having a size that is finally larger or smaller in step (b22) and the auditory characteristic, and the m-th having a variable size And determining a band signal as the m-th conversion band signal and proceeding to step (b3).
The method of claim 19, wherein step (b22)
The magnitude [A (n)] measured at any sample time n for the m-th band signal is greater than the magnitude [A (n-1)] measured at one sample previous time n-1. Determining whether the error is greater;
If A (n) is greater than or equal to the first threshold than A (n-1), the measured size [A (n)] is gradually reduced as follows, and finally the size [Mag (n) Obtaining an m-th band signal having a)] and proceeding to step (b23);

(T .sub.r means the time taken to reach a level higher by a first predetermined level than the level when the magnitude of the m-th band signal with respect to the measured magnitude of the m-th band signal is finally reduced. do.)
Determining that A (n) is less than or equal to A (n-1) by a second threshold value if A (n) is not greater than A (n-1) or more than the first threshold value; And

If A (n) is less than the second threshold than A (n-1), the measured magnitude [A (n)] is gradually increased as follows, and finally the magnitude [Mag (n) Obtaining an m-th band signal having a) and proceeding to step (b23).

Here, T .sub.f means the time required to reach a level lower by a second predetermined level than the level when the magnitude of the m-th band signal with respect to the measured magnitude of the m-th band signal is finally increased. .)
The method of claim 20, wherein step (b22)
If the A (n) is not less than the second threshold value than the A (n-1), a magnitude [Mag (n-1)] which is finally larger or smaller at a sample previous time n-1 is determined. Determining as a finally larger or smaller magnitude [Mag (n)] at sample time (n), and further proceeding to step (b23).
The method of claim 20, wherein step (b22)
If the A (n) is not less than the second threshold value than the A (n-1), the measured size [A (n)] is varied as follows to have a variable size [Mag (n)]. And obtaining a band signal and proceeding to step (b23).

The method of claim 20, wherein step (b22)
If the A (n) is not less than the second threshold value than the A (n-1), the measured size [A (n)] is varied as follows to have a variable size [Mag (n)]. And obtaining a band signal and proceeding to step (b23).

19. The method of claim 18, wherein the user's hearing characteristics are given from outside.
19. The method of claim 18, wherein the personal wireless communication method is
And (d) proceeding to step (b) by self-inspecting the hearing characteristics of the user.
The method of claim 18, wherein the hearing characteristics of the user
A personal wireless communication method having an auditory correction function, characterized in that it corresponds to an auditory characteristic determined by a user by listening to sounds corresponding to the plurality of auditory characteristics among a plurality of auditory characteristics previously given from the outside.
The method of claim 25, wherein step (d)
(d1) continuously determining whether the measurement of the auditory characteristic is required;
(d2) if a measurement of the auditory characteristic is required, selecting a first frequency band from the first to Mth frequency bands;
(d3) determining a knee point for the audible threshold of the corresponding m-th frequency band;
(d4) determining knee points which provide a comfortable feeling to the user of the m-th frequency band;
(d5) determining a knee point corresponding to the discomfort threshold of the m-th frequency band;
(d6) determining whether the corresponding m th frequency band is the last M th frequency band, and if the m th frequency band is the M th frequency band, proceeding to step (b); And
(d7) if the mth frequency band is not the Mth frequency band, increasing m by 1 and proceeding to step (d3), And wherein said auditory characteristic consists of said knee points.
The method of claim 27, wherein step (d3)
(d31) generating a test signal having a predetermined minimum magnitude;
(d32) determining whether the user can hear a sound corresponding to the test signal;
(d33) if the user cannot hear the sound, increasing the magnitude of the test signal by a third predetermined level and proceeding to step (d32); And
(d34) if the user can hear the sound, determine the magnitude of the test signal corresponding to the audible sound as the audible threshold, determine the knee point for the home threshold using the audible threshold, and (and d4) the step of personal hearing communication.
The method of claim 28, wherein step (d4)
(d41) after the step (d3), the user determines whether the sound corresponding to the test signal provides a comfortable feeling;
(d42) if the sound does not provide a comfortable feeling, increasing the magnitude of the test signal by a fourth predetermined level and proceeding to step (d41); And
(d43) if the sound provides a comfortable feeling, determining the knee point using the magnitude of the test signal corresponding to the sound providing the comfortable feeling, and proceeding to step (d5). A personal

wireless communication method having an auditory correction function.
The method of claim 29, wherein step (d5)
(d51) after the step (d4), the user determines whether the sound corresponding to the test signal is too loud;
(d52) if the sound is not too loud, increasing the magnitude of the test signal by a fifth predetermined level and proceeding to step (d51); And
(d53) if the sound is too loud, determining the magnitude of the test signal corresponding to the loud sound as the discomfort threshold, determining the knee point using the discomfort threshold, and proceeding to step (d6). Personal wireless communication method having an auditory correction function, characterized in that it comprises.
31. The method of claim 28, 29 or 30, wherein the test signal is
And a pure tone signal corresponding to the center frequency of the m-th frequency band or a complex signal in which frequency components within the m-th frequency band are added together.

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(54) 청각 보정 기능을 갖는 개인용 무선 통신 장치 및 방법

요약

사용자에게 제공될 소리의 크기 및 특성을 사용자 개개인의 청각 특성에 맞추어 보정하는 청각 보정 기능을 갖는 개인용 무선 통신 장치 및 방법이 개시된다. 이 장치는, 외부로부터 수신되어 복조된 디지탈 음성 신호를 복호화하고, 복호화된 결과를 출력하는 복호부와, 복호부로부터 입력한 복호화된 결과의 크기를 사용자의 청각 특성에 상응하여 변형시키고, 변형된 크기를 갖는 디지탈 음성 신호를 출력하는 청각 보정부 및 청각 보정부로부터 출력되는 디지탈 음성 신호를 아날로그 음성 신호로 변환하여 사용자에게 제공하는 디지탈/아날로그 변환부를 구비하는 것을 특징으로 한다. 그러므로, 사용자에게 편안하고 변별력 있는 소리를 제공할 수 있는 효과를 갖는다.

대표도
도 1

명세서

도면의 간단한 설명

도 1은 본 발명에 의한 청각 보정 기능을 갖는 개인용 무선 통신 장치의 블럭도이다.

도 2는 본 발명에 의한 청각 보정 기능을 갖는 개인용 무선 통신 방법을 설명하기 위한 플로우차트이다.

도 3은 인간의 일반적인 주파수별 청각 특성을 나타내는 그래프이다.

도 4a ~ 4c들은 다양한 청각 특성들을 나타내는 그래프들이다.

도 5는 도 1에 도시된 청각 보정부의 본 발명에 의한 바람직한 일 실시예의 블럭도이다.

도 6은 도 5에 도시된 제m 신호 변환부의 본 발명에 의한 바람직한 일 실시예의 블럭도이다.

도 7은 도 5에 도시된 제m 신호 변환부에서 제m 변환 밴드 신호를 발생하는 본 발명에 의한 바람직한 일 실시예에 의한 동작을 설명하기 위한 플로우차트이다.

도 8a 및 도 8b들은 크기 측정부의 입력 및 출력을 나타내는 그래프들이다.

도 9는 도 6에 도시된 크기 결정부의 본 발명에 의한 바람직한 일 실시예의 블럭도이다.

도 10a 및 10b는 필터 뱅크로 입력되는 신호 및 신호 합성부로부터 출력되는 신호의 파형도들을 나타낸다.

도 11 (a) 및 (b)들은 제1 소정 어텍 시간 및 제2 소정 릴리스 시간들을 설명하기 위한 파형도들이다.

도 12는 본 발명에 의한 밴드 신호 압축 과정을 설명하기 위한 그래프이다.

도 13은 본 발명에 의한 밴드 신호 압축 과정을 설명하기 위한 그래프이다.

도 14는 본 발명에 의한 청각 특성 검사 방법을 설명하기 위한 플로우차트이다.

도 15는 본 발명에 의한 청각 특성 검사부의 본 발명에 의한 바람직한 일 실시예의 블럭도이다.

도 16은 본 발명에 의한 청각 보정 기능을 갖는 휴대용 전화 장치의 블럭도이다.

발명의 상세한 설명

발명의 목적

발명이 속하는 기술 및 그 분야의 종래기술

본 발명은 휴대 전화 장치등과 같은 개인용 무선 통신 장치에 관한 것으로서, 특히 청각 보정 기능을 갖는 개인용 무선 통신 장치 및 방법에 관한 것이다.

종래의 휴대 전화 장치의 주된 목적은 적은 량의 데이타로 원음에 가까운 높은 음질의 소리를 송/수신하는 것이다. 따라서, 보코더- vocoder(voice coder), EVRC(enhanced variable rate codec.), AMR(Adaptive Multirate Codec.) 등- 에 관련된 기술은 발달되어 왔다.

한편, 현대인은 환경적인 요인으로 인하여 청각 장애를 다소간 갖고 있으며, 노령화에 따른 고주파 난청 등의 장애는 피하기 어렵다. 게다가, 선천적 또는 후천적 질병에 의해 난청을 갖게 되는 사람들도 있다. 이와 같이 소리를 듣는 휴대 전화 장치의 사용자가 정상적인 청각 특성의 소유자이든지 비 정상적인 청각 특성의 소유자이든지 상관없이 그 사용자는

각자의 고유한 청각 특성을 가지고 있다. 여기서, 비 정상적인 청각 특성이란, 소리를 인지할 수 있는 소리의 세기 범위(dynamic range)가 줄어든 청각 장애 따위를 지칭하며, 이에 대해서는 상세하게 후술된다.

그러나, 종래의 휴대 전화 장치는 사용자의 청각 특성에 따른 소리의 보정 기능을 갖기 못하였기 때문에 사용자의 청각 특성에 부합하는 소리를 제공할 수 없는 문제점을 갖는다. 특히, 노인이나 청각 이상 등에 의해 청각에 장애가 있는 사용자를 위해 소리의 보정이 필수적임에도 불구하고, 이러한 종래의 휴대 전화 장치는 소리의 보정 기능을 제공할 수 없었다.

발명이 이루고자 하는 기술적 과제

본 발명이 이루고자 하는 기술적 과제는, 사용자에게 제공될 소리의 크기 및 특성을 사용자 개개인의 청각 특성에 맞추어 보정하는 청각 보정 기능을 갖는 개인용 무선 통신 장치를 제공하는 데 있다.

본 발명이 이루고자 하는 다른 기술적 과제는, 상기 개인용 무선 통신 장치에서 수행되는 청각 보정 기능을 갖는 개인용 무선 통신 방법을 제공하는 데 있다.

발명의 구성 및 작용

상기 과제를 이루기 위한 본 발명에 의한 청각 보정 기능을 갖는 개인용 무선 통신 장치는, 외부로부터 수신되어 복조된 디지탈 음성 신호를 복호화하고, 복호화된 결과를 출력하는 복호부와, 상기 복호부로부터 입력한 상기 복호화된 결과의 크기를 사용자의 청각 특성에 상응하여 변형시키고, 변형된 크기를 갖는 디지탈 음성 신호를 출력하는 청각 보정부 및 상기 청각 보정부로부터 출력되는 상기 디지탈 음성 신호를 아날로그 음성 신호로 변환하여 상기 사용자에게 제공하는 디지탈/아날로그 변환부로 구성되는 것이 바람직하다.

상기 다른 과제를 이루기 위한 본 발명에 의한 청각 보정 기능을 갖는 개인용 무선 통신 방법은, 외부로부터 수신되어 복조된 디지탈 음성 신호를 복호화하는 단계와, 상기 복호화된 결과의 신호의 크기를 사용자의 청각 특성에 상응하여 변형시켜, 변형된 크기를 갖는 디지탈 음성 신호를 구하는 단계 및 상기 변형된 크기를 갖는 상기 디지탈 음성 신호를 아날로그 음성 신호로 변환하여 상기 사용자에게 제공하는 단계로 이루어지는 것이 바람직하다.

이하, 본 발명에 의한 청각 보정 기능을 갖는 개인용 무선 통신 장치의 구성 및 동작과, 그 장치에서 수행되는 무선 통신 방법을 첨부한 도면들을 참조하여 다음과 같이 설명한다.

도 1은 본 발명에 의한 청각 보정 기능을 갖는 개인용 무선 통신 장치의 블럭도로서, 복호부(10), 청각 보정부(12) 및 디지탈/아날로그 변환부(DAC:Digital to Analog Converter)(14)로 구성된다.

도 2는 도 1에 도시된 장치에서 수행되는 본 발명에 의한 청각 보정 기능을 갖는 개인용 무선 통신 방법을 설명하기 위한 플로우차트로서, 음성 신호를 복호화하는 단계(제20 단계), 복호화된 결과의 크기를 사용자의 청각 특성에 상응하여 변형시키는 단계(제22 ~ 제26 단계) 및 변형된 신호를 아날로그 신호로 변환하는 단계(제28 단계)로 이루어진다.

먼저, 도 1에 도시된 복호부(10)는 외부로부터 수신되어 복조된 디지탈 음성 신호를 입력단자 IN1을 통해 입력하여 복호화하고, 복호화된 결과를 청각 보정부(12)로 출력한다(제20 단계).

제20 단계후에, 청각 보정부(12)는 복호부(10)로부터 입력한 복호화된 결과의 크기를 입력단자 IN2를 통해 입력한 사용자의 청각 특성에 상응하여 변형시키고, 변형된 크기를 갖는 디지탈 음성 신호를 디지탈/아날로그 변환부(14)로 출력한다(제22 ~ 제26 단계들).

제22 ~ 제26 단계들을 설명하기에 앞서, 인간의 일반적인 청각 특성에 대해 다음과 같이 살펴본다.

도 3은 인간의 일반적인 주파수별 청각 특성을 나타내는 그래프로서, 종축은 음압(sound pressure)을 나타내고, 횡축은 주파수를 각각 나타낸다. 여기서, 참조부호 44는 음성(speech)에 대한 음압 분포를 나타내고, 참조부호 46은 음악에 대한 음압 분포를 각각 나타낸다.

인간이 들을 수 있는 가장 작은 소리의 크기(HT:hearing threshold, 이하, 가청 역치라 한다.)와 귀에 통증을 느끼거나 청각 작용에 이상을 일으킬 수 있는 최대 소리의 크기(UCL:UnComfortable hearing Level, 이하, 불쾌 역치라 한다.)가 주파수 별로 다르게 분포한다. 여기서, HT와 UCL 사이의 범위를 '소리의 세기 범위'라 한다. 또한, 가청 역치 및 불쾌 역치는 사람마다 차이가 나며, 특히 난청이 심한 경우에 이러한 역치들은 다양한 형태로 나타난다. 도 3에 도시된 바와 같이, 이상이 있는 청각을 갖는 비 정상인의 HT(42)는 정상적인 청각을 갖는 정상인의 HT(40)보다 올라가고, 비 정상인의 UCL(48)는 정상인의 UCL(50)보다 내려가는 것이 일반적으로 나타나는 현상이다.

도 4a ~ 4c들은 다양한 청각 특성들을 나타내는 그래프들로서, 도 4a는 정상인의 평균적인 청각특성을 나타내고, 도 4b는 전도성 청각 장애(conductive loss)를 갖는 비 정상인의 평균적인 청각 특성을 나타내고, 도 4c는 감음 신경성 난청(sensorineural loss)을 갖는 비 정상인의 평균적인 청각 특성을 각각 나타낸다. 도 4b ~ 4c에서, 점선은 정상적인 사용자의 일반적인 HT를 나타내고, 실선은 정상적이거나 비 정상적인 사용자의 HT와 등 감각 레벨(사용자가 같은 크기의 소리로 감지하는 주파수별 음압을 등고선 형식으로 나타낸 것)을 각각 나타낸다.

도 4b에 도시된 전도성 청각 장애를 갖는 비 정상적인 사용자의 청각 특성은 도 4a에 도시된 정상적인 사용자와 비교하여 상승하였으며 각각의 주파수와 음압에 대해서 정상적인 경우와 같은 형태의 등고선을 유지한 것을 알 수 있다. 이는 전도성 난청의 경우 주파수에 따른 소리의 왜곡은 적고 전체 주파수 영역에서 소리를 듣기가 어려울 뿐이다. 반면, 도 4c에 도시된 감음 신경성 난청을 갖는 비 정상인적인 사용자의 HT와 각각의 주파수와 음압에 대한 감각 레벨은 정상인에 비해 고주파 영역에서 청각 능력이 상실된 예를 보인다. 이 경우 주파수에 따른 보상이 필요하며 본 발명은 이러한 경우의 청각 보상에 특히 유효하다.

따라서, 도 1에 도시된 청각 보정부(12)는 제22 ~ 제26 단계들을 수행하여, 복호화된 결과의 크기를 주파수 별로 사용자가 들을 수 있는 소리의 세기 범위(dynanmic range)로 개인용 무선 통신 장치를 사용하는 사용자의 청각 특성에 따라 변형하여 준다. 예컨데, 청각 보정부(12)는 4KHz 주파수 신호에 대해서 도 4c에 도시된 바와 같이 정상적인 사용자가 들을 수 있는 소리의 세기 범위(60)를 비 정상적인 사용자가 들을 수 있는 소리의 세기 범위(62)로 변형하여 주는 역할을 한다. 여기서, 입력 신호인 소리의 세기 범위를 60으로부터 62로 줄이는 변형을 '압축(compression)'이라고 한다.

도 1에 도시된 청각 보정부(12)에서 수행되는 제22 ~ 제26 단계들에 대하여 첨부된 도면들을 참조하여 다음과 같이 설명한다.

도 5는 도 1에 도시된 청각 보정부(12)의 본 발명에 의한 바람직한 일 실시예의 블럭도로서, 제1 ~ 제M 대역 통과 필터(BPF:Band Pass Filter)들(72, 74, ... 및 76)로 구성되는 필터 뱅크(70), 제1 ~ 제M 신호 변환부들(82, 84, ... 및 86)로 구성되는 부(80) 및 신호 합성부(90)로 구성된다.

먼저, 제20 단계후에, 필터 뱅크(70)의 대역 통과 필터들(72, 74, ... 및 76)은 입력단자 IN3를 통해 복호부(10)로부터 입력한 복호화된 결과를 원하는 주파수 대역별로 필터링하고, 필터링된 결과들을 제1 ~ 제M 밴드 신호들로서 제1 ~ 제M 신호 변환부들(82, 84, ... 및 86)로 출력한다(제22 단계). 예컨데, 제m($1 \le m \le M$) 대역 통과 필터(72, 74, ...

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또는 76)는 복호화된 결과를 원하는 m번째 주파수 대역에서 필터링하고, 필터링된 결과를 제m 밴드 신호로서 제m 신호 변환부(82, 84, ... 또는 86)로 출력한다. 여기서, 대역 통과 필터의 수(M)는 4 ~ 8개가 될 수 있고, 각 대역 통과 필터는 옥타브(octave band) 필터로 구현될 수 있다. 이 때, M과 각 대역 통과 필터의 폭은 고정될 수 있다. 이와 같이, 복호화된 결과를 원하는 주파수 대역별로 필터링하는 이유는, 사용자의 청각 이상 또는 청각 차이는 주파수 별로 다르게 나타나는 것이 일반적인 유형이므로, 복호화된 결과의 이득을 주파수 대역별로 다르게 조정하기 위함이다.

제22 단계후에, 제1 ~ 제M 신호 변환부들(82, 84, ... 및 86)로 구성되는 부(80)는 제1 ~ 제M 밴드 신호들 각각의 크기를 측정하고, 측정된 크기들 각각을 입력단자 IN2을 통해 입력한 사용자의 청각 특성에 상응하여 변형시키고, 변형된 크기들을 갖는 밴드 신호들을 제1 ~ 제M 변환 밴드 신호들로서 신호 합성부(90)로 출력한다(제24 단계). 예컨데, 제m 신호 변환부(82, 84, ... 또는 86)는 제m 밴드 신호의 크기를 측정하고, 측정된 크기를 입력단자 IN2을 통해 입력한 청각 특성에 상응하여 변형시키고, 변형된 크기를 갖는 제m 변환 밴드 신호를 신호 합성부(90)로 출력한다.

도 5에 도시된 각 신호 변환부(82, 84, ... 또는 86)의 본 발명에 의한 바람직한 일 실시예의 구성 및 동작을 살펴보면 다음과 같다.

도 6은 도 5에 도시된 제m 신호 변환부의 본 발명에 의한 바람직한 일 실시예의 블럭도로서, 크기 측정부(106) 및 크기 결정부(108)로 구성되는 신호 크기 조정부(100), 이득 제어부(102) 및 증폭부(104)로 구성된다.

도 7은 도 5에 도시된 제m 신호 변환부에서 제m 변환 밴드 신호를 발생하는 본 발명에 의한 바람직한 일 실시예에 의한 동작을 설명하기 위한 플로우차트로서, 제m 밴드 신호의 크기를 측정하는 단계(제120 단계), 측정된 크기를 조정하는 단계(제122 ~ 제130 단계들) 및 제m 밴드 신호의 이득을 조정된 크기와 청각 특성에 상응하여 변화시키는 단계(제132 및 제134 단계들)로 이루어진다.

먼저, 도 6에 도시된 제m 신호 변환부(82, 84, ... 또는 86)의 신호 크기 조정부(100)는 제22 단계후에, 입력단자 IN4를 통해 제m BPF(72, 74, ... 또는 76)로부터 입력한 제m 밴드 신호의 크기를 측정하고, 측정된 크기의 변화 정도가 큰가를 감지하며, 감지된 결과에 응답하여 제m 밴드 신호의 크기를 점차적으로 크게 하거나 점차적으로 작게하여 이득 제어부(102)로 출력한다(제120 ~ 제130 단계).

여기서, 신호 크기 조정부(100)의 역할을 살펴보면 다음과 같다.

도 6에 도시된 신호 크기 조정부(100)가 마련되지 않는다고 하더라도, 청각 보정부(12)에 의해, 사용자에게 제공되는 소리의 크기가 작을 경우 소리는 적당히 크게 되고, 소리의 크기가 너무 클 경우 소리의 적당히 줄어든다. 그런데, 신호의 크기가 갑자기 커지거나 갑자기 작아지면, 아주 큰 소리 또는 아주 작은 소리가 출력될 수 있다. 즉, 입력 신호에 해당하는 작은 소리가 갑자기 크게 변할 때, 입력 신호의 크기 보다 줄어든 크기를 갖는 신호가 출력되어야 한다. 그러나, 이 경우, 갑자기 소리의 크기를 줄이면 언어의 별별력을 떨어뜨릴 수도 있고, 또한 순간적으로 큰 소리가 의미 있는 소리 예를 들어, 필요한 자동차의 경적 소리 등일 경우, 이러한 의미있는 소리를 제대로 사용자에게 전달하지 못하는 문제들이 발생한다. 이러한 문제들을 해결하기 위해, 전술한 신호 크기 조정부(100)가 마련된다.

이를 위해, 도 6에 도시된 신호 크기 조정부(100)의 크기 측정부(106)는 제22 단계후에 입력단자 IN4를 통해 제m BPF로부터 입력한 제m 밴드 신호의 크기를 측정하고, 측정된 크기를 크기 결정부(108)로 출력한다(제120 단계).

도 8a 및 도 8b들은 크기 측정부(106)의 입력 및 출력을 나타내는 그래프들로서, 도 8a는 크기 측정부(106)에 입력되는 20K 샘플링된 제m 밴드 신호의 예시적인 파형도를 나타내고, 도 8b는 이 신호에 대해서 크기 측정부(106)로부터 출력되는 제m 밴드 신호의 크기 즉, 엔벨로프(envelope)를 각각 나타내며, 횡축은 시간(n)을 나타내고, 종축은 제m 밴드 신호의 크기를 각각 나타낸다.

본 발명의 바람직한 일 실시예에 의하면, 크기 측정부(106)는 도 8a에 도시된 제m 밴드 신호의 엔벨로프를 크기로서 측정하고, 도 8b에 도시된 측정된 크기를 크기 결정부(108)로 출력할 수 있다. 그러나, 엔벨로프를 정확히 계산하기 위해서는 많은 연산량이 필요하고 시간 지연된 결과를 얻을 수 밖에 없다. 그러므로, 본 발명에 의한 다른 실시예에 의하면, 크기 측정부(106)는 제m 밴드 신호의 엔벨로프 대신에 절대값을 측정하고, 측정한 절대값을 제m 밴드 신호의 측정된 크기로서 크기 결정부(108)로 출력할 수도 있다. 따라서, 크기 측정부(106)는 적은 연산량에도 불구하고 효과적으로 제m 밴드 신호의 크기를 측정할 수 있다.

제120 단계후에, 크기 결정부(108)는 제m 밴드 신호에 대해 크기 측정부(106)에서 어느 샘플 시간(n)에서 측정된 크기[A(n)]를 한 샘플 이전 시간(n-1)에 측정된 크기[A(n-1)]와 비교하고, 비교된 결과에 응답하여 제m 밴드 신호의 크기를 점차적으로 크게 하거나 작게 하여 이득 제어부(102)로 출력한다(제122 ~ 제130 단계들).

도 9는 도 6에 도시된 크기 결정부(108)의 본 발명에 의한 바람직한 일 실시예의 블럭도로서, 제1 및 제2 버퍼들(150 및 156), 비교부(152), 제1 및 제2 선택부들(154 및 166), 제1 및 제2 승산부들(158 및 162), 감산부(160) 및 가산부(164)로 구성된다.

도 10a 및 10b들은 도 5에 도시된 필터 뱅크(70)로 입력되는 신호의 파형도를 나타내고, 도 10b는 도 5에 도시된 신호 합성부(90)로부터 출력되는 신호의 파형도를 각각 나타낸다.

도 9에 도시된 제1 버퍼(150)는 크기 측정부(106)에서 측정된 크기(A)를 입력하여 버퍼링하고, 버퍼링된 결과를 비교부(152)로 출력한다. 그러므로, 제1 버퍼(150)로 A(n)가 입력될 때 제1 버퍼(150)로부터 출력되는 버퍼링된 결과는 A(n-1)가 된다. 이 때, 비교부(152)는 제m 밴드 신호에 대해 어느 샘플 시간(n)에서 크기 측정부(106)에서 측정된 크기[A(n)]가 한 샘플 이전 시간(n-1)에서 측정된 제1 버퍼(150)에 버퍼링된 결과인 크기[A(n-1)]보다 제1 임계값(Th1) 이상 큰가를 판단하고, 판단된 결과를 측정된 크기의 변화 정도를 감지한 결과로서 출력한다(제122 단계). 즉, 제122 단계에서, 비교부(152)는 크기 측정부(106)에서 측정된 크기가 급격하게 커졌는가를 판단한다. 예컨데, 측정된 크기[A]가 A(a)로부터 A(b)로 급격하게 커졌는가를 판단한다.

도 11(a) 및 11(b)들은 제1 소정 어텍(attack) 시간 및 제2 소정 릴리스(release) 시간들을 설명하기 위한 파형도들로서, 도 11(a)는 도 5에 도시된 필터 뱅크(70)로 입력되는 신호를 구형파의 형태로 나타낸 타이밍도이고, 도 11(b)는 도 5에 도시된 신호 합성부(90)로부터 출력되는 신호를 구형파의 형태로 나타낸 타이밍도이다.

만일, 도 10a에 도시된 바와 같이 측정된 크기 A(n)(182)이 A(n-1)(180)보다 제1 임계값(Th1) 이상 크면, 도 10b에 도시된 바와 같이 신호의 크기[A(n)]를 점차적으로 작게 하고, 다음 수학식 1과 같이 표현되는 최종적으로 결정된 크기[Mag(n)]를 갖는 제m 밴드 신호를 구하고 제132 단계로 진행한다(제124 단계).

수학식 1

$$Mag(n)=T_r*Mag(n-1)+(1-T_r)*A(n)$$

여기서, 소정 어택 시간(T_r)은 크기 측정부(106)에서 측정된 크기에 대해서 도 11(b)에 도시된 바와 같이 제m 밴드 신호의 크기가 최종적으로 작아질 때의 레벨(190)보다 제1 소정 레벨 만큼 높은 레벨(192)에 도달할 때 까지 소요되는 시간을 의미한다. 여기서, 레벨(190)은 크기 결정부(108)의 출력이 안정화될 때의 레벨에 해당한다. 제1 소정 레벨은 도 11(b)에 도시된 바와 같이 2dB가 될 수 있다.

그러나, 비교부(152)는 A(n)가 A(n-1)보다 제1 임계값(Th1) 이상 크지 않으면, A(n)이 A(n-1)보다 제2 임계값

(Th2) 이상 적은가를 판단한다(제126 단계). 즉, 비교부(152)는 크기 측정부(106)에서 측정된 크기가 급격하게 작아졌는가를 판단한다. 예컨데, 도 10a에 도시된 바와 같이 측정된 크기[A]가 A(b)로부터 A(a)로 변하였는가를 판단한다. 만일, 도 10a에 도시된 바와 같이 A(n)(186)이 A(n-1)(184)보다 제2 임계값(Th2) 이상 적으면, 도 10b에 도시된 바와 같이 측정된 크기[A(n)]를 점차적으로 크게하여, 다음 수학식 2에 표현된 최종적으로 커진 크기[Mag(n)]를 갖는 제m 밴드 신호를 구하고 제132 단계로 진행한다(제128 단계).

수학식 2

$$Mag(n)=T_f*Mag(n-1)+(1-T_f)*A(n)$$

여기서, 소정 릴리스 시간(T_f)은 크기 측정부(106)에서 측정된 크기에 대해서 도 11(b)에 도시된 바와 같이 제m 밴드 신호의 크기가 최종적으로 커졌을 때의 레벨(194)보다 제2 소정 레벨만큼 낮은 레벨(196)에 도달할 때 까지 소요되는 시간을 의미한다. 여기서, 레벨(194)은 크기 결정부(108)의 출력이 안정화될 때의 레벨에 해당한다. 제2 소정 레벨은 도 11(b)에 도시된 바와 같이 2dB가 될 수 있다.

제124 단계 및 제128 단계들을 수행하기 위해, 크기 결정부(108)는 제1 선택부(154), 제1 및 제2 승산부들(158 및 162), 감산부(160), 가산부(164) 및 제2 버퍼(156)을 마련할 수 있다.

여기서, 제1 선택부(154)는 소정 어텍 시간(T_r) 또는 소정 릴리스 시간(T_f)중 하나를 비교부(152)에서 비교된 결과에 응답하여 선택적으로 출력한다. 즉, 제1 선택부(154)는 비교부(152)에서 비교된 결과를 통해, A(n)이 A(n-1)보다 제1 임계값(Th1) 이상 큰 것으로 판단되면 소정 어텍 시간(T_r)을 선택하여 출력하고, A(n)이 A(n-1)보다 제2 임계값(Th2) 이상 적은 것으로 판단되면 소정 릴리스 시간(T_f)을 선택하여 출력한다. 이 때, 제1 승산부(158)는 제2 버퍼(156)에서 버퍼링된 결과[Mag(n-1)]와 제1 선택부(154)의 출력을 승산하고, 승산된 결과를 가산부(164)로 출력한다. 감산부(160)는 소정값 예를 들면 '1'로부터 제1 선택부(154)의 출력을 감산하고, 감산된 결과를 제2 승산부(162)로 출력한다. 승산부(162)는 감산부(160)의 출력과 크기 측정부(106)의 출력[A(n)]을 승산하고, 승산된 결과를 가산부(164)로 출력한다. 가산부(164)는 제1 및 제2 승산부들(158 및 162)에서 승산된 결과들을 가산하고, 가산된 결과를 샘플 시간(n)에서 가변된 전술한 수학식 1 또는 2에 표현된 크기[Mag(n)]로서 출력한다. 이 때, 제2 버퍼(156)는 가산부(164)의 출력을 버퍼링하고, 버퍼링된 결과[Mag(n-1)]를 제1 승산부(158)로 출력한다.

한편, 본 발명에 의한 바람직한 일 실시예에 의하면, A(n)이 A(n-1)보다 제2 임계값(Th2) 이상 적지 않은 것으로 판단되면, 즉, A(n)의 레벨이 A(n-1)의 레벨보다 급격하게 커졌거나 급격하게 작아지지 않은 것으로 판단되면, 한 샘플 이전 시간(n-1)에서 최종적으로 커졌거나 작아진 크기[Mag(n-1)]를 어느 샘플 시간(n)에서 최종적으로 커졌거나 또는 작아진 크기[Mag(n)]로서 결정하고, 제132 단계로 진행한다(제130 단계). 이를 위해, 크기 결정부(108)는 가산부(164)의 출력 또는 제1 버퍼(150)에서 버퍼링된 결과[A(n-1)]중 하나를 비교부(152)에서 비교된 결과에 응답하여 선택적으로 이득 제어부(102)로 Mag(n)로서 출력하는 제2 선택부(166)를 더 마련할 수도 있다. 즉, 제2 선택부(166)는 비교부(152)에서 비교된 결과를 통해 A(n)이 A(n-1)보다 제2 임계값(Th2) 이상 적거나 제1 임계값(Th1) 이상 큰 것으로 판단되면, 가산부(164)의 출력을 선택하여 이득 제어부(102)로 출력한다. 그러나, 제2 선택부(166)는 비교부(152)에서 비교된 결과를 통해 A(n)이 A(n-1)보다 제1 임계값(Th1) 이상 크지도 않고, A(n)이 A(n-1)보다 제2 임계값(Th2) 이상 적지도 않은 것으로 판단되면, 제1 버퍼(150)에서 버퍼링된 결과[Mag(n-1)]를 이득 제어부(102)로 출력한다.

본 발명에 의한 바람직한 다른 실시예에 의하면, A(n)이 A(n-1)보다 제2 임계값(Th2) 이상 적지 않은 것으로 판단될 때, 즉, A(n)의 레벨이 A(n-1)의 레벨보다 급격하게 커졌거나 급격하게 작아지지도 않은 것으로 판단될 때, 측정된 크기[A(n)]를 전술한 수학식 1 또는 2와 같이 가변시키고, 가변된 크기[Mag(n)]를 갖는 신호를 이득 제어부(102)로 출력할 수도 있다. 이 경우, 크기 결정부(108)는 도 9에 도시된 제2 선택부(106)를 마련할 필요가 없다. 즉, 크기 결정부(108)의 제1 선택부(154)는 비교부(152)에서 비교된 결과를 통해, A(n)의 레벨이 A(n-1)의 레벨보다 급격하게 커지지도 않았고, 급격하게 작아지지도 않은 것으로 판단되면, 소정 어텍 시간(T_r)이나 소정 릴리스 시간(T_f) 들 중 어느 것이나 선택적으로 출력할 수 있다.

한편, 제124, 제128 또는 제130 단계에서, 크기 결정부(108)로부터 출력되는 제m 밴드 신호의 크기[Mag(n)] 및 청각 특성을 이용하여, 제m 밴드 신호의 크기를 가변시키고, 가변된 크기를 갖는 제m 밴드 신호를 제m 변환 밴드 신호로서 결정하고, 제26 단계로 진행한다(제132 및 제134 단계들). 이를 위해, 도 6에 도시된 이득 제어부(102)는 신호 크기 조정부(100)에서 출력되는 제m 밴드 신호의 크기[Mag(n)] 및 입력단자 IN2을 통해 입력한 청각 특성을 이용하여 발생한 제m 이득 제어 신호를 증폭부(104)로 출력한다(제132 단계). 여기서, 제m 신호 변환부는 도 6에 도시된 바와 달리 신호 크기 조정부(100)를 마련하지 않을 수 있으며, 이 경우, 입력단자 IN4를 통해 입력되는 제m 밴드 신호는 이득 제어부(102)로 직접 인가된다. 그러므로, 이득 제어부(102)는 신호 크기 조정부(100)로부터 출력되는 제m 밴드 신호의 크기[Mag(n)]를 입력하는 대신에 제m BPF(72, 74, ... 또는 76)로부터 제m 밴드 신호를 직접 입력하고, 입력한 제m 밴드 신호의 크기 및 입력단자 IN2을 통해 입력한 청각 특성을 이용하여 제m 이득 제어 신호를 발생할 수도 있다. 이 때, 증폭부(104)는 입력단자 IN4를 통해 입력한 제m 밴드 신호의 크기를 이득 제어부(102)로부터 출력되는 제m 이득 제어 신호에 응답하여 가변시키고, 가변된 크기를 갖는 제m 밴드 신호를 제m 변환 밴드 신호로서 출력단자 OUT3을 통해 신호 합성부(90)로 출력한다(제134 단계).

한편, 제132 및 제134 단계들에서 수행되는 본 발명에 의한 밴드 신호 압축 과정에 대해 다음과 같이 세부적으로 살펴본다.

도 12는 본 발명에 의한 밴드 신호 압축 과정을 설명하기 위한 그래프로서, 횡축은 이득 제어부(102)로 입력되는 신호의 크기(Xm)를 나타내고, 종축은 이득 제어부(102)로부터 출력되는 신호의 크기(Ym)를 나타낸다. 여기서, 곡선(212)의 점선 부분은 비 정상적인 사용자에 대한 실질적인 청각 특성을 나타내고, 실선 부분은 비 정상적인 사용자에 대한 근사화된 청각 특성을 나타낸다.

m번째 주파수 대역에서 정상적인 사용자(210)와 청각 장애를 갖는 비 정상적인 사용자(212)의 각 HT와 UCL이 도 12에 도시된 바와 같이 주어진다고 가정하자. 이 때, 이득 제어부(102) 및 증폭부(104)는 정상적인 사용자의 다이나믹 레인지(214) 내의 크기(Xm)를 갖고 입력되는 입력 신호를 입력단자 IN2을 통해 입력되는 청각 특성에 따라 비 정상적인 사용자의 다이나믹 레인지(216) 내의 크기(Ym)를 갖는 신호로 압축시켜 출력하는 역할을 한다. 여기서, 청각 특성은 도 12에 도시된 니 포인트(knee point)들(A1, A2, A3, A4, A5 및 A6)로 이루어져 있다. 니 포인트는 X축이 제m 밴드 신호의 크기 또는 크기 결정부(108)의 출력이고, Y축이 제m 변환 밴드 신호의 크기인 X 및 Y 좌표상의 한 점에 해당한다. 여기서, A1은 정상적인 사용자의 HT에 대응하는 비 정상적인 사용자의 HT를 나타내며, A5는 정상적인 사용자의 UCL에 대응하는 비 정상적인 사용자의 UCL을 나타내며, A2, A3 및 A4들은 중간 단계의 특성을 각각 나타낸다. 도 12에서는 5개의 니 포인트들을 사용하여 청각 특성을 나타냈다. 그러나, 도 12에 도시된 청각 특성 곡선(212)의 모양과 복잡성을 고려하여, 니 포인트들의 수는 결정될 수 있다. 바람직한 니 포인트들의 개수는 일반적으로 3 ~ 4개 정도이다.

도 6에 도시된 이득 제어부(102)는 크기 결정부(108)로부터 입력되는 신호(Xm)의 크기를 입력단자 IN2을 통해 입력한 니 포인트들(A1, A2, A3, A4 및 A5)을 이용하여 보간(interpolation)하는 역할을 하며, 보간 방법으로서 여러가지가 있을 수 있다. 그 중 하나의 보간 방법인 선형 보간 방법에 대해 살펴보면 다음과 같다.

선형 보간 방법에서는, 이득 제어부(102)는 입력한 니 포인트들을 선형적으로 연결하여 도 12에 도시된 곡선(212)의 실선 부분 즉, 비 정상적인 사용자의 근사화된 청각 특성 곡선을 만들어 낸다. 이 때, 도 12에 도시된 HT와 UCL 사이의 크기(Xm)를 갖는 입력 신호가 입력될 때, 이득 제어부(102)는 입력 신호의 크기(Xm)에 대응하는 출력[Y(Xm)]을 곡선(212)의 실선 부분을 이용하여 찾는다.

도 13은 본 발명에 의한 밴드 신호 압축 과정을 설명하기 위한 그래프로서, 횡축은 이득 제어부(102)로 입력되는 신호의 크기(Xm)를 나타내고, 종축은 이득 제어부(102)로부터 출력되는 신호의 크기(Ym)를 각각 나타낸다.

예를 들어, 이득 제어부(102)로 입력되는 신호의 레벨(Xm)이 도 13에 도시된 바와 같이 HT와 B2 사이에 존재한다고 가정한다. 이 때, 이득 제어부(102)는 Xm이 HT인 경우 사용자의 청각 특성에 맞는 출력 신호[Y(HT)]를 구하고, Xm이 B2인 경우 의 사용자의 청각 특성에 맞는 출력 신호[Y(B2)]를 구하고, Xm이 HT와 B2 사이의 값인 경우 사용자의 청각 특성에 맞는 출력 신호[Y(Xm)]를 구한다. 이득 제어부(102)는 출력 신호[Y(HT), Y(B2) 또는 Y(Xm)]에 대응하는 제m 이득 제어 신호를 증폭부(104)로 출력한다. 이 때, 증폭부(104)는 입력단자 IN4를 통해 입력한 제m 밴드 신호의 이득(Gm)을 제m 이득 제어 신호에 응답하여 제어하고, 이득이 제어된 결과[Y(HT), Y(B2) 또는 Y(Xm)]를 제m 변환 밴드 신호로서 출력단자 OUT3을 통해 출력한다.

결국, 제132 및 제134 단계에서는 니 포인트들(A1 ~ A5)을 외부로부터 입력하여, 이들을 선형적으로 연결하고, 연결된 선분으로부터 일반 방정식 Ym = sXm + I(여기서, s는 기울기를 의미하고, I는 Y축의 절편을 각각 의미한다.)을 구하며, 일반 방정식으로부터 해당하는 Xm에 대응하는 Ym을 구한다.

제24 단계후에, 신호 합성부(90)는 제1 ~ 제M 신호 변환부들(82, 84, ... 및 86)로부터 각각 출력되는 제1 ~ 제M 변환 밴드 신호들을 합성하고, 합성된 결과를 출력단자 OUT2를 통해 디지탈/아날로그 변환부(14)로 출력한다(제26 단계).

제26 단계후에, 신호 합성부(90)에서 합성된 결과인 청각 보정부(12)로부터 출력되는 변형된 크기를 갖는 디지탈 음성 신호는 디지탈/아날로그 변환부(14)에서 아날로그 음성 신호로 변환되고, 변환된 아날로그 음성 신호는 출력단자 OUT1을 통해 사용자에게 제공된다(제28 단계).

한편, 본 발명에 의한 바람직한 일 실시예에 의하면, 청각 보상부(12)는 외부에서 미리 구해진 청각 특성을 직접 인가받을 수 있다. 이 실시예에 의하면, 사용자가 심한 난청을 가질 경우에, 본 발명에 의한 개인용 무선 통신 장치는 모든 장비들이 구비된 외부의 청각 검사실에서 정확하게 측정된 이상적인 청각 특성을 이용하여 밴드 신호를 보정할 수 있다. 이 때, 청각 특성은, 후술되는 외부 인터페이스(미도시)를 통해 청각 보정부(12)로 직접 인가될 수도 있고, 키 입력부(미도시)의 키를 사용자가 직접 조작함으로서 청각 보정부(12)에 인가될 수도 있다.

본 발명의 바람직한 다른 실시예의 의하면, 청각 보상부(12)는 외부로부터 사전에 주어져서 저장된 다수개의 청각 특성들에 해당하는 소리들을 듣고서 사용자가 결정한 청각 특성을 인가받을 수 있다. 이를 위해, 도 1에 도시된 본 발명에 의한 개인용 무선 통신 장치는 다수개의 청각 특성들을 외부로부터 입력하여 저장하는 저장부(미도시) 및 저장부(미도시)에 저장된 다수개의 청각 특성들중 하나를 선택 신호에 응답하여 선택적으로 출력하는 선택부(미도시)를 더 마련할 수 있다. 여기서, 저장부(미도시)에 저장되는 청각 특성 테이블에 각 청각 특성(1, 2, 3, 4, 5, 6, ... n')은 다음 표 1과 같은 니 포인트들(A1, A2, A3, A4 및 A5)로 이루어질 수 있다.

[표 1]

청각 특성 선택									청각 특성 변수						
F1= 500Hz			F2= 1000Hz			F3= 2000Hz			FM= XHz						
A1	A2	A3	A1	A2	A3	A1	A2	A3	A4	A5	A1	A2	A3	A4	
1	23	133	576	66	154	877	45	534	1242	3455	4568	10	30	53	100
2	32	132	867	56	245	987	55	345	1424	3453	6758	20	40	167	238
3	34	124	978	76	134	677	67	353	1342	3545	6865	20	45	176	567
4	65	145	567	87	276	566	46	465	1423	3453	6786	14	42	156	865
5	78	156	978	78	145	867	54	355	1234	3453	6866	15	56	276	348
6	56	187	896	98	186	866	46	322	1234	3453	8666	17	23	187	297
‖															
n'	76	167	987	78	228	867	35	214	1244	3533	7455	20	54	287	345

표 1에서, F1, F2, ... 및 F(M) 각각은 각 주파수 대역의 중심 주파수를 나타낸다. 이 때, 사용자는 저장부(미도시)에 저장된 다수개의 청각 특성들에 해당하는 소리들을 듣고서 선택 신호를 결정함으로써, 해당하는 청각 특성이 입력단자 IN2를 통해 청각 보정부(12)로 인가되도록 한다. 여기서, 표 1에 도시된 청각 특성 테이블을 구하는 과정을 다음과 같이 살펴본다.

일반적인 사용자를 대상으로 청각 특성을 조사하면, 크게 몇 가지로 분류할 수 있다. 예컨데, 년령별 또는 사용자가 처한 환경별로 청각 특성들을 세분하여 분류할 수 있다. 즉, 고령자는 고주파의 난청과 좁은 다이나믹 레인지를 갖는 청각 특성을 갖고, 특정한 종류의 소음에 자주 노출되는 사람들은 서로 비슷한 청각 특성을 보이고, 헤드폰 등을 통해 큰 소리로 음악을 자주 듣는 사람들은 서로 비슷한 청각 특성을 보인다. 따라서, 이러한 현상을 이용하여 몇 가지의 대표적인 청각 특성들을 표 1에 보인 바와 같이 구할 수 있다.

이 때, 사용자는 저장부(미도시)에 미리 저장된 몇 가지의 청각 특성들 중에서 자기에게 맞는 청각 특성을 선택하여 본 발명에 의한 개인용 무선 통신 장치로 제공한다. 즉, 저장된 몇 가지의 청각 특성들에 상응하는 표준 음성 신호를 사용자에게 순차적으로 제공하고, 사용자는 여러개의 표준 음성 신호를 통해 자신에게 적합한 청각 특성을 선택하고, 선택된 청각 특성을 본 발명에 의한 개인용 무선 통신 장치에 인가한다.

본 발명에 의한 바람직한 또 다른 실시예에 의하면, 본 발명에 의한 개인용 무선 통신 장치는, 사용자의 청각 특성을 자체적으로 검사하는 청각 특성 검사부(미도시)를 별도로 더 마련할 수 있다. 이는, 본 발명에 의한 개인용 무선 통신 장치가 휴대 전화 장치에 적용될 경우, 휴대 전화 장치의 사용자자 자신의 청각 특성을 스스로 간단하게 검사할 수 있도록 한다. 이 경우, 청각 특성 검사부(미도시)는 청각 보정부(12)에 내장될 수도 있고, 청각 보정부(12)의 외부에 별도로 마련될 수도 있다. 또한, 청각 특성 검사부(미도시)에서 수행되는 청각 특성 검사는 도 2에 도시된 제24 단계를 수행하기 이전에 한 번만 수행하며 사용자의 청각 특성이 변하기 전까지 검사된 결과를 계속 사용한다.

이하, 본 발명에 의한 청각 특성 검사 방법과 그 방법을 수행하는 청각 특성 검사부(미도시)의 구성 및 동작을 첨부된 도면들을 참조하여 다음과 같이 설명한다.

도 14는 본 발명에 의한 청각 특성 검사 방법을 설명하기 위한 플로우차트로서, 청각 특성이 요구되면 제1 주파수 대역을 선택하는 단계(제240 및 제242 단계들), 해당하는 주파수 대역에 대한 가청 역치를 결정하는 단계(제244 ~ 제250 단계들), 해당하는 주파수 대역에 대한 니 포인트를 결정하는 단계(제252 ~ 제256 단계들), 해당하는 주파수 대역에 대한 불쾌 역치를 결정하는 단계(제258 ~ 제262 단계들) 및 해당하는 다른 주파수 대역을 결정하는 단계(제264 및 제266 단계들)로 이루어진다.

도 15는 도 14에 도시된 청각 특성 검사 방법을 수행하는 본 발명에 의한 청각 특성 검사부의 본 발명에 의한 바람직한 일 실시예의 블럭도로서, 제1, 제2, 제3 니 포인트 결정부들(280, 282 및 284) 및 제어부(286)로 구성된다.

먼저, 제어부(286)는 청각 특성의 검사를 요구하는 청각 검사 요구 신호가 외부로부터 입력단자 IN6을 통해 입력되는가를 계속적으로 판단하고, 판단된 결과를 제어 신호로서 발생한다(제240 단계). 만일, 청각 특성의 측정이 외부로부터 요구되면, 제1 ~ 제M 주파수 대역들중에서 제1 주파수 대역을 선택한다(제242 단계). 이를 위해, 제1 니 포인트 결정부(280)는 제어부(286)로부터 발생되는 제어 신호를 통해 외부로부터 청각 특성의 검사가 요구된 것으로 인지하면, 제1 ~ 제M 주파수 대역들중 제1 주파수 대역에 해당하는 테스트 신호를 입력단자 IN5를 통해 입력한다. 여기서, 테스트 신호는 제m 주파수 대역의 중심 주파수에 해당하는 순음 신호 또는 제m 주파수 대역내의 주파수 성분이 합해진 복합 신호에 해당한다.

제242 단계후에, 제1 니 포인트 결정부(280)는 해당하는 제m 주파수 대역의 가청 역치를 결정하고, 결정된 가청 역치에 해당하는 대한 니 포인트(A1)를 출력한다(제244 ~ 제250 단계들).

이를 위해, 제242 단계후에, 제1 니 포인트 결정부(280)는 입력단자 IN5를 통해 입력한 소정의 최소 크기를 갖는 테스트 신호를 출력단자 OUT4를 통해 발생한다(제244 단계). 제244 단계후에, 사용자는 출력단자 OUT4를 통해 출력된 테스트 신호에 해당하는 소리를 들을 수 있는가를 판단한다(제246 단계). 만일, 사용자가 소리를 들을 수 없으면, 테스트 신호의 크기를 제3 소정 레벨 만큼 증가시키고, 제246 단계로 진행한다(제248 단계). 즉, 제1 니 포인트 결정부(280)는 입력단자 IN7을 통해 입력되는 제1 상태 신호를 통해 사용자가 소리를 들을 수 없는 것으로 판단되면, 테스트 신호의 크기를 제3 소정 레벨만큼 증가시키고, 증가된 레벨을 갖는 새로운 테스트 신호를 출력단자 OUT4를 통해 다시 출력하다. 따라서, 사용자는 새로운 테스트 신호에 해당하는 소리를 들을 수 있는가를 판단하고, 판단된 결과를 제1 상태 신호로서 입력단자 IN7을 통해 제1 니 포인트 결정부(280)에 인가한다. 그러나, 제1 니 포인트 결정부(280)는 입력단자 IN7을 통해 입력한 제1 상태 신호를 통해 사용자가 소리를 들을 수 있는 것으로 판단되면, 들리는 소리에 해당하는 테스트 신호의 크기를 가청 역치로 결정하고, 가청 역치에 해당하는 니 포인트(A1)를 출력한다(제250 단계).

제250 단계후에, 제2 니 포인트 결정부(282)는 사용자에게 편안한 느낌을 제공하는 제m 주파수 대역의 니 포인트를 결정하고, 결정된 니 포인트(A3)를 출력한다(제252 ~ 제256 단계들).

이를 위해, 제250 단계후에, 사용자는 출력단자 OUT5를 통해 출력되는 테스트 신호에 해당하는 소리가 편안한 느낌을 제공하는가를 판단한다(제252 단계). 만일, 테스트 신호에 해당하는 소리가 편안한 느낌을 제공하지 않으면, 테스트 신호의 크기를 제4 소정 레벨만큼 증가시키고, 제252 단계로 진행한다(제254 단계). 즉, 제2 니 포인트 결정부(282)는 입력단자 IN8을 통해 입력되는 제2 상태 신호를 통해 사용자가 편안한 느낌을 제공받을 수 없는 것으로 판단되면, 테스트 신호의 크기를 제4 소정 레벨만큼 증가시키고, 증가된 레벨을 갖는 새로운 테스트 신호를 출력단자 OUT5를 통해 다시 출력하다. 따라서, 사용자는 새로운 테스트 신호에 해당하는 소리가 편안한 느낌을 제공하는가를 판단하고, 판단된 결과를 입력단자 IN8을 통해 제2 상태 신호로서 제2 니 포인트 결정부(282)에 인가한다. 그러나, 제2 니 포인트 결정부(282)는 입력단자 IN8을 통해 입력한 제2 상태 신호에 응답하여 사용자가 소리로부터 편안한 느낌을 제공받은 것으로 판단되면, 편안한 느낌을 제공하는 소리에 해당하는 테스트 신호의 크기를 이용하여 결정한 니 포인트(A3)를 출력한다(제256 단계). 여기서, 제2 니 포인트 결정부(282)는 제256 단계에서 결정된 니 포인트(A3)에 해당하는 소리보다 약간 작은 소리에 해당하는 니 포인트(A2) 및 약간 큰 소리에 해당하는 니 포인트(A4)를 부가적으로 더 결정할 수도 있다. 그러나, 임상적으로 니 포인트들을 5개 이상 결정하는 것은 의미가 적으며, 측정하기도 어렵다. 따라서, 니 포인트는 세 개(A1, A3 및 A5)가 바람직하다.

제256 단계후에, 제3 니 포인트 결정부(284)는 제m 주파수 대역의 불쾌 역치에 해당하는 니 포인트를 결정하고, 결정된 니 포인트(A5)를 출력한다(제258 ~ 제262 단계들).

이를 위해, 제256 단계후에, 사용자는 출력단자 OUT6을 통해 출력되는 테스트 신호에 해당하는 소리가 너무 큰가를 판단한다(제258 단계). 즉, 사용자는 소리가 너무 커서 제대로 들리지 않는가, 소리가 너무 커서 귀가 아픈가 혹은 더 이상의 큰 소리가 출력되지 않았으면 좋겠다는 느낌을 받는가를 판단한다. 만일, 테스트 신호에 해당하는 소리가 너무 크지 않으면, 테스트 신호의 크기를 제5 소정 레벨만큼 증가시키고, 제258 단계로 진행한다(제260 단계). 즉, 제3 니 포인트 결정부(284)는 입력단자 IN9를 통해 입력되는 제3 상태 신호를 통해 소리가 너무 크지 않은 것으로 사용자가 판단하였다고 인식되면, 테스트 신호의 크기를 제5 소정 레벨만큼 증가시키고, 증가된 레벨을 갖는 새로운 테스트 신호를 출력단자 OUT6을 통해 다시 출력하다. 따라서, 사용자는 새로운 테스트 신호에 해당하는 소리가 너무 큰가를 판단하고, 판단된 결과를 입력단자 IN9를 통해 제3 상태 신호로서 제3 니 포인트 결정부(284)에 인가한다. 그러나, 제3 니 포인트 결정부(284)는 입력단자 IN9를 통해 입력한 제3 상태 신호를 통해 소리가 너무 큰 것으로 사용자가 판단하였다고 인식되면, 너무 큰 소리에 해당하는 테스트 신호의 크기를 불쾌역치로 결정하고, 결정한 불쾌역치에 해당하는 니 포인트(A5)를 출력한다(제262 단계).

제262 단계후에, 제어부(286)는 해당하는 제m 주파수 대역이 마지막 주파수 대역인 제M 주파수 대역인가를 판단하고 판단된 결과를 제1, 제2 및 제3 니 포인트 결정부들(280, 282 및 284)로 출력한다(제264 단계). 만일, 제m 주파수 대역이 제M 주파수 대역이면, 청각 특성 검사를 종료한다. 이를 위해, 제어부(286)는 더 이상 니 포인트들이 결정되지 않도록 제1, 제2 및 제3 니 포인트 결정부들(280, 282 및 284)을 제어한다. 즉, 제어부(286)는 테스트 신호가 제1, 제2 및 제3 니 포인트 결정부들(280, 282 및 284)에 인가되지 않도록 한다. 그러나, 제m 주파수 대역이 제M 주파수 대역이 아니면, m은 1만큼 증가되고, 제244 단계로 진행한다(제266 단계). 즉, 제m+1 주파수 대역에 대하여 제244 ~ 제262 단계들이 수행될 수 있도록 한다. 이 때, 제어부(286)는 해당하는 니 포인트를 발생하도록 제1, 제2 및 제3 니 포인트 결정부들(280, 282 및 284)을 제어한다. 즉, 제어부(286)는 제m+1 주파수 대역에 대한 테스트 신호가 입력단자 IN5를 통해 각 니 포인트 결정부에 입력되도록 제어한다.

여기서, 제1, 제2 및 제3 니 포인트 결정부들(280, 282 및 284)들에 입력되는 제m 주파수 대역에 대한 테스트 신호는 입력단자 IN5을 통해 외부로부터 인가될 수도 있고, 제어부(286)로부터 각 니 포인트 결정부에 직접 인가될 수도 있다.

이하, 도 1에 도시된 개인용 무선 통신 장치가 휴대용 전화 장치에 해당할 경우, 본 발명에 의한 청각 보정 기능을 갖는 휴대용 전화 장치의 구성 및 동작을 다음과 같이 설명한다.

도 16은 본 발명에 의한 청각 보정 기능을 갖는 휴대용 전화 장치의 블럭도로서, 마이크(302) 따위로 구현될 수 있는 음성 입력부(300), 스피커(306) 따위로 구현될 수 있는 음성 출력부(304), 아날로그/디지탈 변환부(ADC:Analog to Digital Converter)(310), DAC(14), 부호부(316), 복호부(10), 중앙 처리부(322), 변복조부(324), 청각 보정부(12), 표시부(328), 키 입력부(326) 및 입/출력부(330)로 구성된다.

도 16 및 도 1에 도시된 복호부(10), 청각 보정부(12) 및 DAC(14)는 동일하며, 동일한 기능을 수행한다. 또한, 입/출력부(330)는 전술한 외부 인터페이스부의 역할을 수행한다.

도 16에 도시된 음성 입력부(300)는 사용자로부터 입력한 음성을 아날로그 형태의 음성 신호로 변환하여 ADC(310)로 출력하며, 이를 위해 마이크(302)로 구현될 수 있다. 이 때, ADC(310)는 음성 입력부(300)로부터 출력되는 아날로그 형태의 음성 신호를 디지탈 형태로 변환하고, 변환된 결과를 부호부(316)로 출력한다. 부호부(316)는 ADC(310)의 출력을 부호화하고, 부호화된 결과를 중앙 처리부(322)로 출력한다. 여기서, 중앙 처리부(322)는 부호부(316)에서 부호화된 결과에 헤더(header) 또는 에러 정정 부호 따위의 부가 정보를 추가하여 변복조부(324)로 출력한다. 변복조부(324)는 중앙 처리부(322)로부터 출력되는 신호를 변조하고, 변조된 결과를 출력단자 OUT7을 통해 안테나(미도시)를 통하여 무선(RF:Radio Frequency) 신호로서 송출한다.

한편, 변복조부(324)는 안테나(미도시)를 통해 수신되어 입력단자 IN10을 통해 입력한 아날로그 음성 신호를 복조하고, 복조된 결과를 중앙 처리부(322)로 출력한다. 중앙 처리부(322)는 복조된 결과로부터 필요한 정보만을 취한 다음에, 복호부(10)로 출력한다. 복호부(10)는 전술한 바와 같이, 음성 신호를 복호화하고, 복호화된 결과를 청각 보정부(12)로 출력한다. 청각 보정부(12)는 중앙 처리부(322)로부터 출력되는 청각 보정 요구 신호에 응답하여 복호화된 결과의 크기를 변형시켜 DAC(14)로 출력한다. 여기서, 키 입력부(326)는 사용자가 청각 보정을 요구할 때 제1 키 입력 신호를 중앙 처리부(322)로 출력하고, 중앙 처리부(322)는 키 입력부(326)로부터 발생되는 제1 키 입력 신호에 응답하여 청각 보정 요구 신호를 청각 보정부(12)로 출력한다. 그러므로, 외부에서 청각 보정이 요구될 때 청각 보정부(12)는 복호화된 결과를 전술한 바와 같이 압축한 후에 DAC(14)로 출력하지만, 외부에서 청각 보정을 요구하지 않으면 복호화된 결과를 압축하지 않고 그대로 DAC(14)로 출력한다. 이 때, 청각 보정부(12)는 전술한 바와 같이 외부 인터페이스부(미도시)에 해당하는 입/출력부(330)를 통해 입력된 사용자의 청각 특성을 중앙 처리부(322)를 거쳐 입력할 수 있다.

DAC(14)는 청각 보정부(12)로부터 출력되는 디지탈 형태의 신호를 아날로그 형태 신호로 변환하여 음성 출력부(304)로 출력한다. 이 때, 음성 출력부(304)는 DAC(14)로부터 출력되는 아날로그 형태의 음성 신호를 사용자에게 소리로서 제공하며, 이를 위해, 스피커(306)로 구현될 수 있다. 여기서, 키 입력부(326)는 사용자가 청각 특성의 검사를 요구할 때 제2 키 입력 신호를 발생하여 중앙 처리부(322)로 출력한다. 이 때, 중앙 처리부(322)는 제2 키 입력 신호에 응답하여 청각 검사 요구 신호를 청각 특성 검사부(미도시)로 출력한다. 따라서, 외부에 별도로 마련되거나 청각 보정부(12) 또는 중앙 처리부(322)에 내장될 수 있는 청각 특성 검사부(미도시)는 청각 검사 요구 신호에 응답하여 전술한 도 14에 도시된 청각 특성을 검사 방법을 수행한다. 또한, 도 16에 도시된 중앙 처리부(322)는 도 16에 도시된 장치의 현재 상태를 표시부(328) 또는 입/출력부(330)를 통해 사용자에게 제공할 수도 있다. 도 16에 도시된 ADC(310) 및 DAC(14)는 일반적인 휴대폰의 코덱(CODEC:COder- DECoder)에 해당하고, 부호부(316) 및 복호부(10)는 일반적인 휴대폰의 보코더(VOCODER)에 해당한다.

발명의 효과

이상에서 설명한 바와 같이, 본 발명에 의한 청각 보정 기능을 갖는 개인용 무선 통신 장치 및 방법은 소리는 최종적으로 개인의 청각 특성에 의하여 인지되는 것이므로, 입력되는 신호를 청각 장애를 갖는 사용자 또는 청각 장애를 갖지 않지만 서로 다른 청각 특성들을 갖는 사용자들 개개인의 청각 특성에 적합하게 보정하여 사용자에게 편안하고 변별력 있는 소리를 제공할 수 있는 효과를 갖는다.

(57) 청구의 범위

청구항 1.

외부로부터 수신되어 복조된 디지탈 음성 신호를 복호화하고, 복호화된 결과를 출력하는 복호부;

상기 복호부로부터 입력한 상기 복호화된 결과의 크기를 사용자의 청각 특성에 상응하여 변형시키고, 변형된 크기를 갖는 디지탈 음성 신호를 출력하는 청각 보정부; 및

상기 청각 보정부로부터 출력되는 상기 디지탈 음성 신호를 아날로그 음성 신호로 변환하여 상기 사용자에게 제공하는 디지탈/아날로그 변환부를 구비하는 것을 특징으로 하는 청각 보정 기능을 갖는 개인용 무선 통신 장치.

청구항 2.

제1 항에 있어서, 청각 보정부는

상기 복호화된 결과를 원하는 주파수 대역별로 필터링하고, 필터링된 결과들을 제1 ~ 제M 밴드 신호들로서 출력하는 제1 ~ 제M 대역 통과 필터들;

상기 제1 ~ 제M 밴드 신호들 각각의 크기를 측정하고, 상기 측정된 크기들 각각을 상기 청각 특성에 상응하여 변형시키고, 변형된 크기들을 갖는 밴드 신호들을 제1 ~ 제M 변환 밴드 신호들로서 출력하는 제1 ~ 제M 신호 변환부들; 및

상기 제1 ~ 제M 변환 밴드 신호들을 합성하고, 합성된 결과를 출력하는 신호 합성부를 구비하고,

상기 합성된 결과는 상기 디지탈/아날로그 변환부에서 아날로그 신호로 변환되어 상기 사용자에게 제공되는 것을 특징으로 하는 청각 보정 기능을 갖는 개인용 무선 통신 장치.

청구항 3.

제2 항에 있어서, 상기 제m($1 \le m \le M$) 신호 변환부는

상기 제m 밴드 신호의 크기를 측정하고, 측정된 크기의 변화 정도를 감지하며, 상기 감지된 결과에 응답하여 상기 제m 밴드 신호의 크기를 점차적으로 커지게 하거나 작아지게 하여 출력하는 신호 크기 조정부;

상기 신호 크기 조정부에서 최종적으로 커졌거나 작아진 크기를 갖는 상기 제m 밴드 신호의 크기 및 상기 청각 특성을 이용하여 제m 이득 제어 신호를 출력하는 이득 제어부; 및

상기 제m 밴드 신호의 크기를 상기 제m 이득 제어 신호에 응답하여 가변시키고, 가변된 크기를 갖는 제m 밴드 신호를 상기 제m 변환 밴드 신호로서 출력하는 증폭부를 구비하는 것을 특징으로 하는 청각 보정 기능을 갖는 개인용 무선 통신 장치.

청구항 4.

제3 항에 있어서, 상기 신호 크기 조정부는

상기 제m 밴드 신호의 크기를 측정하여 출력하는 크기 측정부; 및

상기 제m 밴드 신호에 대해 상기 크기 측정부에서 어느 샘플 시간(n)에서 측정된 크기[A(n)]를 한 샘플 이전 시간(n-1)에 측정된 크기[A(n-1)]와 비교하고, 상기 감지된 결과에 해당하는 비교된 결과에 응답하여 상기 제m 밴드 신호의 크기를 점차적으로 크게하거나 작아지게 하여 상기 이득 제어부로 출력하는 크기 결정부를 구비하는 것을 특징으로 하는 청각 보정 기능을 갖는 개인용 무선 통신 장치.

청구항 5.

제4 항에 있어서, 상기 크기 측정부는 상기 제m 밴드 신호의 절대값을 측정하고, 상기 절대값을 상기 제m 밴드 신호의 측정된 크기로서 상기 크기 결정부로 출력하는 것을 특징으로 하는 청각 보정 기능을 갖는 개인용 무선 통신 장치.

청구항 6.

제5 항에 있어서, 상기 크기 결정부는

상기 크기 측정부의 출력을 입력하여 버퍼링하는 제1 버퍼;

상기 크기 측정부의 출력[A(n)]과 상기 제1 버퍼에서 버퍼링된 결과[A(n-1)]를 비교하고, 비교된 결과들을 상기 감지된 결과들로서 출력하는 비교부;

소정 어텍 시간 또는 소정 릴리스 시간중 하나를 상기 비교부에서 비교된 결과에 응답하여 선택적으로 출력하는 제1 선택부;

제1 승산부;

소정값으로부터 상기 제1 선택부의 출력을 감산하고, 감산된 결과를 출력하는 감산부;

상기 감산부의 출력과 상기 크기 측정부의 출력[A(n)]을 승산하고, 승산된 결과를 출력하는 제2 승산부;

상기 제1 및 상기 제2 승산부들에서 승산된 결과들을 가산하고, 가산된 결과를 어느 샘플 시간(n)에서 가변된 크기[Mag(n)]로서 출력하는 가산부; 및

상기 가산부의 출력을 버퍼링하고, 버퍼링된 결과를 상기 제1 승산부로 출력하는 제2 버퍼를 구비하고,

상기 제1 승산부는 상기 제2 버퍼에서 버퍼링된 결과와 상기 제1 선택부의 출력을 승산하는 것을 특징으로 하는 청각 보정 기능을 갖는 개인용 무선 통신 장치.

청구항 7.

제6 항에 있어서, 상기 크기 결정부는

상기 가산부의 출력 또는 상기 제1 버퍼에서 버퍼링된 결과[A(n-1)]중 하나를 상기 비교부에서 비교된 결과에 응답하여 선택적으로 상기 이득 제어부로 출력하는 제2 선택부를 더 구비하는 것을 특징으로 하는 청각 보정 기능을 갖는 개인용 무선 통신 장치.

청구항 8.

제6 항 또는 제7 항에 있어서, 상기 소정 어텍 시간은 상기 크기 측정부의 출력에 대한 상기 크기 결정부의 출력이 안정화될 때의 레벨보다 제1 소정 레벨만큼 높은 레벨에 도달할 때 까지 소요되는 시간인 T_r에 해당하고, 상기 소정 릴리스 시간은 상기 크기 측정부의 출력에 대한 상기 크기 결정부의 출력이 안정화될 때의 레벨보다 제2 소정 레벨만큼 낮은 레벨에 도달할 때 까지 소요되는 시간인 T_f에 해당하는 것을 특징으로 하는 청각 보정 기능을 갖는 개인용 무선 통신 장치.

청구항 9.

제1 항에 있어서, 상기 개인용 무선 통신 장치는

상기 사용자의 청각 특성을 외부로부터 입력하여 상기 청각 보정부로 출력하는 외부 인터페이스부를 더 구비하는 것을 특징으로 하는 청각 보정 기능을 갖는 개인용 무선 통신 장치.

청구항 10.

제2 항에 있어서, 상기 개인용 무선 통신 장치는

상기 사용자의 청각 특성을 자체적으로 검사하는 청각 특성 검사부를 더 구비하는 것을 특징으로 하는 청각 보정 기능을 갖는 개인용 무선 통신 장치.

청구항 11.

제1 항에 있어서, 상기 개인용 무선 통신 장치는

다수개의 상기 청각 특성들에 대한 정보를 갖는 청각 특성 테이블을 미리 입력하여 저장하는 저장부; 및

상기 저장부에 저장된 상기 청각 특성 테이블에서 하나의 청각 특성을 선택 신호에 응답하여 선택적으로 출력하는 제3 선택부를 더 구비하고,

상기 사용자는 상기 다수개의 청각 특성들에 해당하는 소리들을 듣고서 상기 선택 신호를 결정하는 것을 특징으로 하는 청각 보정 기능을 갖는 개인용 무선 통신 장치.

청구항 12.

제2 항 또는 제10 항에 있어서, 상기 제m 신호 변환부는

상기 청각 특성을 나타내는 니 포인트(knee point)들을 선형적으로 연결하고, 연결된 선상에서 상기 제m 밴드 신호의 크기에 해당하는 상기 제m 변환 밴드 신호의 크기를 찾고,

상기 니 포인트는 X축이 상기 제m 밴드 신호의 크기이고, Y축이 상기 제m 변환 밴드 신호의 크기인 X 및 Y 좌표상의 한점에 해당하는 것을 특징으로 하는 청각 보정 기능을 갖는 개인용 무선 통신 장치.

청구항 13.

제12 항에 있어서, 상기 청각 특성 검사부는

상기 제1 ~ 제M 상기 밴드 신호들에 해당하는 제1 ~ 제M 주파수 대역들중 제어 신호에 응답하여 입력한 상기 제m 주파수 대역의 가청 역치를 결정하고, 결정된 상기 가정 역치에 해당하는 니 포인트를 출력하는 제1 니 포인트 결정부;

상기 제m 주파수 대역의 상기 사용자에게 편안한 느낌을 제공하는 니 포인트(들)를 결정하고, 결정된 상기 니 포인트(들)를 출력하는 제2 니 포인트 결정부;

상기 제m 주파수 대역의 불쾌 역치를 결정하고, 결정된 상기 불쾌 역치에 해당하는 니 포인트를 출력하는 제3 니 포인트 결정부; 및

상기 사용자가 청각 특성의 검사를 요구하는가에 상응하여 상기 제어 신호를 발생하고, 상기 제1 ~ 제M 주파수 대역들에 대한 상기 니 포인트들이 모두 구해졌는가에 상응하여 상기 제1, 상기 제2 및 상기 제3 니 포인트 결정부들의 상기 니 포인트 결정을 제어하는 제어부를 구비하고, 상기 청각 특성은 상기 니 포인트들로 이루어지는 것을 특징으로 하는 청각 보정 기능을 갖는 개인용 무선 통신 장치.

청구항 14.

제13 항에 있어서, 상기 제2 니 포인트 결정부는

출력하는 상기 니 포인트에 해당하는 소리보다 약간 작은 소리에 해당하는 니 포인트 및 약간 큰 소리에 해당하는 니 포인트를 부가적으로 더 결정하는 것을 특징으로 하는 청각 보정 기능을 갖는 개인용 무선 통신 장치.

청구항 15.

제1 항, 제9 항, 제10 항 또는 제11 항에 있어서, 상기 개인용 무선 통신 장치는

상기 사용자로부터 입력한 음성을 아날로그 형태의 음성 신호로 변환하여 출력하는 음성 입력부;

아날로그 형태의 상기 음성 신호를 디지탈 형태로 변환하고, 변환된 결과를 출력하는 아날로그/디지탈 변환부;

상기 아날로그/디지탈 변환부의 출력을 부호화하여 출력하는 부호부;

상기 부호화된 결과를 변조하는 변조부;

외부로부터 수신한 음성 신호를 복조하고, 복조된 결과를 출력하는 복조부;

상기 디지탈/아날로그 변환부로부터 출력되는 상기 아날로그 음성 신호를 상기 사용자에게 소리로서 제공하는 음성 출력부;

상기 부호화된 결과를 입력하여 상기 변조부로 제공하고, 상기 복조된 결과를 입력하여 상기 복조된 디지탈 음성 신호로서 상기 복호부로 출력하고, 제1 키 입력 신호에 응답하여 청각 보정 요구 신호를 출력하는 중앙 처리부; 및

상기 사용자가 청각 보정을 요구할 때 상기 제1 키 입력 신호를 출력하는 키 입력부를 더 구비하고,

상기 청각 보정부는 상기 복호화된 결과의 크기를 상기 청각 보정 요구 신호에 응답하여 변형시키는 것을 특징으로 하는 청각 보정 기능을 갖는 개인용 무선 통신 장치.

청구항 16.

제15 항에 있어서, 상기 개인용 무선 통신 장치에서

상기 키 입력부는 상기 사용자가 상기 청각 특성의 검사를 요구할 때 제2 키 입력 신호를 발생하고, 상기 중앙 처리부는 상기 제2 키 입력 신호에 응답하여 청각 검사 요구 신호를 출력하고, 상기 청각 특성 검사부는 상기 청각 검사 요구 신호에 응답하여 상기 청각 특성을 검사하는 것을 특징으로 하는 청각 보정 기능을 갖는 개인용 무선 통신 장치.

청구항 17.

(a) 외부로부터 수신되어 복조된 디지탈 음성 신호를 복호화하는 단계;

(b) 상기 복호화된 결과의 신호의 크기를 사용자의 청각 특성에 상응하여 변형시켜, 변형된 크기를 갖는 디지탈 음성 신호를 구하는 단계; 및

(c) 상기 변형된 크기를 갖는 상기 디지탈 음성 신호를 아날로그 음성 신호로 변환하여 상기 사용자에게 제공하는 단계를 구비하는 것을 특징으로 하는 청각 보정 기능을 갖는 개인용 무선 통신 방법.

청구항 18.

제17 항에 있어서, 상기 (b) 단계는

(b1) 상기 (a) 단계에서 복호화된 결과를 원하는 주파수 대역별로 나누어 제1 ~ 제M 밴드 신호들을 구하는 단계;

(b2) 상기 제1 ~ 제M 밴드 신호들 각각의 크기를 상기 청각 특성에 상응하여 변형시키고, 변형된 크기들을 갖는 밴드 신호들인 제1 ~ 제M 변환 밴드 신호들을 구하는 단계; 및

(b3) 상기 제1 ~ 제M 변환 밴드 신호들을 합성하고, 상기 (c) 단계로 진행하는 단계를 구비하고,

상기 합성된 결과는 아날로그 신호로 변환되어 사용자에게 제공되는 것을 특징으로 하는 청각 보정 기능을 갖는 개인용 무선 통신 방법.

청구항 19.

제18 항에 있어서, 상기 (b2) 단계는 각 제m($1 \le m \le M$) 밴드 신호에 대하여,

(b21) 상기 (b1) 단계후에, 상기 제m 밴드 신호의 크기를 측정하는 단계;

(b22) 상기 측정된 크기의 변화 정도에 상응하여 상기 제m 밴드 신호의 크기를 점차적으로 커지게 하거나 작아지게 하는 단계; 및

(b23) 상기 (b22) 단계에서 최종적으로 커지거나 작아진 크기를 갖는 제m 밴드 신호의 크기 및 상기 청각 특성을 이용하여, 상기 제m 밴드 신호의 크기를 가변시키고, 가변된 크기를 갖는 제m 밴드 신호를 상기 제m 변환 밴드 신호로서 결정하고, 상기 (b3) 단계로 진행하는 단계를 구비하는 것을 특징으로 하는 청각 보정 기능을 갖는 개인용 무선 통신 방법.

청구항 20.

제19 항에 있어서, 상기 (b22) 단계는

상기 제m 밴드 신호에 대해 어느 샘플 시간(n)에서 측정된 크기[A(n)]가 한 샘플 이전 시간(n-1)에서 측정된 크기[A(n-1)]보다 제1 임계값 이상 큰가를 판단하는 단계;

상기 A(n)가 상기 A(n-1)보다 상기 제1 임계값 이상 크면, 아래와 같이 상기 측정된 크기[A(n)]를 점차적으로 작아지게 하여, 최종적으로 작아진 크기[Mag(n)]를 갖는 제m 밴드 신호를 구하고 상기 (b23) 단계로 진행하는 단계;

$$Mag(n)=T_r*Mag(n-1)+(1-T_r)*A(n)$$

(여기서, T_r는 상기 제m 밴드 신호의 측정된 크기에 대한 상기 제m 밴드 신호의 크기가 최종적으로 작아질 때의 레벨보다 제1 소정 레벨만큼 높은 레벨에 도달할 때 까지 소요되는 시간을 의미한다.)

상기 A(n)가 상기 A(n-1)보다 상기 제1 임계값 이상 크지 않으면, 상기 A(n)이 상기 A(n-1)보다 제2 임계값 이상 적은가를 판단하는 단계; 및

상기 A(n)이 상기 A(n-1)보다 상기 제2 임계값 이상 적으면, 아래와 같이 상기 측정된 크기[A(n)]를 점차적으로 커지게 하여, 최종적으로 커진 크기[Mag(n)]를 갖는 제m 밴드 신호를 구하고 상기 (b23) 단계로 진행하는 단계를 구비하는 것을 특징으로 하는 청각 보정 기능을 갖는 개인용 무선 통신 방법.

$$Mag(n)=T_f*Mag(n-1)+(1-T_f)*A(n)$$

(여기서, T_f는 상기 제m 밴드 신호의 측정된 크기에 대한 상기 제m 밴드 신호의 크기가 최종적으로 커졌을 때의 레벨보다 제2 소정 레벨만큼 낮은 레벨에 도달할 때 까지 소요되는 시간을 의미한다.)

청구항 21.

제20 항에 있어서, 상기 (b22) 단계는

상기 A(n)이 상기 A(n-1)보다 상기 제2 임계값 이상 적지 않으면, 한 샘플 이전 시간(n-1)에서 최종적으로 커졌거나 작아진 크기[Mag(n-1)]를 어느 샘플 시간(n)에서 최종적으로 커졌거나 작아진 크기[Mag(n)]로서 결정하고, 상기 (b23) 단계로 진행하는 단계를 더 구비하는 것을 특징으로 하는 청각 보정 기능을 갖는 개인용 무선 통신 방법.

청구항 22.

제20 항에 있어서, 상기 (b22) 단계는

상기 A(n)이 상기 A(n-1)보다 상기 제2 임계값 이상 적지 않으면, 아래와 같이 상기 측정된 크기[A(n)]를 가변시켜, 가변된 크기[Mag(n)]를 갖는 밴드 신호를 구하고 상기 (b23) 단계로 진행하는 단계를 더 구비하는 것을 특징으로 하는 청각 보정 기능을 갖는 개인용 무선 통신 방법.

$$Mag(n)=T_1*Mag(n-1)+(1-T_1)*A(n)$$

청구항 23.

제20 항에 있어서, 상기 (b22) 단계는

상기 A(n)이 상기 A(n-1)보다 상기 제2 임계값 이상 적지 않으면, 아래와 같이 상기 측정된 크기[A(n)]를 가변시켜, 가변된 크기[Mag(n)]를 갖는 밴드 신호를 구하고 상기 (b23) 단계로 진행하는 단계를 더 구비하는 것을 특징으로 하는 청각 보정 기능을 갖는 개인용 무선 통신 방법.

$$Mag(n)=T_f*Mag(n-1)+(1-T_f)*A(n)$$

청구항 24.

제18 항에 있어서, 상기 사용자의 청각 특성은 외부로부터 주어지는 것을 특징으로 하는 청각 보정 기능을 갖는 개인용 무선 통신 방법.

청구항 25.

제18 항에 있어서, 상기 개인용 무선 통신 방법은

상기 사용자의 청각 특성을 자체적으로 검사하고, 상기 (b) 단계로 진행하는 (d) 단계를 더 구비하는 것을 특징으로 하는 청각 보정 기능을 갖는 개인용 무선 통신 방법.

청구항 26.

제18 항에 있어서, 상기 사용자의 청각 특성은

외부로부터 사전에 주어지는 다수개의 청각 특성들중에서, 상기 다수개의 청각 특성들에 해당하는 소리들을 듣고서 사용자가 결정한 청각 특성에 해당하는 것을 특징으로 하는 청각 보정 기능을 갖는 개인용 무선 통신 방법.

청구항 27.

제25 항에 있어서, 상기 (d) 단계는

(d1) 상기 청각 특성의 측정이 요구되는가를 계속적으로 판단하는 단계;

(d2) 상기 청각 특성의 측정이 요구되면, 상기 제1 ~ 제M 주파수 대역들중에서 제1 주파수 대역을 선택하는 단계;

(d3) 해당하는 제m 주파수 대역의 가청 역치에 해당하는 대한 니 포인트(knee point)를 결정하는 단계;

(d4) 상기 제m 주파수 대역의 상기 사용자에게 편안한 느낌을 제공하는 니 포인트들을 결정하는 단계;

(d5) 상기 제m 주파수 대역의 불쾌 역치에 해당하는 니 포인트를 결정하는 단계;

(d6) 상기 해당하는 제m 주파수 대역이 마지막인 제M 주파수 대역인가를 판단하여, 상기 제m 주파수 대역이 상기 제M 주파수 대역이면, 상기 (b) 단계로 진행하는 단계; 및

(d7) 상기 제m 주파수 대역이 상기 제M 주파수 대역이 아니면, m을 1만큼 증가시키고, 상기 (d3) 단계로 진행하는 단계를 구비하고,

상기 청각 특성은 상기 니 포인트들로 이루어지는 것을 특징으로 하는 청각 보정 기능을 갖는 개인용 무선 통신 방법.

청구항 28.

제27 항에 있어서, 상기 (d3) 단계는

(d31) 소정의 최소 크기를 갖는 테스트 신호를 발생하는 단계;

(d32) 상기 사용자가 상기 테스트 신호에 해당하는 소리를 들을 수 있는가를 판단하는 단계;

(d33) 상기 사용자가 상기 소리를 들을 수 없으면, 상기 테스트 신호의 크기를 제3 소정 레벨 만큼 증가시키고, 상기 (d32) 단계로 진행하는 단계; 및

(d34) 상기 사용자가 상기 소리를 들을 수 있으면, 들리는 소리에 해당하는 상기 테스트 신호의 크기를 상기 가청 역치로서 결정하고, 상기 가청 역치를 이용하여 상기 가정 역치에 대한 니 포인트를 결정하고, 상기 (d4) 단계로 진행하는 단계를 구비하는 것을 특징으로 하는 청각 보정 기능을 갖는 개인용 무선 통신 방법.

청구항 29.

제28 항에 있어서, 상기 (d4) 단계는

(d41) 상기 (d3) 단계후에, 상기 사용자는 상기 테스트 신호에 해당하는 소리가 편안한 느낌을 제공하는가를 판단하는 단계;

(d42) 상기 소리가 편안한 느낌을 제공하지 않으면, 상기 테스트 신호의 크기를 제4 소정 레벨만큼 증가시키고, 상기 (d41) 단계로 진행하는 단계; 및

(d43) 상기 소리가 편안한 느낌을 제공하면, 편안한 느낌을 제공하는 소리에 해당하는 상기 테스트 신호의 크기를 이용하여 상기 니 포인트를 결정하고, 상기 (d5) 단계로 진행하는 단계를 구비하는 것을 특징으로 하는 청각 보정 기능을 갖는 개인용 무선 통신 방법.

청구항 30.

제29 항에 있어서, 상기 (d5) 단계는

(d51) 상기 (d4) 단계후에, 상기 사용자는 상기 테스트 신호에 해당하는 소리가 너무 큰가를 판단하는 단계;

(d52) 상기 소리가 너무 크지 않으면, 상기 테스트 신호의 크기를 제5 소정 레벨만큼 증가시키고, 상기 (d51) 단계로 진행하는 단계; 및

(d53) 상기 소리가 너무 크면, 너무 큰 소리에 해당하는 상기 테스트 신호의 크기를 상기 불쾌 역치로 결정하고, 상기 불쾌 역치를 이용하여 상기 니 포인트를 결정하고 상기 (d6) 단계로 진행하는 단계를 구비하는 것을 특징으로 하는 청각 보정 기능을 갖는 개인용 무선 통신 방법.

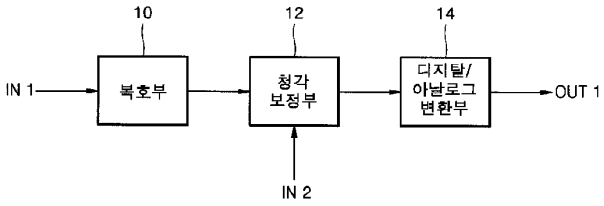
청구항 31.

제28 항, 제29 항 또는 제30 항에 있어서, 상기 테스트 신호는

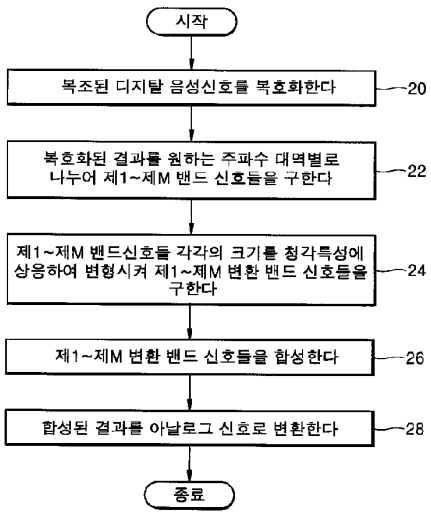
상기 제m 주파수 대역의 중심 주파수에 해당하는 순음 신호 또는 제m 주파수 대역내의 주파수 성분이 합해진 복합 신호인 것을 특징으로 하는 청각 보정 기능을 갖는 개인용 무선 통신 방법.

도면

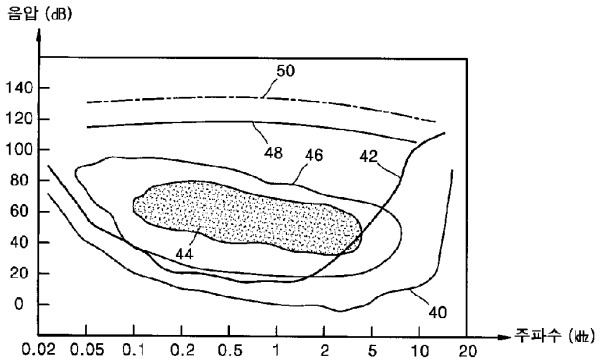
도면 1



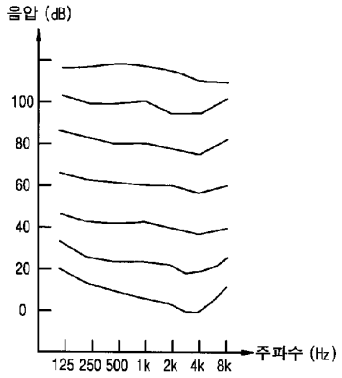
도면 2



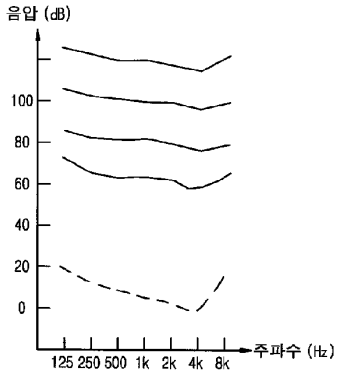
도면 3


음압 (dB)
140
120
100
80
60
40
20
0
50
48
46
42
44
40
0.02 0.05 0.1 0.2 0.5 1 2 5 10 20
주파수 (㎑)

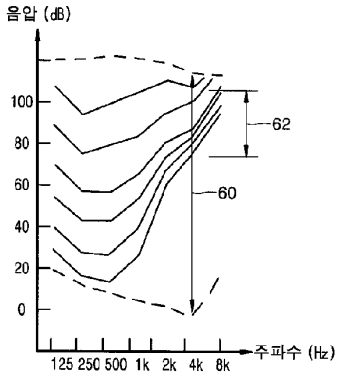
도면 4a


음압 (dB)
100
80
60
40
20
0
125 250 500 1k 2k 4k 8k
주파수 (Hz)

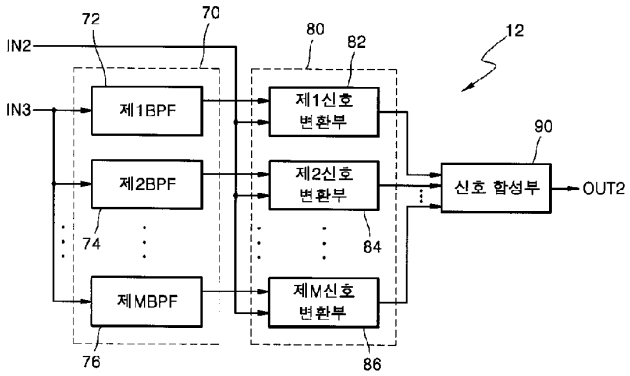
도면 4b


음압 (dB)
100
80
60
40
20
0
125 250 500 1k 2k 4k 8k
주파수 (Hz)

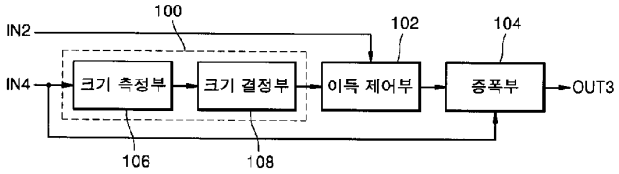
도면 4c


음압 (dB)
100
80
60
40
20
0
62
60
125 250 500 1k 2k 4k 8k
주파수 (Hz)

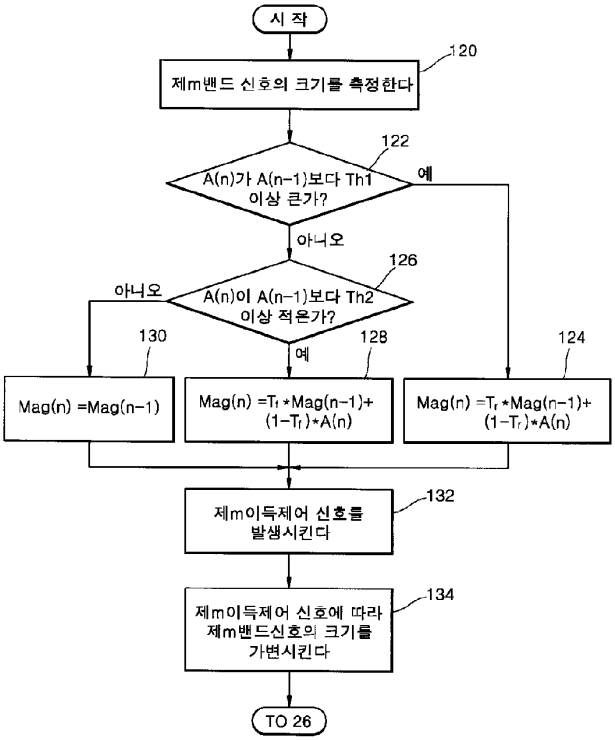
도면 5


IN2
IN3
72
70
80
82
12
제1BPF
제2BPF
제MBPF
제1신호 변환부
제2신호 변환부
제M신호 변환부
90
신호 합성부
OUT2
74
84
76
86

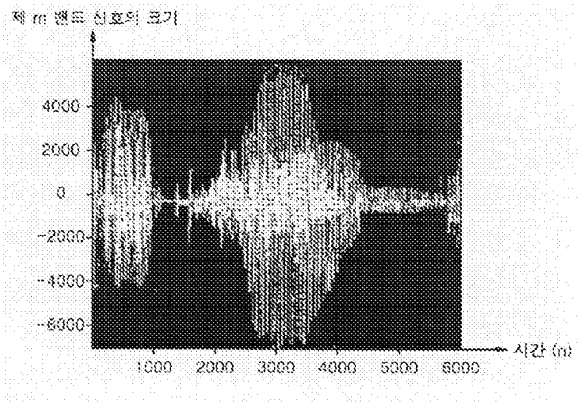
도면 6


IN2
IN4
100
102
104
크기 측정부
크기 결정부
이득 제어부
증폭부
OUT3
106
108

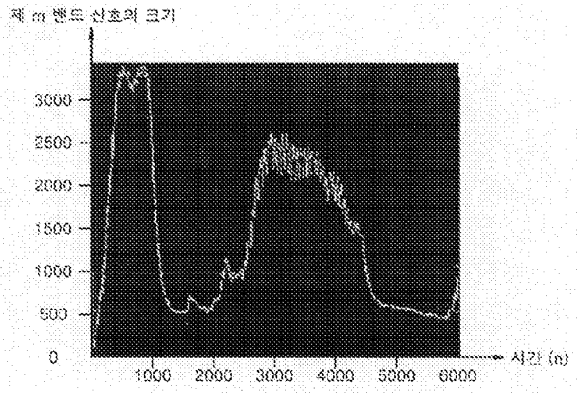
도면 7


시 작
제m밴드 신호의 크기를 측정한다
120
A(n)가 A(n-1)보다 Th1 이상 큰가?
122
예
아니오
A(n)이 A(n-1)보다 Th2 이상 적은가?
126
아니오
예
130
128
124
Mag(n) =Mag(n-1)
Mag(n) =Tf *Mag(n-1)+ (1-Tf)*A(n)
Mag(n) =Tr *Mag(n-1)+ (1-Tr)*A(n)
제m이득제어 신호를 발생시킨다
132
제m이득제어 신호에 따라 제m밴드신호의 크기를 가변시킨다
134
TO 26

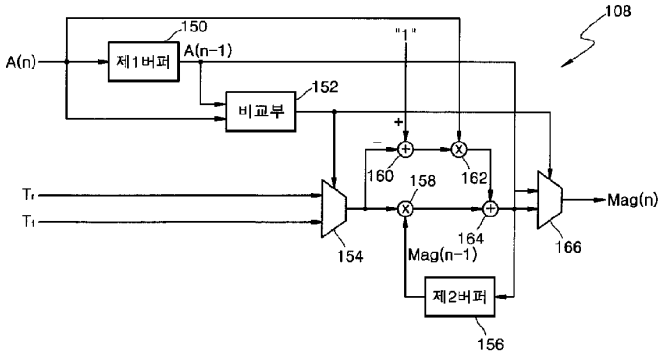
도면 8a


제 m 밴드 신호의 크기
4000
2000
0
-2000
-4000
-6000
1000
2000
3000
4000
5000
6000
시간 (n)

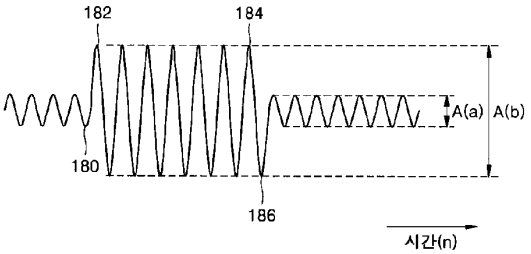
도면 8b


제 m 밴드 신호의 크기
3000
2500
2000
1500
1000
500
0
1000
2000
3000
4000
5000
6000
시간 (n)

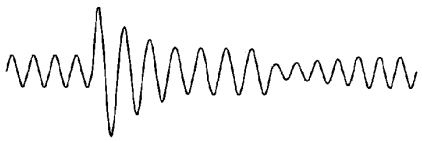
도면 9



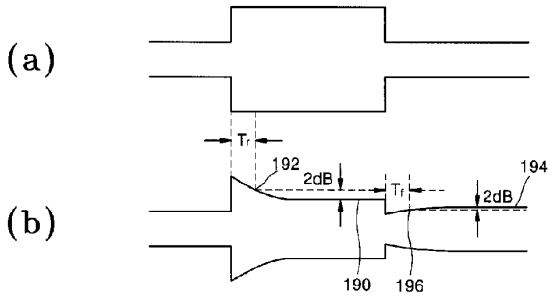
도면 10a



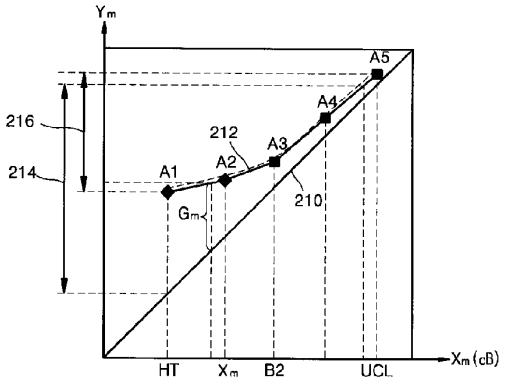
도면 10b



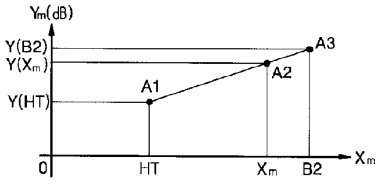
도면 11



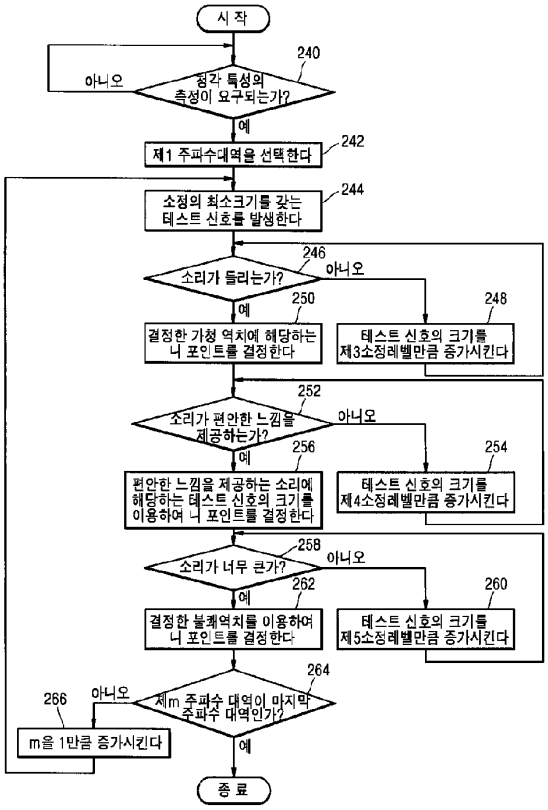
도면 12



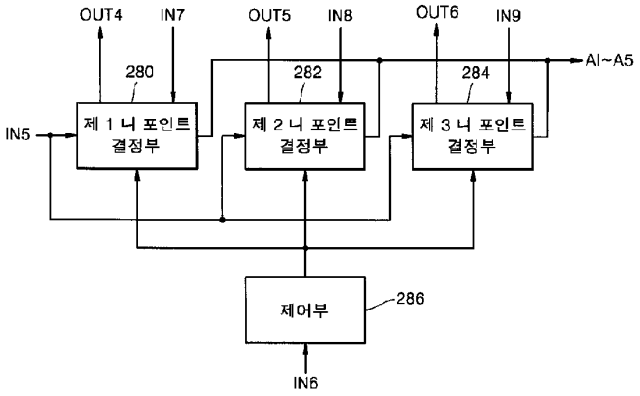
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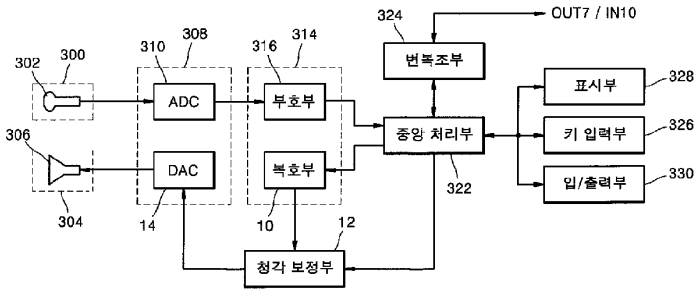
도면 14


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OUT4
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IN9
A1~A5
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282
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IN5
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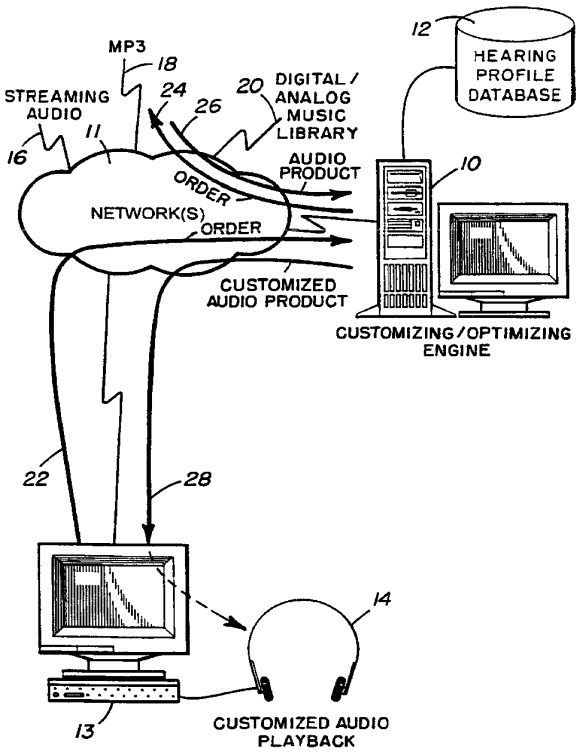
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(54) Title: PRODUCING AND STORING HEARING PROFILES AND CUSTOMIZED AUDIO DATA BASED



(57) Abstract: A method for providing customized audio data products that includes the steps of (1) storing a machine readable hearing profile for a customer, (2) accepting via a data input device or data network for example, machine readable orders from the customer for a particular audio data product, (3) associating the hearing profile for the customer with the particular audio data product, (4) modifying the particular audio data product according to the hearing profile to produce a customized audio data product, (5) delivering the customized audio data product to the customer, for example via a network or by a machine readable storage medium, (6) accepting feedback from the customer concerning the objective or subjective performance of the customized audio data product, and (7) modifying the hearing profile in response to the feedback provided. An audio playback device for playing back customized audio products based on the hearing profiles, and a hearing test device for use in the generation of hearing profiles are provided. The customized audio data product can be delivered using a network, or provided on an article of manufacture that comprises a data storage medium that is configured for connection to and for disconnection from an audio playback device. In one embodiment, an audio playback device and a hearing test device for producing hearing profiles are combined in a single appliance including a headset and earphones.

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PRODUCING AND STORING HEARING PROFILES AND CUSTOMIZED AUDIO DATA BASED

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to the distribution, customization and playback of audio data products, like telephone signals, music batch files, and streaming audio data. In particular, the present invention provides for distribution and/or playback of audio data products customized according to a hearing profile of a customer, and for techniques for the production of hearing profiles for customers.

Description of Related Art

The hearing profiles of individuals vary in a number of ways. The ability to hear sounds varies with frequency among individuals across the normal audio frequency range. Also, the dynamic range varies among individuals so that levels of audio stimulus that are perceived as soft sounds and levels of audio stimulus that are perceived as loud sounds differ from person to person. Standard hearing tests are designed to produce an audiogram that characterizes such factors as frequency, sensitivity, and dynamic range in the hearing profiles of individuals. There are also other factors that affect a hearing profile. For example, psycho-acoustic factors concerning the manner in which a person perceives combinations of normal sounds affect the ability to hear in manners that can vary from person to person. Also, environmental factors such as the usual listening environment of a person (library, conference room, concert hall) and the equipment on which the sound is produced (loud speaker, ear phones, telephone hand set), are important. In persons wearing hearing aids or using other assistive hearing devices, the type of aid or device affects the hearing profile. The physiology of an impairment suffered by the individual may also be an important factor in the hearing profile.

Audio products that are distributed to customers in digital or analog electronic form are intended for persons having hearing profiles within a normal range. For example, a popular

compression technique for musical compositions being distributed across the Internet, known as MP3, is based on the psycho-acoustic model of a typical listener. Thus, some persons have hearing profiles that may interfere with enjoyment of MP3 compressed music. Other persons may have hearing profiles which make it difficult to understand normal telephone conversations using audio data from the telephone network. Also, individuals may have hearing profiles which make it impossible to enjoy a musical composition in the way which it was intended by the composer or musician, even if it were played back with very high fidelity. Other audio data products, such as streaming audio over the Internet, telephone calls over land line or wireless networks, audio accompanying television programs, radio broadcasts, live radio format broadcasts over the Internet, prerecorded audio books and the like, may be difficult for persons having some hearing profiles to fully enjoy.

The hearing profiles of individuals have been applied in the hearing aid field for customizing and fitting hearing aids for individuals. See, for example, U.S. Patent No. 4,731,850 entitled PROGRAMMABLE DIGITAL HEARING AID SYSTEM, invented by Levitt et al.; and U.S. Patent No. 5,848,171 entitled HEARING AID DEVICE INCORPORATING SIGNAL PROCESSING TECHNIQUES, invented by Stockham, Jr. et al. Thus, techniques for processing sound to offset variations in hearing are well known. However, these techniques are unavailable to persons not using hearing aids. Furthermore, many persons who could benefit from such processing are not in positions to use hearing aids, for a variety of reasons.

Accordingly, it is desirable to provide systems and methods to apply techniques for the processing of audio data according to hearing profiles for the benefit of individuals who are not wearing hearing assistance devices. Also it is desirable to provide tools to simplify the gathering of information needed to develop hearing profiles of individuals, and to apply the gathered information in the distribution and customization of audio data products.

SUMMARY OF THE INVENTION

The present invention provides customized audio data products, and systems and methods for producing the customized audio data products, for a customer, who may be an individual or a group of individuals, processed according to a hearing profile of the customer. Also, the present invention provides tools for gathering information concerning a customer's hearing profile, and for establishing and optimizing such profile for use in the production of the customized audio

data products. According to the present invention, the quality of life as it relates to enjoying music, talking on the telephone, and participating in other listening activities can be improved for a wide range of individuals having hearing profiles that are not typical, whether or not the individual has been fitted with a hearing aid or other assistive hearing device.

In addition, the present invention provides an audio playback device for playing back customized audio products based on the hearing profiles, and a hearing test device for use in the generation of hearing profiles.

The customized audio data product can be delivered using a network, or provided on an article of manufacture that comprises a data storage medium that is configured for connection to and for disconnection from an audio playback device. In some embodiments, the customized audio data product is stored in the data storage medium. The data storage medium comprises in various aspects a CD-ROM, a DVD disk, a floppy disk, a solid state memory card, and other portable memory devices. In another embodiment, the data storage medium comprises a fixed memory element of an audio playback device, such as a personal computer with appropriate decoding and sound production resources.

In one preferred aspect of the invention, a hearing test device and an audio playback device comprise a single appliance such as a mobile phone, radio, wireless communication device, personal digital assistant with or without a wireless link, or music playback device, and may be coupled with or mounted on a headset. In one example, the appliance is a small portable unit comprising an audio processor, an audio transducer such as ear phones, an optional removable storage media port and a communication port packaged with a battery. The audio processor includes logic implemented using software, hardware or a combination of hardware and software supporting a hearing test, and supporting the decoding of customized audio data products. The removable storage media port is adapted to receive a solid state memory card or other removable memory device on which the customized audio data is stored. In various embodiments, both circuit components and earphones of the appliance are mounted in an ergonomic manner on a headset. In alternatives, circuit components of the appliance are packaged in a portable format and coupled to a headset using cables or wireless connections.

The communication port on the appliance in this aspect of the invention is adapted for connection to a data processor such as a personal computer that provides a user interface for support of the hearing test. The data processor can be coupled to the network across which

access to sophisticated testing resources may be provided, or can comprise sufficient resources for conducting the test without access to remote resources.

Logic on the appliance comprises resources for the generation of the sounds used in the test in response to signals from the data processor. The data processor provides signals produced in response to user input provided during a testing, and signals produced in response to the testing algorithms being executed. User input generated during a testing is used for the production of a hearing profile for the customer. Customized audio products are produced using the hearing profile, and provided on a portable storage medium for connection to the removable storage media port on the appliance. The customized audio products may be played using the same appliance as used in the generation of the hearing profile. In addition, the hearing profile may be stored on the appliance itself, and used for the production of customized audio products in the appliance based on data products from a wide variety of sources.

Also, the customized audio products may be played on other devices, and stored in other formats as suits the particular needs the customer. Likewise the hearing profiles may be used, optimized and distributed in a variety of ways.

In one preferred aspect of the invention, a method executed by a system for providing customized audio data products includes the steps of (1) storing a machine readable hearing profile of a customer, (2) accepting via an input device or data network for example, machine readable orders from the customer for a particular audio data product, (3) associating the hearing profile of the customer with the particular audio data product, (4) modifying the particular audio data product according to the hearing profile to produce a customized audio data product, (5) delivering the customized audio data product to the customer, for example via a network or by a machine readable storage medium, (6) accepting feedback from the customer concerning the objective or subjective performance of the customized audio data product, and (7) modifying the hearing profile in response to the feedback.

In one embodiment of the present invention, the hearing profile and the audio data product are delivered to the customer via separate channels. In one example, the hearing profile is sent via one communication channel to a machine, such as a set top box, at the location in which the audio data product is played, and the audio data product is sent via another communication channel. According to this example, the hearing profile may be provided over the Internet, while the audio data product is provided via a television cable network. In another

embodiment, the hearing profile is stored in a portable data storage device, such as a card having a magnetic strip memory, or a card having a non-volatile integrated circuit memory. The hearing profile of the customer in this embodiment is stored on a machine using a portable data storage device. The audio data product is customized by the machine using the hearing profile prior to playback.

The system in various embodiments provides input tools, such as a graphical user interface usable, for example, at a kiosk or accessible via a network, for accepting input data concerning a hearing profile of a customer, either supported by a specialized hearing test device as described above or by other resources for use in the test. The input tools are used for creating a machine readable hearing profile, which is stored in a registry of hearing profiles for use in the production of customized audio data products. Alternatively, the hearing profile is stored on a portable data storage medium for use by the customer, as described above.

Also, in various embodiments of the invention, the system provides tools for accepting input data characterizing the feedback from the customer. Processing resources are provided for modifying the machine readable hearing profile in response to the feedback data. The modifying of the machine readable hearing profile in one aspect of the invention comprises applying an optimization modeling process to the hearing profile, by which the profiles are improved over time using feedback arising from a variety of customized audio data products and from a variety of listening conditions.

According to other aspects of the invention, the system includes resources for determining a type of delivery for the customized audio data product, such as by prompting a customer to select a delivery mode. The step of modifying the particular audio data product is responsive to the type of delivery requested by the customer. Thus, for example, if a customer requests a music batch file to be delivered using the MP3 compression technique, the processing algorithm applied, or the parameters applied in a single algorithm, may be different than that applied if the customer requests a telephone conversation delivered via a telephone network customized according to the customer's hearing profile.

The present invention also provides a system that includes a source of an encoded audio data product, and processing resources that are configured to receive a request for the encoded audio data product, and to associate the encoded audio data product with a customer hearing profile. The customer hearing profile is used for production of a customized audio data product.

The customer hearing profile comprises in various embodiments, the coefficients of the transfer function used to transform an audio data product according to a hearing characteristic of a customer, and an identifier of a transfer function used to transform the encoded audio data product, an identifier of a transfer function and coefficients for the identified transfer function, values indicating listening conditions in which the customized audio data product is to be played, specification of psycho-acoustic characteristics of a customer, an audiogram characterizing physical hearing characteristics of a customer, and executable software defining a transfer function for producing the customized audio data product. Thus it can be seen that the hearing profile used for production of the customized audio data product according to the present invention assumes a structure adapted to the distribution of processing and communication resources in the particular system being utilized.

The data processing resources are adapted according to the network resources available. Thus, the processing power for transforming the selected audio data product into the customized audio data product can be positioned at a central location accessible via a network, it can be distributed at a variety of locations in the network, it can be positioned in the playback device at a customer's home or office, and it can be implemented using combinations of processors located in several sites.

The architecture of the system can assume a variety configurations. In one aspect, the processing resources in the system include a network interface and logic to accept via the network interface data concerning the customer for use in producing the customer's hearing profile. In other embodiments, the system includes a source of a plurality of customer hearing profiles, such as a customer registry. In response to a request for particular audio data product, the hearing profile is retrieved from the registry and used for production of the customized audio data product.

A variety of user interface tools, such as Web pages, other tools accessible via a network, graphical user interfaces executed on a customer terminal, graphical user interfaces executed at a terminal in a kiosk, personal digital assistant (PDA) devices with network interfaces, and telephones, are included in various embodiments of the invention for accepting data concerning hearing profiles, selections of audio data products, selections of delivery modes, and other input data utilized in the system.

The resources used for associating a customer hearing profile with an audio data product are centrally located at a site accessible via a network by a large customer base. However, in various embodiments, these resources can be distributed among a variety of sites accessible via a network. In a similar manner, the database for storing the hearing profiles of customers is coupled with the site used for associating the hearing profile with encoded audio data product. Alternatively, the database is distributed among a variety of locations for the purposes, for example, of load balancing, security and redundancy.

The customized audio data product is likewise implemented according to the particular configuration of the network processing and communication resources. Thus, the customized audio data product in various embodiments consists of the hearing profile, or portions of the hearing profile, concatenated with the selected audio data product for processing, or further processing, after delivery. In other embodiments, the customized audio data product includes the encoded audio data product transformed using the hearing profile, and ready for play back, prior to delivery. The transformed audio data is coupled to identifiers such as addresses or customer codes in various embodiments, which may be used in decoding the transformed data.

The encoded audio data product, which is customized and delivered according to the present invention comprises in various embodiments analog or digital instances of pre-recorded audio tracks, pre-recorded audio music tracks, live audio music streams, pre-recorded audio voice tracks, live audio voice tracks, live audio telephone data, audio tracks associated with television programs or movies, or other kinds of batch or streaming mode audio data.

The present invention also supports a variety of modes of delivery for the customized audio data product. The customized audio data product is delivered in various embodiments by providing resources to store the customized audio data product on machine readable storage media, such as CD ROM, DVD, or other storage media formats suitable for shipping to the customer. In one preferred embodiment, the customized audio data product is transmitted via a network to the customer using a format such as MP3, formats for voice over the Internet VoIP, or standard telephone formats. The network in various embodiments includes the Internet, a private network, a telephone network, a satellite communications network, or other wired or wireless communication technologies. The transmitted customized audio data product is adapted for a particular playback device in one embodiment. Thus, the product is adapted for transmission to a

personal computer, to a hand-held PDA having a wireless communication link, or directly to a playback device with a wired or wireless network interface.

Thus, the present invention provides a comprehensive system and method for providing audio data products customized according to individual hearing profiles of customers. The system and method operate without requiring assistance of specialized listening devices or hearing aids and allow for optimization of the hearing profiles and customizing processes according to characteristics of the customer, to the particular audio data product being customized, and the listening environment in which the product is to be enjoyed. Utilizing the techniques of present invention, greater numbers of people may take advantage of the processing techniques developed in the hearing aid arts to account for variations in hearing profiles of individuals. Further, the need for hearing aids or other assistive listening devices will be reduced, and many people will be able to the avoid the need for such devices completely.

Other aspects and advantages of the present invention can be seen on review of the drawings, the detailed description, and the claims which follow.

BRIEF DESCRIPTION OF THE FIGURES

Fig. 1 is a diagram of one example system for delivering customized audio data products according to the present invention.

Fig. 2 illustrates a method for delivering customized audio data products according to the present invention.

Fig. 3 is a heuristic diagram illustrating a variety of system configurations and implementations of the present invention.

Fig. 4 is a diagram of one example of a customized audio data product according to the present invention.

Fig. 5 is a diagram of another example of a customized audio data product according to the present invention.

Fig. 6 is a diagram of one example of a hearing profile for use in producing customized audio data products.

Fig. 7 is a diagram of another example of a hearing profile for use in producing customized audio data products.

Fig. 8 is a diagram of yet another example of a hearing profile for use in producing customized audio data products.

Fig. 9 is a simplified diagram of a user interface for selecting a particular audio product in conjunction with the system of the present invention.

Fig. 10 is a simplified diagram of a user interface for setting up a hearing profile for a customer in conjunction with the system of the present invention.

Fig. 11 is a simplified diagram of the user interface for obtaining feedback from a customer concerning a hearing profile in conjunction with the present invention.

Fig. 12 illustrates environments in which input data is received from customers in conjunction with the production and optimization of hearing profiles according to the present invention.

Fig. 13 illustrates optimization loops, and the interaction among optimization loops for producing hearing profiles according to the present invention.

Fig. 14 illustrates processing resources for dynamic optimization of hearing profiles according to the present invention utilizing reference model adaptive control techniques.

Fig. 15 illustrates a graphical user input tool for the purposes of gathering information concerning a hearing profile of a customer.

Fig. 16 illustrates another graphical user input tool for gathering information concerning hearing profiles of customers.

Fig. 17 illustrates a second level graphical user input tool used in the conjunction with the input tool of Fig.16.

Fig. 18 illustrates another second level graphical user input tool used in the conjunction with the input tool of Fig.16.

Fig. 19 illustrates a configuration of an alternative system according to the present invention in which the hearing profile is applied in a set top box, and delivered via a communication channel different than that used for the audio data product.

Fig. 20 illustrates a configuration of an alternative system according to the present invention in which the hearing profile is provided using a portable storage device for use by a customer to produce customized audio data.

Fig. 21 illustrates a configuration of an alternative system according to the present invention in which the customized audio data is provided on a portable storage device.

Fig. 22 illustrates a combination hearing test and playback device for customized audio data according to the present invention.

Fig. 23 illustrates an alternative implementation of a combination hearing test and playback device for customized audio data according to the present invention.

Fig. 24 is a block diagram of a hearing test and playback appliance for use with the device of Figs. 22 and 23.

DETAILED DESCRIPTION

A detailed description of the various embodiments of the present invention is provided with reference to Figs. 1 through 24.

Fig. 1 provides an illustration of one example system for delivering customized audio data products. Other examples will be discussed below. The system includes a server 10 which is coupled to a network or networks 11 for communication with other network connected devices. The server 10 is also coupled to a database 12 storing hearing profiles of customers. In this example, a customer has a personal computer 13 which is coupled to the network or networks 11. The personal computer 13 includes data processing resources, such as memory, a graphical user interface program, and a digital signal processing based sound board coupled with ear phones 14 for playing back an audio product stored in the PC or being received by via the network through the PC. The network or networks 11 interconnect services to supply audio data products. In this example, suppliers of streaming audio are represented by the line 16, suppliers of MP3 batch files are represented by the line 18, and suppliers of digital and analog music library files are represented by the line 20.

In this example, the server 10 includes a variety of data processing resources, including a network interface or interfaces, a host processor for managing an Internet based service, memory resources, and a processor, such as a digital signal processor, used in the customizing of audio data products, and used for optimizing hearing profiles stored in the database 12. In this example, the network interface or interfaces of the server 10 act as a source of audio data products. The user issues an order ORDER via the network as represented by line 22, for a particular audio data product. Resources in the server 10 translate the order into a form

ORDER', as represented by line 24, for retrieving the audio data product from the network. The particular audio data product requested by the customer is returned via the network as represented by line 26 to the server 10. Data processing resources in the server 10 associate a hearing profile from the hearing profile database 12 with the particular audio data product. The customized audio data product is then returned as represented by line 28 via the network to the customer PC 13. The PC 13 processes the customized audio data product and supplies it for customized audio playback at the ear phones 14.

The system of Fig. 1 also provides data processing resources for gathering information needed for developing and storing hearing profiles in the database 12. In addition, the system includes resources for obtaining feedback from customers used in the optimizing of hearing profiles.

Fig. 2 illustrates a basic method of operation of a system according to the present invention. Although Fig. 2 is drawn in the form of a flow chart, the particular sequence of steps can be modified as suits particular implementation or context of execution.

A first step in the method is to characterize the hearing of a customer (block 50). The hearing of a customer can be characterized in the system of the present invention indirectly, such as by entering an audiogram, entering the make of the hearing aid and associated prescription, if any is used by the customer, or entering responses to questionnaires. This indirect input data is processed by the system to produce a hearing profile which can be used in a production of customized audio data products. Alternatively, the hearing of a customer may be characterized directly. For example, a customer may sample a closed set of hearing profile choices and select a preferred one. Alternatively, a network based test can be executed by which information needed for administering the test is delivered to the customer via the Internet or other network, and the customer's responses to stimulus in the test are returned via the network to the processing resources in the system. In another example, a kiosk is set up in a public location for use by customers to establish a hearing profile using the processing resources of the kiosk designed for administering the hearing tests. In yet another embodiment, a test is administered over the telephone, particularly when the audio data product to be delivered is telephone calls. These direct measurements of the hearing profile of customer are processed by the system into hearing profiles used for customizing audio data.

Another process in the method of the present invention is to determine the listening conditions in which the customer will be using the customized audio data product (block 51). The listening conditions may include free field environments in which the transducers consist of loud speakers in a living room being driven by a television, radio, or a home stereo, speakers in an automobile driven by the automobile sound system, or concert conditions of some sort. Other listening conditions may be monaural, such as a telephone or an existing prosthetic device. In another example, listening conditions consist of binaural settings, in which sounds are to be delivered via a headset or a binaural prosthetic device. The listening conditions can be characterized in the hearing profile to be applied for producing the customized audio data product.

The next process illustrated in Fig. 2 in the method of the present invention involves determining the mode of delivery of the audio data product which the customer has requested (block 52). After it has been customized, the audio data product can be delivered on a storage medium, or via a network. Also, the format of delivery, such as an MP3 batch file to be played after it has been delivered and stored on the customer's machine, or a streaming audio product which can be listened to while it is being downloaded from the Internet from a live source or from a stored library of audio products, may be subject to different customization algorithms.

The system also includes resources for determining the audio product requested by the customer (block 53). These resources may be implemented using well-known Internet server techniques for commercial transactions and for presenting catalogs of goods or services. Examples of audio products which may be requested include pre-recorded music, live music performances, radio broadcasts, radio format streaming audio products, telephone calls, television shows, audio books and any other audio data source.

Based upon one or more of the processes in blocks 50-53, the system determines the processing needed to customize the audio data product (block 54). The information gathered in the processes of blocks 50-53 is applied using the principles developed for customizing and fitting hearing aids, and improved using adaptive optimization processes as discussed below.

The processing is applied, and the customized audio data is provided to the customer according to the mode of delivery requested (block 55). The customized audio data may take on a variety of formats as discussed in more detail below.

Another process provided by the system is to obtain customer feedback concerning the objective and subjective performance of the customized audio data (block 56). The feedback is retrieved using Internet based techniques for gathering data in one embodiment. Alternatively, customers can be called on the telephone or prompted to fill out questionnaires to rate the performance of the products.

Utilizing the feedback obtained, the hearing profiles are adjusted (block 57). Adjustments may be made either on the fly, or offline as is determined by the processing resources available, and the type of product being delivered. For example, for streaming audio products it may be desirable to optimize the customization of the product on the fly so that the customer can experience the improvements resulting from feedback being returned to the system within a short period of time.

The final process illustrated in the method of Fig. 2 is to update the database used for storing hearing profiles based upon the adjustments made in response to customer feedback (block 58). In this manner, a database is developed of hearing profiles, including the adjustments made to hearing profiles based on specific kinds of feedback for specific kinds of audio data products. Using information in the database, the system is able to improve techniques for establishing and adjusting hearing profiles over time according to adaptive optimization techniques. In addition, the database may be used to as a resource for delivering other products to the customer.

Fig. 3 is a diagram used for illustrating a variety of configurations of the system of the present invention. It will be apparent to persons of skill in the art that a large number of variations in architecture for a network based data processing system can be applied, depending on such issues as load balancing, security, reliability, and speed.

Fig. 3 illustrates a system that includes a network server 100 which is coupled to a network or networks 101. A plurality of customer end stations, including customer end station 102, customer end station 103, customer end station 104, and customer end station 105 are coupled to the network 101. Also, the network interconnects suppliers of audio data products, such as audio data product server 106. The network server 100 also includes a separate link 107 to another supplier of audio data products 108. Also, connected to the server 100 via a link 109 is a registry of customer hearing profiles 110, such as a database which stores hearing profiles accessible using customer identifiers. In this example, a transform engine 111 is coupled to the

network server 100 via link 112, and also to the network 101. The transform engine 111 includes the resources for applying hearing profiles to an audio data product, in order to produce the customized audio data products for delivery to the customer. The configuration of Fig. 3 also includes other transform engines distributed in the system. Thus, the server 106 for delivering audio data products includes a transform engine 113. Also, the customer end station 105 consists of a personal computer including a transform engine 114 based on, for example, a digital signal processing card.

The customer end stations 102-105 illustrate a variety of playback modes which may be served by the system of the present invention. Thus, the customer end station 102 consists of an MP3 player, which transduces batch mode MP3 music files for supply to ear phones 115. The customer end station 103 consists of a personal computer which is coupled to a stereo receiver 116 which drives loud speakers 117. Customer end station 104 consists of a telephone which supplies the customized audio data to a telephone handset 118. Customer end station 105 consists of personal computers with an on-board transform engine which supplies the audio data transformed to match the hearing profile of the customer to ear phones 119.

The network 101 is illustrated in Fig. 3 as a single entity. However, the network may comprise a plurality of networks, including the telephone network, the World Wide Web, private networks, land based wireless networks, satellite communication networks, and other forms of data communication. The plurality of networks by which audio data products may be communicated can be used alone, or in combination as suits the particular communication channel being set up to deliver the product.

In one preferred mode, the particular audio data product selected by the customer has a particular format, such as an MP3 format. The customized audio data product is also delivered in the particular format of the original audio data product. In this manner, the customer is able to playback the customized audio data product using the type of equipment for which the original product was developed. In alternative embodiments, the customized audio data product is transformed from the format of the original audio data product into the format of the listing device in which customer intends to play back the customized audio data product.

The server 100 in one preferred embodiment includes resources for keeping information used for billing the customer for ordered customized audio data products.

Figs. 4 and 5 illustrate alternative formats for the customized audio data product according to the present invention. In Fig. 4, the customized audio data product consists of a header 200 that includes, for example, a destination address, a field 201 holding the hearing profile, or portions of the hearing profile, and a field 202 holding the audio data product which has been retrieved and modified by the addition of the header 200 and hearing profile 201. The format of customized audio data product shown in Fig. 4 is utilized when the transform engine is located at the customer site or remote from the server at which the hearing profile is associated with the audio data product to be delivered.

Fig. 5 illustrates an alternative format for a customized audio data product which includes a header 210, including a destination address or other parameter like a digital signature or user identification number identifying the customer or associating the customized data product with the customer, and a field 211 holding a transformed version of the audio data product. The format of customized audio data product shown in Fig. 5 is utilized when the transform engine is coupled with the network server which associates the hearing profile with the particular audio data product to be delivered. The parameter, such as the address, user identification number or digital signature mentioned above, is used in decoding the transformation of the audio data product in one embodiment.

According to the present invention, an article of manufacture comprises the customized audio data product having a format such as those shown in Figs. 4 and 5, stored on a storage device, such as machine readable, portable non-volatile memory device.

Figs. 6, 7 and 8 illustrate alternative formats for the hearing profiles to be stored in the registry 110. The hearing profile shown in Fig. 6 includes a customer ID 250, coefficients of transform equations 251, and an identifier of the playback device type and listening environment 252 in which the audio data product is to be played. In Fig. 7, the hearing profile includes a customer identifier 260, the audiogram for customer 261, listening condition data 262, and psycho-acoustic parameters 263 which relate to the listening characteristics of the customer. The hearing profile shown in Fig. 8 includes a customer identifier 270, and software 271 along with code data structures 272 that in combination provide executable transform code for producing the customized audio data product from the selected audio data product. The three examples of hearing profile formats shown in Figs. 6-8 are representative of a large number of hearing profile

formats that could be utilized depending on the type of transform processes being executed, the type of audio products being delivered, and other factors related to the architecture of the system.

According to the present invention, an article of manufacture comprises the hearing profile having a format such as those shown in Figs. 6, 7 and 8, stored on a storage device, such as machine readable, portable non-volatile memory device.

As mentioned before, the system of the present invention provides user input tools for selecting audio products, for setting up hearing profiles, and for providing feedback about the performance of the customer's audio data products. Figs. 9 through 11 show simplified graphic user interface pages used for prompting a user to input data for these purposes. Thus, Fig. 9 shows a page 300 prompting the user to select an audio product. The page 300 includes a first graphical tool 301 for selecting an MP3 music file; a second graphical tool 302 used for selecting streaming audio such as a radio format data, and a third tool 303 used for selecting live audio products, such as a web broadcast performance, or telephone call. Fig. 10 shows a simplified user interface page 310 for setting up a hearing profile. In this example, the page 310 includes a tool 311 for entering audiological data, such an audiogram. The tool 312 is provided for allowing a user to enter playback device types. The tool 313 is included on the page 310, prompting the user to enter environmental parameters. Fig. 11 shows a simplified user interface page 320 prompting the user to provide feedback concerning the hearing profile. Thus in this example, the tool 321 is provided prompting the user to enter subjective performance data, such as whether the customized audio data products sounded good or bad, or whether the pitch of the product was too high or too low. Also, tool 322 is provided to allow the user update the playback device types being used. Finally, in the example of Fig. 11, the tool 323 is provided by which the user is prompted to update parameters about the environment. The pages shown in Figs. 9-11 are obviously simplified versions showing a range of possibilities for input tools provided by the system of the present invention.

Fig. 12 illustrates a variety of scenarios by which a central server 400 interacts with customers in the development and optimization of hearing profiles, and for the selection and delivery of customized audio data products. Thus, the system in Fig. 12 consists of the server 400 which is coupled to the database 401 storing hearing profiles. The server 400 is coupled to the Internet 402, and via Internet 402 to a kiosk 403, and to a plurality of other locations, including a personal computer 403 at the home of the customer, and via wireless link 405 to a

personal digital assistant 406, by which the customer provides feedback away from home. The kiosk 403 includes a computer 410 having a graphical user interface such as a touch screen 411 for administering a hearing test to gather data for development of hearing profiles. In the preferred embodiment, sounds used in the test are provided using an acoustic dome 411, such as the stereo sound dome unit known as a Virtual Audio Imager provided by Brown Innovations, Inc. of Chicago, IL. Utilizing the acoustic dome 411, carefully controlled audio vectors are generated and directed to the customer for use in direct measurement of the customer's hearing profile. A sequence of graphic user interface screens are presented on the touch screen 412, in combination with the audio stimulus provided by the acoustic dome 411. The user's hearing profile is developed based on interaction via the touch screen 412.

The personal computer 404 at the customer's home is utilized for follow-up interaction with the customer, or for gathering indirect data concerning the hearing profile of customer. Thus, via the Internet 402, the server 400 can deliver questionnaires and simple audio tests to the home PC 404. Also, a user can access a web page, or use electronic mail, to provide feedback concerning the performance of the customized audio data product that had been played by the user. Finally as shown in Fig. 12, the user may access the server 400 using a wireless personal digital assistant 406 to provide feedback concerning the performance of the customized audio data product.

Fig. 13 illustrates optimization loops used for the production of a customer's hearing profile according to the present invention. The first optimization loop A is based on administration of an interative test. For each customer, the vector "s" representing a sound environment, a vector "f" representing a fitting parameter, and a vector "e" representing the customer's evaluation at this stage of the test is developed. The sequence of stimuli is applied to produce the vectors. The vectors are applied to a second loop C. In the second loop C, a fitting algorithm is executed based upon the aggregate of data from many patients. In this loop, data mining techniques can be used to make a best initial guess of the fitting to be applied to customer. The fitting being developed for the customer is applied to a feedback loop B. In the feedback loop B, the fitting "f" developed during the test for the profile represented by transform g^t is applied to a real world environment g^r. The evaluation "e" provided by the customer in response to the real world experience is used in feedback for the purposes of optimization of the fitting.

Fig. 14 illustrates processing resources used in the adaptive optimization of a hearing profile according to the present mention. The customer's profile "p" is applied to a fitting processor 500. Other inputs to the fitting processor 500 include prior evaluation data provided on line 501, prior sound environment data delivered online 502, and customer input. A particular fitting vector "f" is provide on line 503. This fitting vector is processed according to a transfer function 504. Customer evaluation of the playback is provided on line 501. The fitting vector on line 503 and the evaluation on line 501 are fed to a performance correlation unit 505. The performance correlation unit 505 generates a result that is applied to data mining resources 506 for the purposes of determining a reaction to the correlation result. Data mining produces parameters used in testing optimization unit 507. A testing optimization unit 507 updates the environmental parameters for the customer. The data mining resources 506 are seeded with the information gathered from prior evaluations for given customers. Thus, model reference adaptive learning using data mining techniques can be utilized to optimize the fitting for a particular customer. For additional information concerning model reference adaptive optimization techniques, reference can be made to LANDAU, *ADAPTIVE CONTROL, THE MODEL REFERENCE APPROACH*, Merkel Dekker, Inc., New York, 1979.

Figs. 15-18 illustrate graphical user interface tools for use in a kiosk environment such as the kiosk 403 shown in Fig. 12, for development of a hearing profile using direct measurements. The user interface of Fig. 15 provides a simple interface for gathering information about the profile the user. The tool includes a first indicator 600 for signaling to a user whether the left or right ear is being stimulated. Next, a label using either text or graphics is displayed for indicating to the user that a test for loudness is being made. Next, a label 602 for bass and treble tests is provided. A label 603 for testing clarity is provided. A label 604 is provided identifying tests for noise and distortion. The user is given the option of making three selections for each test represented by a left facing arrow 605, a center button 606, and a right facing arrow 607. Thus, for example during a loudness test for the left ear, an indicator in region 600 identifies stimulus to the left ear. A sound is played using the acoustic dome 411 shown in Fig. 12. The user selects the left arrow if the tone is too loud, the right arrow if the tone is too soft, and the center button 606 if the tone sounds right. Similar stimulus-response tests are administered for the other factors to be determined. The upper left-hand section of the screen includes a button 608 to signal to repeat of the test, and a button 609 to signal that the user is ready to proceed to a

next test. Using this stimulus-response technique, with limited feedback options, a basic hearing profile can be developed without professional assistance.

Figs. 16-18 illustrate another technique for gathering feedback from a customer during the development of a hearing profile. A first screen as shown in Fig. 16 is displayed with a row of condition indicators 700-702 across of the top of the screen. The indicators show whether the test being executed is adapted to determine soft sounds, normal sounds, or loud sounds. An array of 16 buttons arranged in a 4 by 4 matrix in this example is displayed to the user. A set of sound stimulus is played, and the user is instructed to select a corresponding button in the 16 button array. After a first selection, preferably within the interior four buttons in the region 703 of the array, a second screen, such as the screen shown in Fig. 17 is displayed to the customer, linked to the choice made in the first screen. The second screen of Fig. 17 includes a second array of 16 buttons presented to the user. The user again selects a preferred setting for a loudness over balance of the stimulus to further refine the profile data. Fig. 18 illustrates another second level screen for the purposes of selecting the preferred level of clarity over noise and distortion for the signal. Utilizing these graphical interface tools in combination with audio stimulus, relatively sophisticated information concerning users' hearing profiles can be gathered automatically by an Internet based, or kiosk based, testing system.

Fig. 19 illustrates another system configuration for the delivery of customized audio data products according to the present invention. The system includes a customized audio server 900 which is coupled to a network or networks 901 for communication with other network connected devices. The servers are also coupled to a hearing profile database 902, such as described above. In this example, a customer has a display system 903 which may be a computer monitor, a television, or another device that is coupled to the network or networks 901. The display system 903 is coupled to an audio system for providing playback of the customized audio, in this example using headphones 904. Also coupled to the display system is a set top box 905 by which the display system is coupled to the network or networks 901. The set top box 905 combines the hearing profile data and the program including audio data to produce the customized audio data product at the customer site.

In one example, the set top box is coupled to a cable television network 906 across which movies and television programming that include audio data products are supplied to the display system 903. Thus, one source of audio data products coupled to the network or networks 901 is

cable television network 906. Other sources of audio data products coupled to the network or networks 901 include streaming audio data 907, MP3 encoded audio data 908, and a digital/analog music library 909.

The customized audio server 900 acts as a gateway for managing the delivery of customized audio data products. In this example, the customized audio server 900 is also coupled to the telephone network, as indicated by the telephone 910. One example transaction using the system of Fig. 19 includes placement of an order for customized audio data products using the telephone 910 using touch tone commands or voice recognition mechanisms. When the order is placed to the customized audio server 900, a request is issued to the source of the requested audio data product, in this example to the cable television network, for delivery of a chosen audio data product. Also, the customized audio server 900 transmits a hearing profile to the set top box 905 across a communication channel between the customized audio server 900 and the set top box 905. The cable television network 906 transmits the requested programming including the audio data product to the set top box 905 using a separate communication channel. Thus, for example, the hearing profile is transmitted from the customized audio server 900 to the set top box 905 using the Internet, while the programming is supplied from the cable television network 906 using the television cable protocols and media. Also, separate Internet channels may be used for the independent channels from the customized audio server 900 and from the source of the audio data.

In other transactions using the system of Fig. 19, the order may be placed via the communication link between the set-top box 905 and customized audio server 900, or via other communication links with the customized audio server 900. Also, feedback concerning the performance of the customized audio data product can be provided using the set top box 905 or via other communication channels to the customized audio server 900. In other configurations, the database 902 is coupled to the network or networks 901 at a site apart from the customized audio server 900.

Fig. 20 illustrates another system configuration for producing customized audio data products according to the present invention in which the hearing profile is carried on a portable storage device 950, such as a plastic card having a magnetic strip or carrying an integrated circuit memory. In this example, a hearing profile database 951 is coupled to the network or networks 952. A plurality of sources of audio data products are also coupled to the network or networks

952, including, for example, streaming audio data 953, MP3 encoded audio data 954, cable television network 955, and a digital/analog music library 956. In the system shown in Fig. 20, a kiosk workstation 960 is coupled to the network or networks 952. Using the workstation 960 and the tools described above for the creation of a hearing profile, an individual generates a hearing profile data set. A card writer 961, or other resource for storing data on a portable storage device 950 is coupled to the kiosk workstation 960. The hearing profile data is stored on the portable storage device 950 and the individual carries it to a location at which a playback device 963 is used to play the customized audio. The user has a personal computer 964, or other network connected appliance such as an internet enabled cell phone or palm sized computer, which is coupled to the network or networks 952. Coupled with personal computer 964 is a card reader 965 by which the data in the portable storage device 950 is downloaded to the personal computer 964.

A transaction using the system of Fig. 20 includes a user issuing an order for a particular customized audio data product directly to the source of the product. Thus, in this example, the order for a customized audio data product is placed directly to the digital/analog music library 956. The selected audio data product is delivered to the personal computer 964. The personal computer 964 uses the hearing profile from the portable storage device 950 to produce the customized audio data product, and delivers it to the playback device 963. In one embodiment, the personal computer 964 is also configured to provide feedback information concerning the performance of the customized audio data product. The feedback information is delivered via the network or networks 952 to the hearing profile database server 951.

Portable storage devices carrying hearing profile data may be used in a variety of settings. For example, a card reader may be coupled to a set top box for a cable or satellite television network to allow for the delivery of customized audio data with standard programming. Also, a card reader and headphone set may be installed in a movie theater to allow for the delivery of customized audio data to moviegoers. Card readers may be coupled to telephones to allow for the correction of audio telephone conversations. Examples of portable storage devices include plastic cards with magnetic strips, PC Card format or PCMCIA format add-on cards for computers, flash memory cards, cards like the "Memory Stick" provided by Sony Corporation, a floppy disk, or other machine readable storage devices adapted to be carried from machine to machine.

Also, in various embodiments of the present invention, customer identification data, such as fingerprints or other biometric data, may be recorded and stored with the hearing profile and/or the customized audio data of a customer for purposes of authentication of feedback data, automatic accounting for use of the hearing profile data, or access playback authorization and other purposes.

Fig. 21 illustrates yet another configuration for distribution of customized audio data products according to the present invention. In Fig. 21, the customized audio data product is provided on a portable storage device 1000. The article of manufacture consisting of the portable storage device having a customized audio data product stored therein is produced in a server 1001 coupled to a network or networks 1002. A plurality of sources of audio data products, for example as mentioned before including a source of streaming audio 1003, a source of MP3 audio 1004, a cable television network 1005, and a digital/analog music library 1006, are coupled to the network or networks 1002.

In one example scenario among many possible scenarios, a customer logs on at end station 1007 coupled to the network or networks 1002. A customer places an order by a message ORDER 1008 to server 1001. The server 1001 produces the article by ordering the requested audio data product from a particular source, such as by a message ORDER' 1009 sent to the digital/analog music library 1006. The audio data product PRODUCT 1019 is returned to the server 1001. The server combines a hearing profile for the customer from the hearing profile database 1018 with the PRODUCT 1019 to produce a customized audio data product as described above. The hearing profile is provided by the user in other embodiments via the network or using a portable storage device. The server includes a card writer 1010, or other resources for storing data on a portable storage device. The server uses the card writer 1010 to write the customized data product onto the portable storage device 1000.

The portable storage device 1000 is delivered to the customer, by mail or by hand delivery, or otherwise. A customer uses a playback device 1011 having a card reader 1012, or other port for a removable storage media. For example, the playback device 1011 may be a hand-held audio device like a "Walkman" style device with an interface for "Memory Stick" portable storage technology provided by Sony Corp. or other similar portable playback devices. Other portable storage media include magnetic tape, CDROM format disks, DVD format disks, magnetic disks, and a variety of media adapted for particular environments.

Fig. 22 is a schematic diagram of a hearing test and playback device according to the present invention, used for the production of hearing profiles, and for playing back customized audio data products. The device includes a headset 1100 having ear phones 1101 and 1102. The headset is coupled by a communication medium such as cable 1103, to a handheld appliance 1104. The appliance includes a port for a removable storage device 1105, and a port for a communication medium 1106. The communication medium 1106 is coupled to a computer 1107 which is coupled to a data network medium 1108. The computer 1107 includes a user interface supporting the hearing test, such as described above with respect to Figs. 9-11 and 15-18. The computer is in turn coupled to the data network medium 1108, for access to hearing test resources located remotely in the network. The computer 1107 acts as an intermediate station supporting the hearing test. In an alternative embodiment, the computer 1107 includes the resources locally sufficient to execute the test without relying on access to other resources via the network medium 1108. The appliance 1104 includes resources for playing sounds as directed by signals from the computer produced in response to the user input, and in response to the algorithms of the test. The appliance is designed so that the sounds produced on the ear phones during the test are calibrated to support accurate test results. In this embodiment, the appliance 1104 is a small device adapted to be handheld, or to be conveniently carried in a pocket or handbag, for example.

Fig. 23 illustrates an alternative embodiment of the portable test/playback appliance. In Fig. 23, the circuit components of the device in appliance 1104 are mounted on the headset 1120 along with the ear phones. Of course, Fig. 23 is a simplified diagram. In a preferred embodiment, the circuit components in the appliance 1104 are mounted using an ergonomic design within the structure the headset. In this embodiment, the appliance 1104 includes the port for portable storage device 1105, and the port 1106 for a communication media used for connection to a computer, or via a network like the internet, the wire line telephone network, the wireless pager network or mobile phone network to a remote system. The port 1106 may be a wireless connection or a cable connection as suits particular implementation.

Fig. 24 is a simplified block diagram of the circuit components of the test/playback appliance 1104. The appliance may be a mobile phone, a music play back device, a radio, a wireless appliance, a combination product or other audio product. The appliance 1104 includes an audio processor 1125. The audio processor is coupled to a removable storage media port

1126 and a communication port 1127. The battery 1128 powers the components of the appliance 1104, as well as the ear phones on the accompanying headset. The audio processor 1125 includes logic, such as software stored in a non-volatile memory 1129 for supporting the hearing test, and for supporting the decoding of customized audio data products stored in a solid state memory card 1130 or other portable storage device coupled to the port 1126. If this example, the nonvolatile memory 1129 includes a set of test sounds which are adapted for the particular ear phones used with the appliance, and test interface routines which support the communication between the appliance and the computer or other test processor on which a user interface is provided supporting the test. Also, the nonvolatile memory 1129 includes decoding resources that support the playback of the customized audio data product read from the solid state memory card 1130. The decoding resources may include logic that utilizes parameters associated with the customized audio data product for a decoding data so that only an appliance or user having these particular parameters can playback the product. In alternative embodiments, the decoding resources are adapted for industry standard audio data encoding techniques.

In alternative embodiments, the appliance 1104 includes user input devices, such as buttons or a touch screen supporting a graphical user interface in the style of a personal digital assistant (PDA), for the test process, and the communication media connects to the Internet or other networks for access to remote test processors used to generate the hearing profile.

In summary, the present invention provides a system and method for producing hearing profiles for customers to be used in the production of customized audio data products. The hearing profiles allow for the customized and optimized sound processing for each customer. The process can be optimized over time and over situations and for each modality for the delivery of the sound product. The customized audio data products are delivered via a variety of communication channels, to specific playback devices or to generic playback devices as suits a particular customer.

The system and method of the present invention provide for delivery of optimized audio products to persons that do not use hearing aids or other assistive hearing devices. Audio products from a variety of sound data sources can be customized using hearing profiles, and delivered to a customer on demand.

While the present invention is disclosed by reference to the preferred embodiments and examples detailed above, it is to be understood that these examples are intended in an illustrative

rather than in a limiting sense. It is contemplated that modifications and combinations will readily occur to those skilled in the art, which modifications and combinations will be within the spirit of the invention and the scope of the appended claims.

CLAIMS

What is claimed is:

1. A system for producing customized audio data, comprising:

a source of an audio data product;

processing resources, coupled to the source of an audio data product, configured to associate the audio data product with a customer hearing profile for use in production of a customized audio data product.

2. The system of claim 1, wherein the customer hearing profile comprises coefficients of a transfer function to transform the audio data product according a hearing characteristic of a customer.

3. The system of claim 1, wherein the customer hearing profile comprises an identifier of transfer function to transform the audio data product according a hearing characteristic of a customer.

4. The system of claim 1, wherein the customer hearing profile comprises an identifier of a transfer function and coefficients of the identified transfer function to transform the audio data product according a hearing characteristic of a customer.

5. The system of claim 1, including a machine readable registry of customer hearing profiles corresponding to registered customers of the audio data product in communication with data processing resources, and further including resources for reading, modifying and writing particular customer hearing profiles in the plurality.

6. The system of claim 1, wherein the customer hearing profile includes a value indicating listening conditions in which the customized audio data product is to be played.

7. The system of claim 1, wherein the customer hearing profile includes a value indicating a hearing characteristic of a customer for whom the customized audio data product is to be played.

8. The system of claim 1, wherein the customer hearing profile includes a specification of psycho-acoustic characteristics of a customer for whom the customized audio data product is to be played.

9. The system of claim 1, wherein the customer hearing profile includes an audiogram characterizing a customer for whom the customized audio data product is to be played.

10. The system of claim 1, wherein the customer hearing profile includes software defining a transfer function for producing the customized audio data product.

11. The system of claim 1, including a source of a plurality of customer hearing profiles, and wherein the data processing resources include logic to accept data concerning a customer for whom the customized audio data product is to be played, and to produce a customer hearing profile for the plurality of customer hearing profiles in response to the accepted data.

12. The system of claim 1, including a source of a plurality of customer hearing profiles, and wherein the data processing resources include a network interface, and logic to accept, via the network interface, data concerning a customer for whom the customized audio data product is to be played, and to produce a customer hearing profile for the plurality of customer hearing profiles in response to the accepted data.

13. The system of claim 1, including a source of a plurality of customer hearing profiles, and wherein the data processing resources include a network interface, and logic to accept, via the network interface, data concerning a customer for whom the customized audio data product is to be played, and to modify a customer hearing profile in the plurality of customer hearing profiles in response to the accepted data.

14. The system of claim 1, including a source of a plurality of customer hearing profiles, and wherein the data processing resources include a network interface, and an interface accessible to a user via the network interface to accept data concerning a customer for whom the customized audio data product is to be played, and to produce a customer hearing profile for the plurality of customer hearing profiles in response to the accepted data.

15. The system of claim 1, including a source of a plurality of customer hearing profiles, and wherein the data processing resources include a network interface, and an interface accessible to a user via the network interface to accept data concerning a customer for whom the customized audio data product is to be played, and to modify a customer hearing profile in the plurality of customer hearing profiles in response to the accepted data.

16. The system of claim 1, wherein the processing resources include a network interface for connection to a data network, and the source of the audio data product comprises the network interface.

17. The system of claim 1, wherein the processing resources include a network interface for connection to a data network, and resources to receive the customer hearing profile via the network interface.

18. The system of claim 1, wherein the audio data product comprises pre-recorded audio tracks.

19. The system of claim 1, wherein the audio data product comprises pre-recorded audio music tracks.

20. The system of claim 1, wherein the audio data product comprises live audio music streams.

21. The system of claim 1, wherein the audio data product comprises pre-recorded audio voice tracks.

22. The system of claim 1, wherein the audio data product comprises live audio voice streams.

23. The system of claim 1, wherein the audio data product comprises live audio telephone data.

24. The system of claim 1, wherein the processing resources include a network interface for connection to a data network, and user input comprises an interface accessible via the network interface.

25. The system of claim 1, wherein the user input comprises tools by which a user selects an instance of the encoded audio data product, and issues a request for the selected instance.

26. The system of claim 1, including a source of a plurality of customer hearing profiles, and wherein the user input comprises tools by which a user adds a customer hearing profile to the plurality of customer hearing profiles.

27. The system of claim 1, including a source of a plurality of customer hearing profiles, and wherein the user input comprises tools by which a user modifies a particular customer hearing profile in the plurality of customer hearing profiles.

28. The system of claim 1, wherein the processing resources include logic to produce information about billing for requested audio data products for customers.

29. The system of claim 1, wherein the audio data product comprises a digitally encoded product.

30. The system of claim 1, wherein the audio data product comprises an analog encoded product.

31. The system of claim 1, wherein the audio data product comprises data encoded according to a particular format suitable for playback by audio systems adapted for the particular format, and the customized audio data product comprises data encoded according to the particular format.

32. The system of claim 1, wherein the data processing resources include a processor which transforms the audio data product to the customized audio data product using the customer hearing profile, a network interface, and logic for transmitting the customized audio data product to a remote location via the network interface.

33. The system of claim 1, wherein the data processing resources include a network interface, and logic for transmitting the audio data product and at least a portion of the customer hearing profile to a remote location via the network interface.

34. The system of claim 1, wherein the data processing resources include a network interface, and logic for transmitting at least a portion of the customer hearing profile to a remote location via the network interface for use in transforming the audio data product.

35. The system of claim 1, wherein the data processing resources include a processor which transforms the audio data product to the customized audio data product using the customer hearing profile, a memory device to store data on a machine readable medium, and logic for storing the customized audio data product on the machine readable medium.

36. The system of claim 1, wherein the processing resources comprise a processor coupled to a device for playing the customized audio data product.

37. The system of claim 1, wherein the processing resources comprise a processor coupled to a network, and resources for transmitting the customized audio data product to the customer via the network.

38. The system of claim 1, wherein the data processing resources include an interface for reading a hearing profile from a portable data storage device.

39. A method for producing customized audio data, comprising:
providing an interface for access to an audio data product;
receiving a request for the audio data product from a customer;
receiving a customer hearing profile associated with the customer; and
associating the audio data product with the customer hearing profile for use in production of a customized audio data product.

40. The method of claim 39, including:
producing the customized audio data product in response to the audio data product and the customer hearing profile, and transmitting the customized audio data product to a remote site.

41. The method of claim 39, including:
producing the customized audio data product in response to the audio data product and the customer hearing profile, and storing the customized audio data product on a machine readable medium.

42. The method of claim 39, including:
producing the customized audio data product in response to the audio data product and the customer hearing profile, and transducing the customized audio data product to sound.

43. The method of claim 39, including transmitting the audio data product and the customer hearing profile to a remote site.

44. The method of claim 39, wherein the customer hearing profile comprises coefficients of a transfer function to transform the audio data product according a psycho-acoustic characteristic of a customer.

45. The method of claim 39, wherein the customer hearing profile comprises an identifier of transfer function to transform the audio data product according a hearing characteristic of a customer.

46. The method of claim 39, wherein the customer hearing profile comprises an identifier of a transfer function and coefficients of the identified transfer function to transform the audio data product according a hearing characteristic of a customer.

47. The method of claim 39, including providing a machine readable registry of customer hearing profiles corresponding to registered customers of the audio data product, and further including reading, modifying and writing particular customer hearing profiles in the plurality to maintain the registry.

48. The method of claim 39, wherein the interface for access to the audio data product comprises a network interface.

49. The method of claim 39, including providing a source of a plurality of customer hearing profiles comprising a network interface.

50. The method of claim 39, wherein the audio data product comprises pre-recorded audio tracks.

51. The method of claim 39, wherein the audio data product comprises pre-recorded audio music tracks.

52. The method of claim 39, wherein the audio data product comprises live audio music streams.

53. The method of claim 39, wherein the audio data product comprises pre-recorded audio voice tracks.

54. The method of claim 39, wherein the audio data product comprises live audio voice streams.

55. The method of claim 39, wherein the audio data product comprises live audio telephone data.

56. The method of claim 39, including providing an interface accessible via a network interface adapted to receive user input, including the request for the audio data product and an identifier of the customer hearing profile.

57. The method of claim 39, including providing tools by which a user selects an instance of the audio data product, and issues a request for the selected instance.

58. The method of claim 39, including providing a source of a plurality of customer hearing profiles, and tools by which a user adds a customer hearing profile to the plurality of customer hearing profiles.

59. The method of claim 39, including providing a source of a plurality of customer hearing profiles, and tools by which a user modifies a particular customer hearing profile in the plurality of customer hearing profiles.

60. The method of claim 39, including providing logic to produce information about billing for requested audio data products for customers.

61. The method of claim 39, wherein the audio data product comprises a digitally encoded product.

62. The method of claim 39, wherein the audio data product comprises an analog encoded product.

63. The method of claim 39, wherein the audio data product comprises data encoded according to a particular format suitable for playback by audio devices adapted for the particular format, and the customized audio data product comprises data encoded according to the particular format.

64. The method of claim 39, including providing a source of a plurality of customer hearing profiles, and wherein a customer hearing profile in the plurality of customer hearing profiles includes a value indicating an audio device on which the customized audio data product is to be played.

65. The method of claim 39, wherein the customer hearing profile includes a value indicating a hearing characteristic type of a customer for whom the customized audio data product is to be played.

66. The method of claim 39, wherein the customer hearing profile includes a specification of psycho-acoustic characteristics of a customer for whom the customized audio data product is to be played.

67. The method of claim 39, wherein the customer hearing profile includes an audiogram of a customer for whom the customized audio data product is to be played.

68. The method of claim 39, wherein the customer hearing profile includes software defining a transfer function for producing the customized audio data product.

69. The method of claim 39, including providing a source of a plurality of customer hearing profiles, accepting data concerning a customer for whom the customized audio data product is to be played, and producing a customer hearing profile for the plurality of customer hearing profiles in response to the accepted data.

70. The method of claim 39, including providing a source of a plurality of customer hearing profiles, accepting data via a network interface concerning a customer for whom the customized audio data product is to be played, and producing a customer hearing profile for the plurality of customer hearing profiles in response to the accepted data.

71. The method of claim 39, including providing a source of a plurality of customer hearing profiles, accepting data via a network interface, concerning a customer for whom the customized audio data product is to be played, and modifying a customer hearing profile in the plurality of customer hearing profiles in response to the accepted data.

72. The method of claim 39, including providing a source of a plurality of customer hearing profiles, providing an interface accessible to a user via a network interface to accept data concerning a customer for whom the customized audio data product is to be played, and producing a customer hearing profile for the plurality of customer hearing profiles in response to the accepted data.

73. The method of claim 39, including providing a source of a plurality of customer hearing profiles, providing an interface accessible to a user via a network interface to accept data concerning a customer for whom the customized audio data product is to be played, and modifying a customer hearing profile in the plurality of customer hearing profiles in response to the accepted data.

74. A method for providing customized audio data products, comprising:

accepting via a data network, machine readable orders from a customer for a particular audio data product;

associating a hearing profile for the customer with the particular audio data product;

modifying the particular audio data product according to the hearing profile to produce a customized audio data product; and

transmitting via a data network, a customized audio data product to the customer.

75. The method of claim 74, wherein the customized audio data product comprises at least a portion of the hearing profile, and the particular audio data product for transformation according to the hearing profile at a remote site.

76. The method of claim 74, wherein the customized audio data product comprises a transformation according to the hearing profile of the particular audio data product.

77. The method of claim 74, including maintaining a registry of hearing profiles, and the step of associating a hearing profile for the customer with the particular audio data product includes retrieving the hearing profile from the registry.

78. The method of claim 77, including providing tools accessible via a network for gathering information about hearing characteristics of customers, and modifying hearing profiles in the registry in response to the information.

79. The method of claim 77, including providing tools accessible via a network for gathering information about hearing characteristics of customers, and modifying hearing profiles in the registry in response to the information according to an optimization modeling process.

80. The method of claim 74, wherein the particular audio data product comprises pre-recorded audio tracks.

81. The method of claim 74, wherein the particular audio data product comprises pre-recorded audio music tracks.

82. The method of claim 74, wherein the particular audio data product comprises live audio music streams.

83. The method of claim 74, wherein the particular audio data product comprises pre-recorded audio voice tracks.

84. The method of claim 74, wherein the particular audio data product comprises live audio voice streams.

85. The method of claim 74, wherein the particular audio data product comprises live audio telephone data.

86. The method of claim 74, including providing an interface accessible via a network interface adapted to receive user input, including the request for the particular audio data product and an identifier of the customer hearing profile.

87. The method of claim 74, including providing tools by which a user selects an instance of the particular audio data product, and issues a request for the selected instance.

88. The method of claim 74, including providing a source of a plurality of customer hearing profiles, and tools by which a user adds a customer hearing profile to the plurality of customer hearing profiles.

89. The method of claim 74, including providing a source of a plurality of customer hearing profiles, and tools by which a user modifies a particular customer hearing profile in the plurality of customer hearing profiles.

90. The method of claim 74, including providing logic to produce information about billing for particular audio data products for customers.

91. The method of claim 74, wherein the particular audio data product comprises a digitally encoded product.

92. The method of claim 74, wherein the particular audio data product comprises an analog encoded product.

93. The method of claim 74, wherein the particular audio data product comprises data encoded according to a particular format suitable for playback by audio devices adapted for the particular format, and the customized audio data product comprises data encoded according to the particular format.

94. The method of claim 74, wherein the hearing profile includes a value indicating listening conditions in which the customized audio data product is to be played.

95. The method of claim 74, wherein the hearing profile includes a value indicating a hearing characteristic type of a customer for whom the customized audio data product is to be played.

96. The method of claim 74, wherein the hearing profile includes a specification of psycho-acoustic characteristics of a customer for whom the customized audio data product is to be played.

97. The method of claim 74, wherein the hearing profile includes an audiogram of a customer for whom the customized audio data product is to be played.

98. The method of claim 74, wherein the hearing profile includes software defining a transfer function for producing the customized audio data product.

99. A method for providing customized audio data products, comprising:
storing a machine readable hearing profile for a customer;
accepting via a data network, machine readable orders from the customer for a particular audio data product;
associating the hearing profile for the customer with the particular audio data product;
modifying the particular audio data product according to the hearing profile to produce a customized audio data product;
delivering the customized audio data product to the customer;
accepting feedback from the customer concerning the customized audio data product; and

modifying the hearing profile in response to the feedback.

100. The method of claim 99, including:

providing input tools for accepting input data concerning a hearing profile for the customer, and producing the machine readable hearing profile in response to the input data.

101. The method of claim 99, including:

providing a graphical user interface, accessible by the customer, for accepting input data concerning a hearing profile for the customer, and producing the machine readable hearing profile in response to the input data.

102. The method of claim 99, including:

providing a graphical user interface, accessible by the customer via a data network, for accepting input data concerning a hearing profile for the customer, and producing the machine readable hearing profile in response to the input data.

103. The method of claim 99, including:

providing input tools for accepting input data characterizing the feedback, and modifying the machine readable hearing profile in response to the input data.

104. The method of claim 99, including:

providing a graphical user interface, accessible by the customer, for accepting input data characterizing the feedback, and modifying the machine readable hearing profile in response to the input data.

105. The method of claim 99, including:

providing a graphical user interface, accessible by the customer via a data network, for accepting input data characterizing the feedback, and modifying the machine readable hearing profile in response to the input data.

106. The method of claim 99, wherein the step of modifying comprises applying an optimization modeling process to the hearing profile.

107. The method of claim 99, including maintaining a database including a plurality of machine readable hearing profiles for a corresponding plurality of customers, and wherein the step of modifying comprises applying an optimization modeling process to the hearing profile in response to the feedback and to the database.

108. The method of claim 99, including determining listening conditions relevant to playback of the customized audio data product, and wherein the step of modifying is responsive to the determined listening conditions.

109. The method of claim 99, including determining a type of delivery for the customized audio data product, and wherein the step of delivering is responsive to the determined type of delivery.

110. The method of claim 99, including determining a type of delivery for the customized audio data product, and wherein the step of modifying is responsive to the determined type of delivery.

111. A method for providing customized audio data products, comprising:
reading a particular audio data product;
associating a hearing profile with the particular audio data product;
modifying the particular audio data product according to the hearing profile to produce a customized audio data product.

112. The method of claim 111, wherein the step of associating a hearing profile with the particular audio data product includes retrieving the hearing profile from a portable memory device.

113. The method of claim 111 including maintaining a registry of hearing profiles, and the step of associating a hearing profile for the customer with the particular audio data product includes retrieving the hearing profile from the registry.

114. The method of claim 113, including providing tools accessible via a network for gathering information about hearing characteristics of customers, and modifying hearing profiles in the registry in response to the information.

115. The method of claim 113, including providing tools accessible via a network for gathering information about hearing characteristics of customers, and modifying hearing profiles in the registry in response to the information according to an optimization modeling process.

116. The method of claim 111, wherein the particular audio data product comprises pre-recorded audio tracks.

117. The method of claim 111, wherein the particular audio data product comprises pre-recorded audio music tracks.

118. The method of claim 111, wherein the particular audio data product comprises live audio music streams.

119. The method of claim 111, wherein the particular audio data product comprises pre-recorded audio voice tracks.

120. The method of claim 111, wherein the particular audio data product comprises live audio voice streams.

121. The method of claim 111, wherein the particular audio data product comprises live audio telephone data.

122. The method of claim 111, including providing tools by which a user selects an instance of the particular audio data product, and issues a request for the selected instance.

123. The method of claim 111, including providing a source of a plurality of customer hearing profiles, and tools by which a user adds a customer hearing profile to the plurality of customer hearing profiles.

124. The method of claim 111, including providing a source of a plurality of customer hearing profiles, and tools by which a user modifies a particular customer hearing profile in the plurality of customer hearing profiles.

125. The method of claim 111, wherein the particular audio data product comprises a digitally encoded product.

126. The method of claim 111, wherein the particular audio data product comprises an analog encoded product.

127. The method of claim 111, wherein the particular audio data product comprises data encoded according to a particular format suitable for playback by audio devices adapted for the particular format, and the customized audio data product comprises data encoded according to the particular format.

128. The method of claim 111, wherein the hearing profile includes a value indicating listening conditions in which the customized audio data product is to be played.

129. The method of claim 111, wherein the hearing profile includes a value indicating a hearing characteristic type of a customer for whom the customized audio data product is to be played.

130. The method of claim 111, wherein the hearing profile includes a specification of psycho-acoustic characteristics of a customer for whom the customized audio data product is to be played.

131. The method of claim 111, wherein the hearing profile includes an audiogram of a customer for whom the customized audio data product is to be played.

132. The method of claim 111, wherein the hearing profile includes software defining a transfer function for producing the customized audio data product.

133. A device for producing customized audio data, comprising:
data storage storing an audio data product and
a hearing profile of a customer for the audio data product; and
logic to produce a customized audio data product in response to the hearing profile and the audio data product.

134. The device of claim 133, including:
an interface by which the customized audio data product is received from a remote site.

135. The device of claim 133, including:
logic to store the customized audio data product on a machine readable medium.

136. The device of claim 133, wherein the customized audio data product comprises at least a portion of the hearing profile, and the audio data product for transformation according to the hearing profile at a remote site.

137. The device of claim 133, wherein the customized audio data product comprises a transformation according to the hearing profile of the audio data product.

138. The device of claim 133, wherein the customized audio data product comprises a transformation according to the hearing profile of the audio data product, and a parameter used for decoding the transformation.

139. The device of claim 133, wherein the customized audio data product comprises a transformation according to the hearing profile of the audio data product, and a parameter associated with the customer used for decoding the transformation.

140. An article of manufacture comprising:

a data storage medium configured for connection to, and for disconnection from, an audio playback device; and

a customized audio data product stored in the data storage medium, the customized audio data product comprising an audio data product customized in response to a hearing profile of a customer.

141. The article of claim 140, wherein the customized audio data product comprises a transformation according to the hearing profile of the audio data product, and a parameter for identification of the customer.

142. The article of claim 140, wherein the customized audio data product comprises at least a portion of the hearing profile, and the audio data product for transformation according to the hearing profile.

143. The article of claim 140, wherein the customized audio data product comprises a transformation according to the hearing profile of the audio data product.

144. The article of claim 140, wherein the customized audio data product comprises a transformation according to the hearing profile of the audio data product, and a parameter used for decoding the transformation.

145. The article of claim 140, wherein the customized audio data product comprises a transformation according to the hearing profile of the audio data product, and a parameter associated with the customer used for decoding the transformation.

146. An audio data playback device comprising:

a data processor;

a data storage medium, coupled to the data processor;

an audio transducer, coupled to the data processor; and

a customized audio data product stored in the data storage medium, the customized audio data product comprising an audio data product customized using a hearing profile of a customer.

147. The audio data playback device of claim 146, wherein the audio transducer comprises a speaker mounted on a headset.

148. The audio data playback device of claim 146, wherein the audio transducer comprises stereo speakers mounted on a headset.

149. The audio data playback device of claim 146, wherein the customized audio data product comprises the audio data product transformed according to the hearing profile, and a parameter for identification of the customer.

150. The audio data playback device of claim 146, wherein the customized audio data product comprises a transformation according to the hearing profile of the audio data product, and a parameter associating the customized audio data product with the customer, and the data processor includes decoding logic responsive to the parameter for playing the customized audio data product.

151. The audio data playback device of claim 146, wherein the customized audio data product comprises at least a portion of the hearing profile, and the audio data product for transformation according to the hearing profile, and the data processor includes decoding logic

responsive to said at least a portion of the hearing profile for playing the customized audio data product.

152. An audio testing device comprising:

a data processor;

a data storage medium, coupled to the data processor;

a communication port, coupled to the data processor;

an audio transducer, coupled to the data processor; and

at least a portion of a hearing test program stored in the data storage medium, the hearing test program comprising routines for execution of a hearing test using the communication port and the hearing test program to produce hearing profile data of a customer.

153. The audio testing device of claim 152, wherein the communication port comprises a port for connection to an external data processing device providing a user interface for the hearing test program.

154. The audio testing device of claim 152, wherein the audio transducer comprises a speaker mounted on a headset.

155. The audio testing device of claim 152, wherein the audio transducer comprises stereo speakers mounted on a headset.

156. The audio testing device of claim 152, including a port adapted to couple a removable data storage device to the data processor, and resources for playing an audio data product stored in the removable data storage device.

157. The audio testing device of claim 152, including a battery, and wherein the data processor and audio transducer are coupled to the battery.

158. The audio testing device of claim 152, including a headset, and wherein the data processor, data storage medium, communication port and audio transducer are mounted on the headset.

159. The audio testing device of claim 152, wherein the customer hearing profile comprises coefficients of a transfer function to transform an audio data product according a hearing characteristic of a customer.

160. The audio testing device of claim 152, wherein the customer hearing profile comprises an identifier of transfer function to transform an audio data product according a hearing characteristic of a customer.

161. The audio testing device of claim 152, wherein the customer hearing profile comprises an identifier of a transfer function and coefficients of the identified transfer function to transform an audio data product according a hearing characteristic of a customer.

162. The audio testing device of claim 152, wherein the customer hearing profile includes a value indicating listening conditions in which a customized audio data product is to be played.

163. The audio testing device of claim 152, wherein the customer hearing profile includes a value indicating a hearing characteristic of a customer for whom a customized audio data product is to be played.

164. The audio testing device of claim 152, wherein the customer hearing profile includes a specification of psycho-acoustic characteristics of a customer for whom a customized audio data product is to be played.

165. The audio testing device of claim 152, wherein the customer hearing profile includes an audiogram characterizing a customer for whom a customized audio data product is to be played.

166. The audio testing device of claim 152, wherein the customer hearing profile includes software defining a transfer function for producing a customized audio data product.

167. An audio testing and playback device comprising:

a data processor;

data memory coupled to the data processor;

a communication port, coupled to the data processor;

an audio transducer, coupled to the data processor;

a hearing test program stored in the data memory, the hearing test program comprising logic used for execution of a hearing test using the communication port to produce hearing profile data for use in production of a hearing profile of a customer; and

a customized audio data product stored in the data memory, the customized audio data product comprising an audio data product customized using the hearing profile.

168. The audio testing and playback device of claim 167, wherein the communication port comprises a port for connection to an external data processing device providing a user interface for the hearing test program.

169. The audio testing and playback device of claim 167, wherein the audio transducer comprises a speaker mounted on a headset.

170. The audio testing and playback device of claim 167, wherein the audio transducer comprises stereo speakers mounted on a headset.

171. The audio testing and playback device of claim 167, including a port adapted to couple a removable data storage device to the data processor, and resources for playing an audio data product stored in the removable data storage device.

172. The audio testing and playback device of claim 167, including a battery, and wherein the data processor and audio transducer are coupled to the battery.

173. The audio testing and playback device of claim 167, including a headset, and wherein the data processor, data memory, communication port and audio transducer are mounted on the headset.

174. A method for conducting a hearing test, comprising:

providing a headset having stored therein audio test software;

coupling the headset to a data processor having a user interface;

executing a test using the audio test software and the user interface to develop a hearing profile;

producing a customized audio data product using the hearing profile; and

playing the customized audio data product on the headset.

175. The method of claim 174, including storing the hearing profile on the headset, and wherein the step of producing a customized audio data product comprises processing an audio data product using the hearing profile stored in the headset.

176. The method of claim 174, including storing the hearing profile in a remote site.

177. The method of claim 174, including producing the customized audio data product in a remote site.

178. The method of claim 174, including storing the customized audio data product on a machine readable medium, and coupling the machine readable medium to the headset.

179. The method of claim 174, including storing the customized audio data product on a portable data storage device, and coupling the portable data storage device to the headset.

180. An article of manufacture comprising:

a data storage medium configured for connection to, and for disconnection from, an audio playback device; and

a customer hearing profile stored in the data storage medium, the hearing profile comprising data generated based on hearing characteristics of a particular customer.

181. The article of claim 180, wherein the customer hearing profile comprises coefficients of a transfer function to transform an audio data product according a hearing characteristic of a customer.

182. The article of claim 180, wherein the customer hearing profile comprises an identifier of a transfer function to transform an audio data product according a hearing characteristic of a customer.

183. The article of claim 180, wherein the customer hearing profile comprises an identifier of a transfer function and coefficients of the identified transfer function to transform an audio data product according a hearing characteristic of a customer.

184. The article of claim 180, wherein the customer hearing profile includes a value indicating listening conditions in which a customized audio data product is to be played.

185. The article of claim 180, wherein the customer hearing profile includes a value indicating a hearing characteristic of a customer for whom a customized audio data product is to be played.

186. The article of claim 180, wherein the customer hearing profile includes a specification of psycho-acoustic characteristics of a customer for whom a customized audio data product is to be played.

187. The article of claim 180, wherein the customer hearing profile includes an audiogram characterizing a customer for whom a customized audio data product is to be played.

188. The article of claim 180, wherein the customer hearing profile includes software defining a transfer function for producing a customized audio data product.

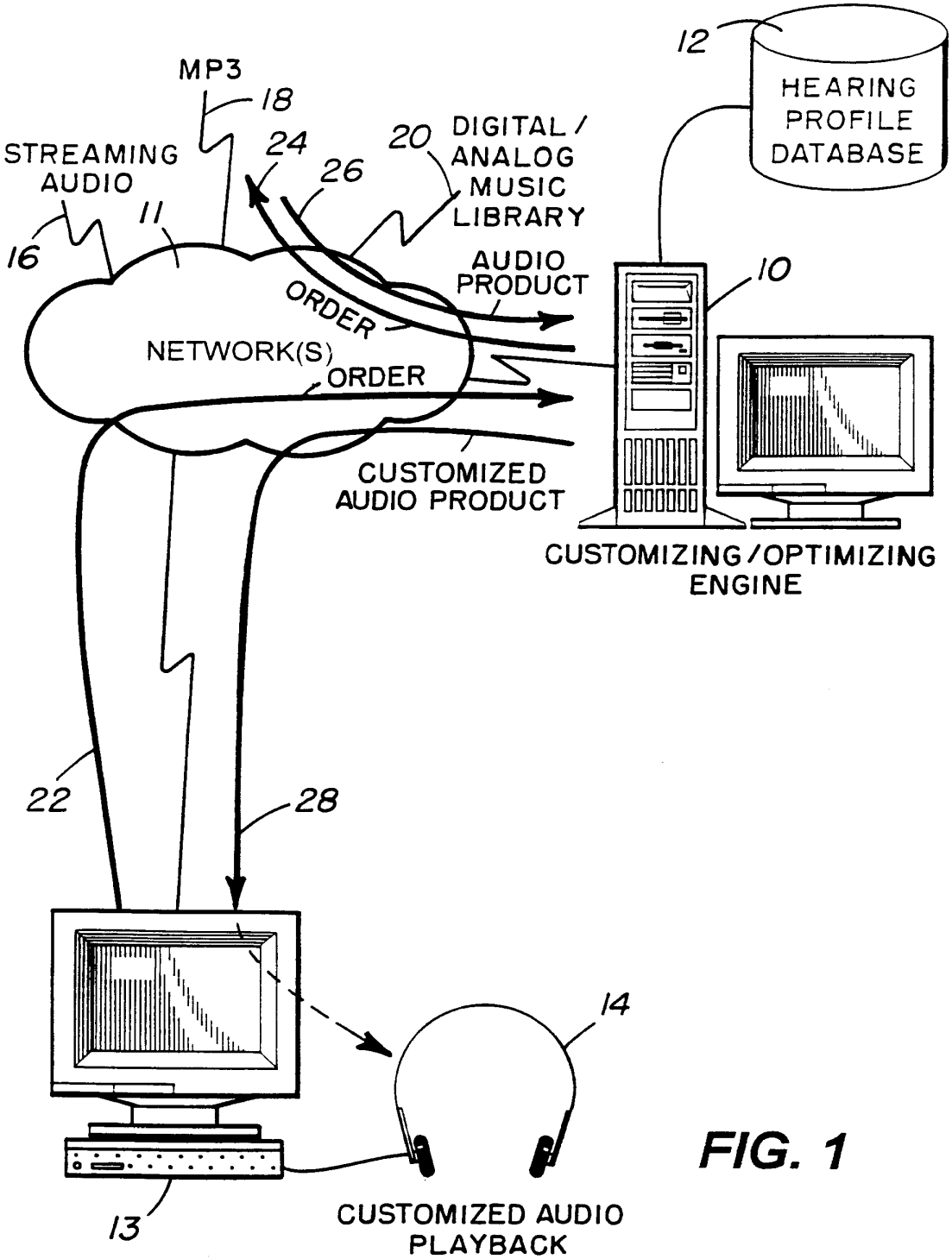

12
HEARING PROFILE DATABASE
MP3
18
STREAMING AUDIO
24
26
20
DIGITAL / ANALOG MUSIC LIBRARY
16
11
AUDIO PRODUCT
10
ORDER
NETWORK(S)
ORDER
CUSTOMIZED AUDIO PRODUCT
CUSTOMIZING/OPTIMIZING ENGINE
22
28
14
13
CUSTOMIZED AUDIO PLAYBACK

FIG. 1

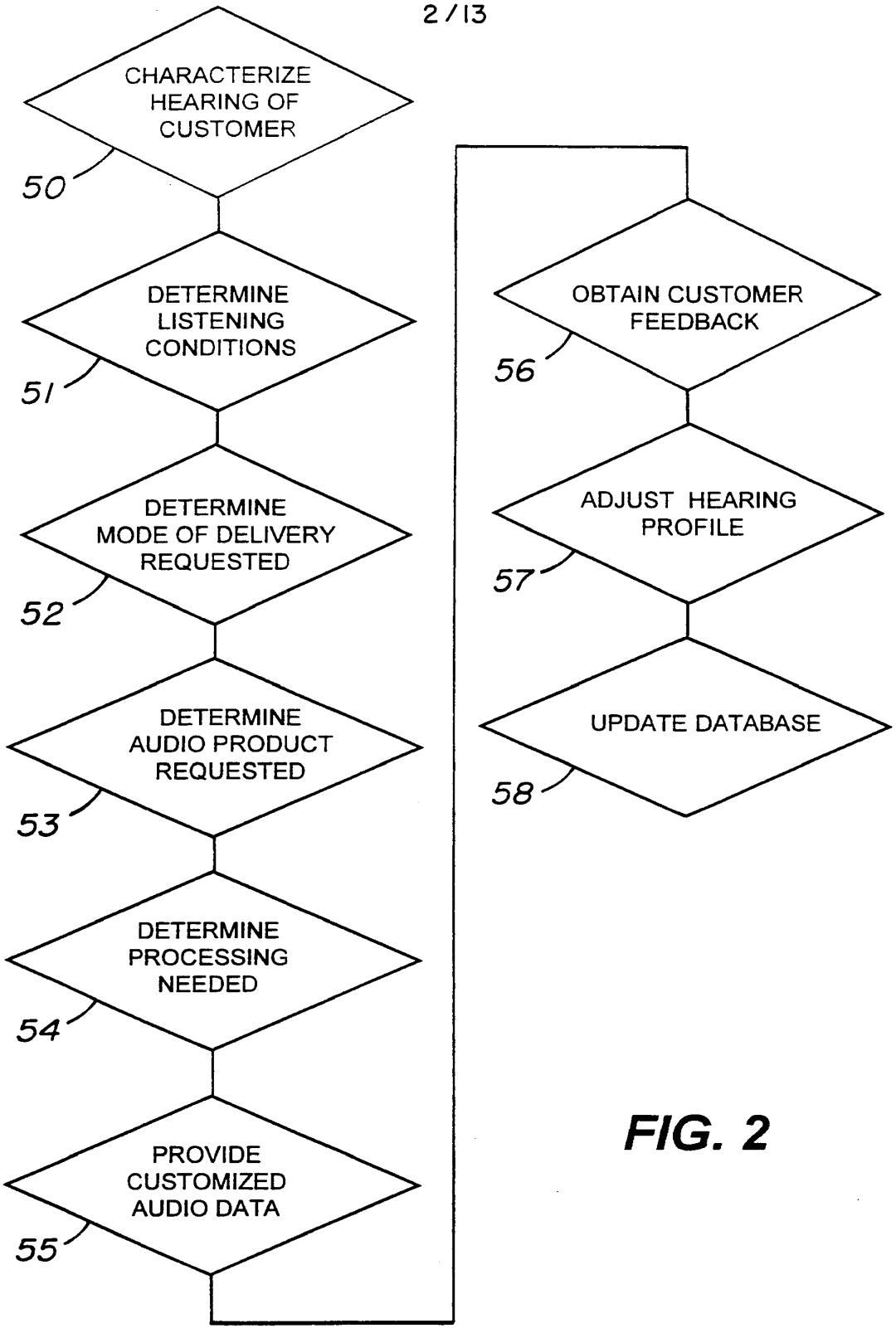

CHARACTERIZE HEARING OF CUSTOMER
50
DETERMINE LISTENING CONDITIONS
51
DETERMINE MODE OF DELIVERY REQUESTED
52
DETERMINE AUDIO PRODUCT REQUESTED
53
DETERMINE PROCESSING NEEDED
54
PROVIDE CUSTOMIZED AUDIO DATA
55
OBTAIN CUSTOMER FEEDBACK
56
ADJUST HEARING PROFILE
57
UPDATE DATABASE
58

FIG. 2

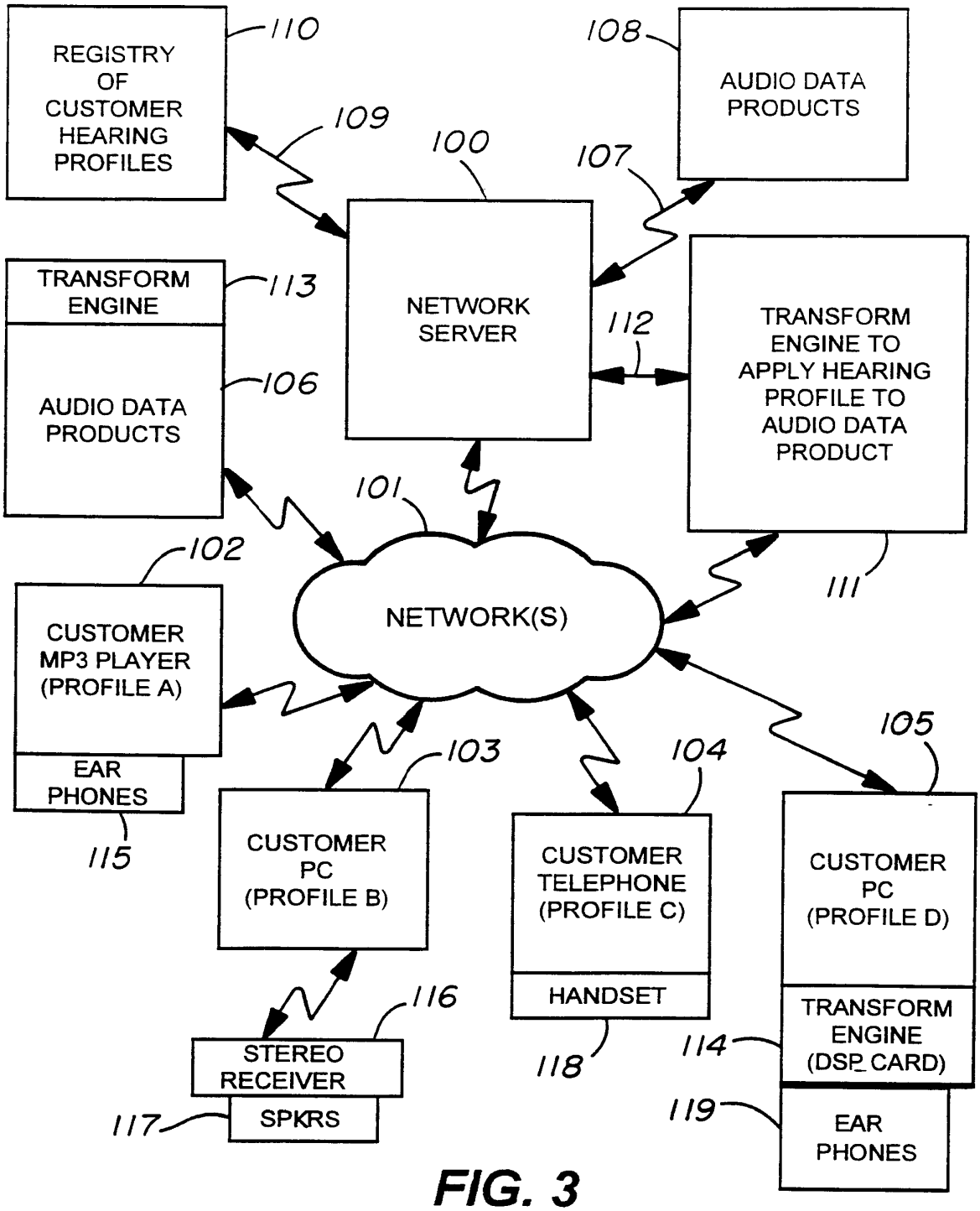

REGISTRY OF CUSTOMER HEARING PROFILES
110
109
100
108
AUDIO DATA PRODUCTS
107
NETWORK SERVER
TRANSFORM ENGINE
113
AUDIO DATA PRODUCTS
106
112
TRANSFORM ENGINE TO APPLY HEARING PROFILE TO AUDIO DATA PRODUCT
101
102
NETWORK(S)
111
CUSTOMER MP3 PLAYER (PROFILE A)
EAR PHONES
115
103
104
105
CUSTOMER PC (PROFILE B)
CUSTOMER TELEPHONE (PROFILE C)
HANDSET
118
CUSTOMER PC (PROFILE D)
TRANSFORM ENGINE (DSP CARD)
114
EAR PHONES
119
116
STEREO RECEIVER
SPKRS
117

FIG. 3

FIG. 4

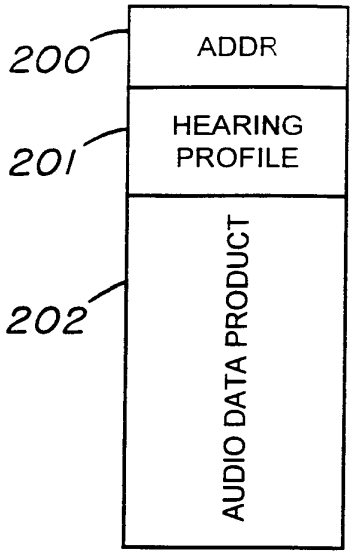
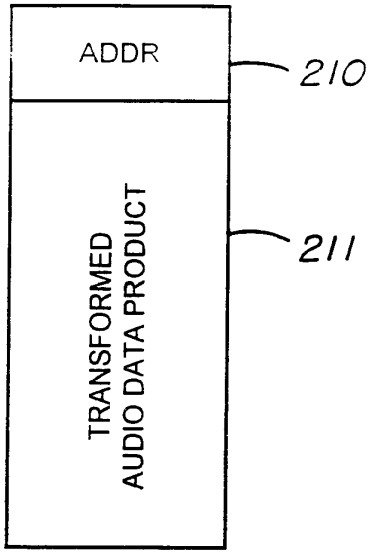


FIG. 5



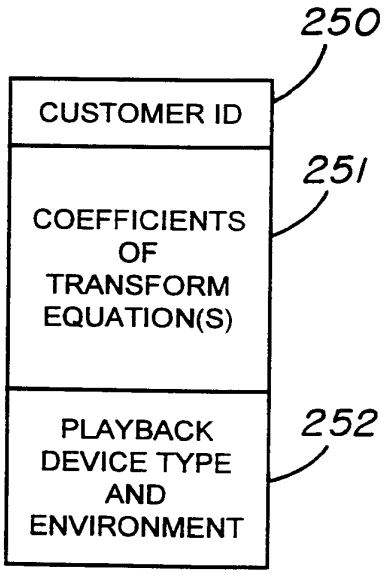


FIG. 6

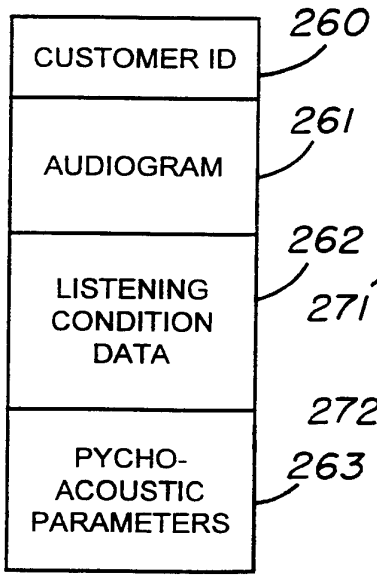


FIG. 7

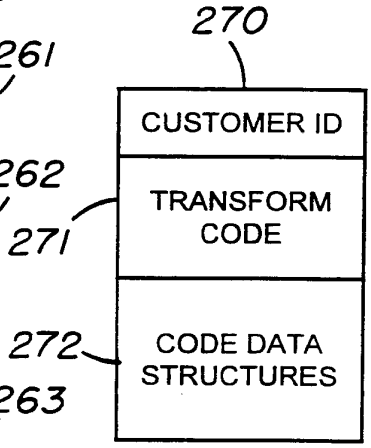


FIG. 8

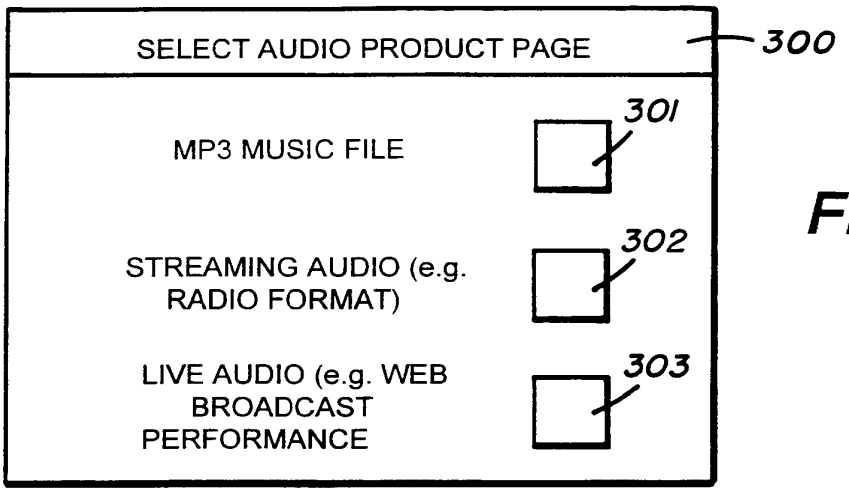


FIG. 9

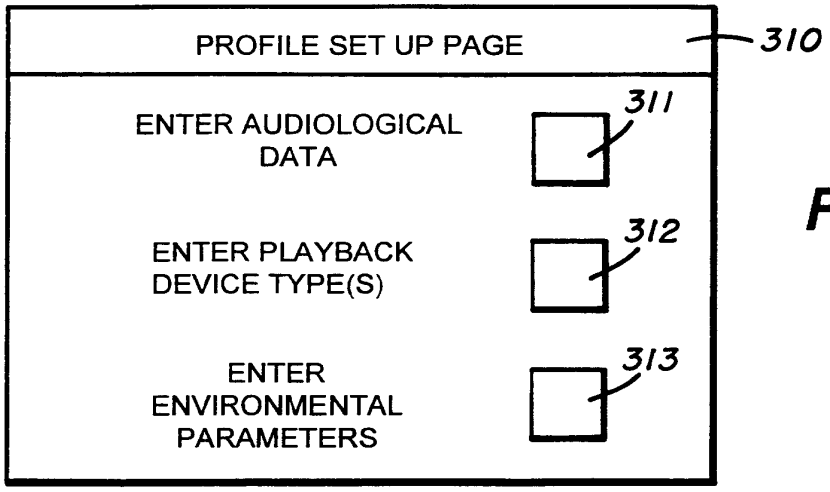


FIG. 10

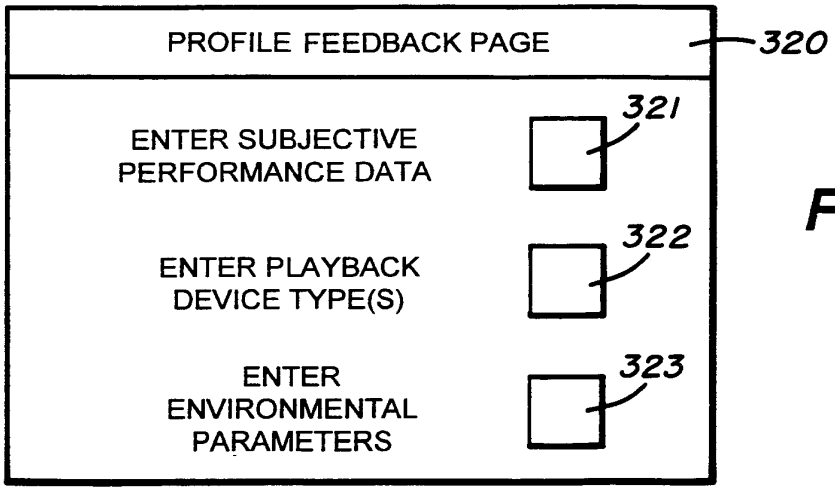


FIG. 11

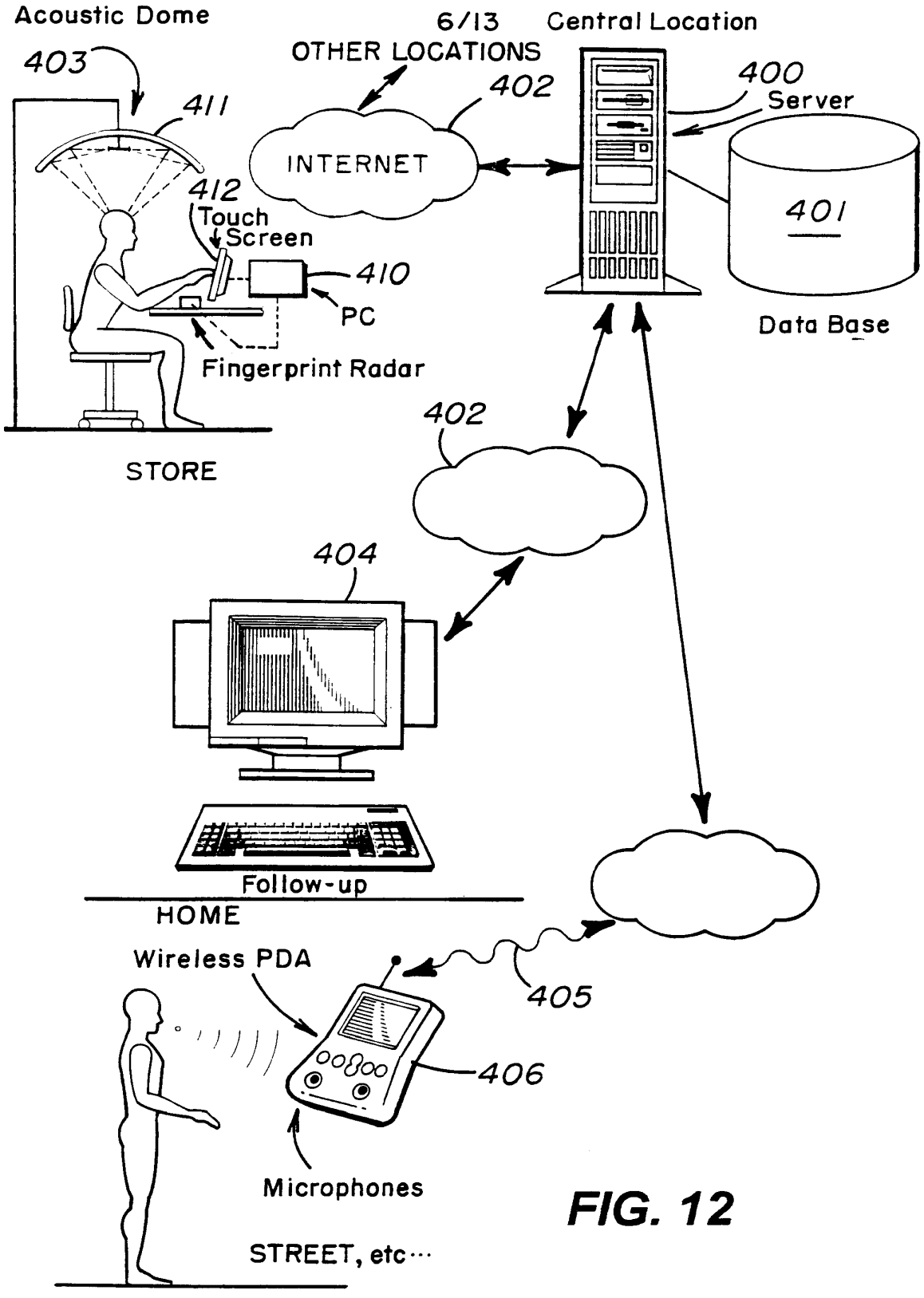

Acoustic Dome
403
411
412
Touch Screen
410
PC
Fingerprint Radar
STORE
6/13
OTHER LOCATIONS
402
INTERNET
Central Location
400
Server
401
Data Base
402
404
Follow-up
HOME
Wireless PDA
405
406
Microphones
STREET, etc···

FIG. 12

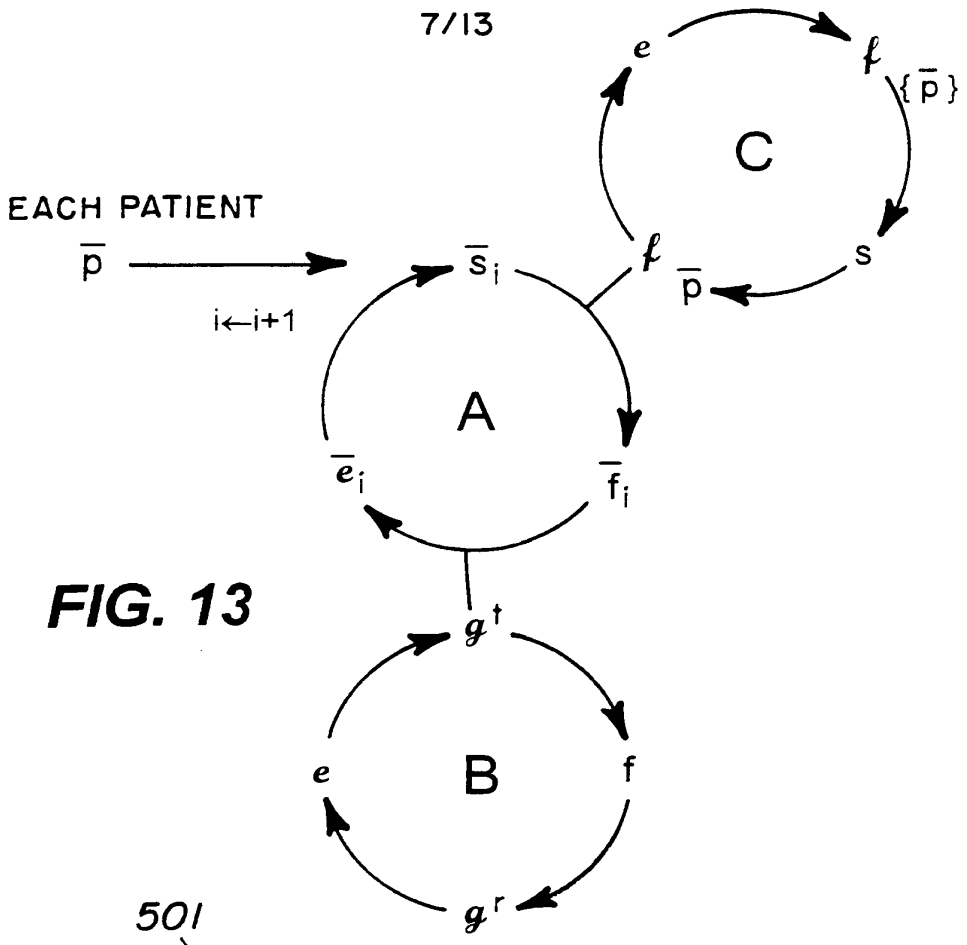

EACH PATIENT
p
i←i+1
s_i
A
e_i
f_i
f
{p}
C
e
f
p
s
g^t
B
e
f
g^r

FIG. 13

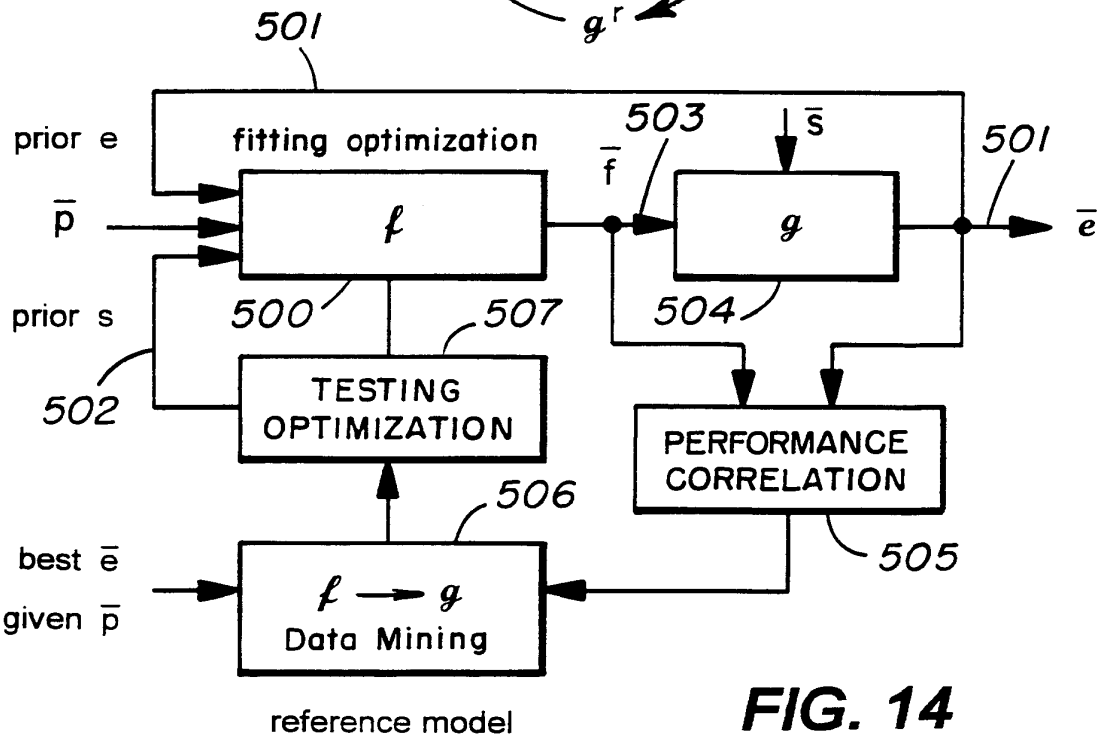

501
prior e
fitting optimization
503
s
501
f
p
f
g
e
prior s
500
507
504
502
TESTING OPTIMIZATION
PERFORMANCE CORRELATION
506
505
best e
given p
f → g
Data Mining
reference model

FIG. 14

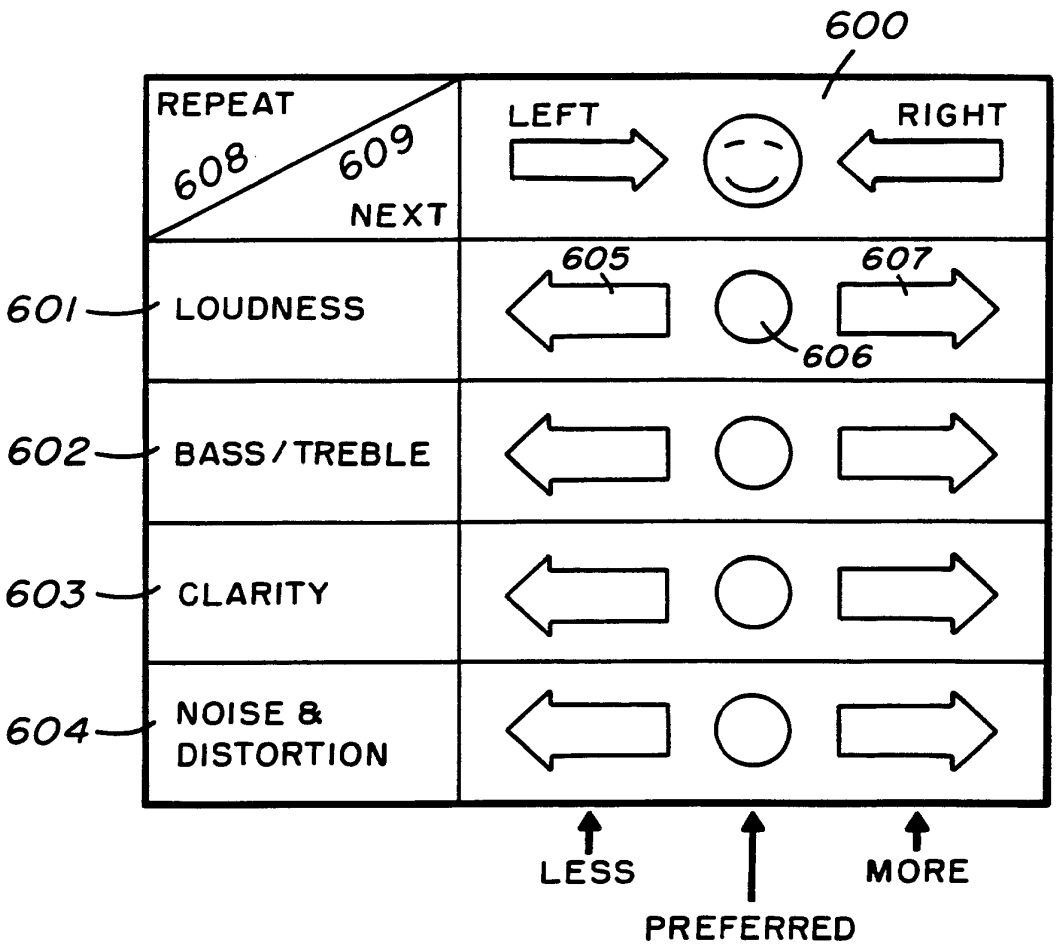

600
REPEAT
608
609
NEXT
LEFT
RIGHT
605
607
606
601
LOUDNESS
602
BASS / TREBLE
603
CLARITY
604
NOISE &
DISTORTION
LESS
MORE
PREFERRED

FIG. 15

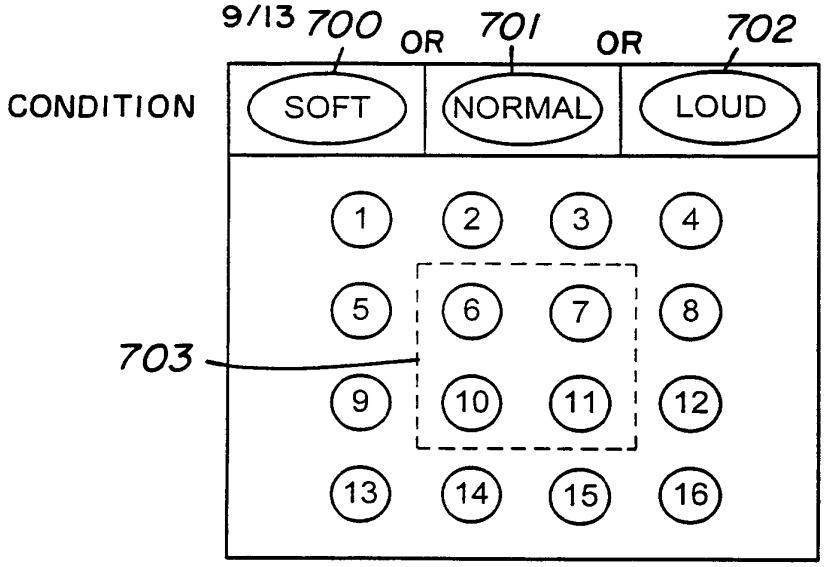


FIG. 16

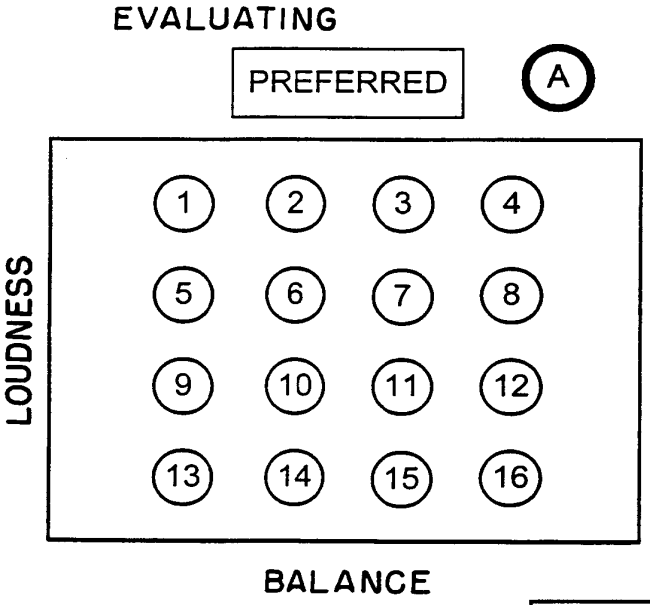


FIG. 17

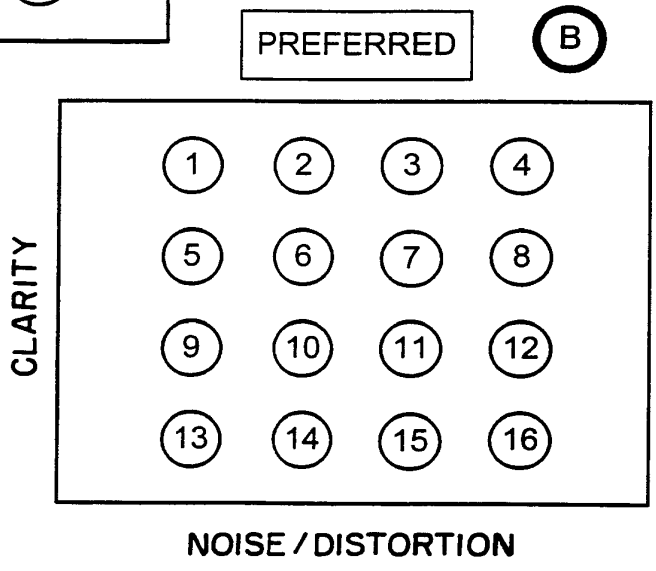


FIG. 18

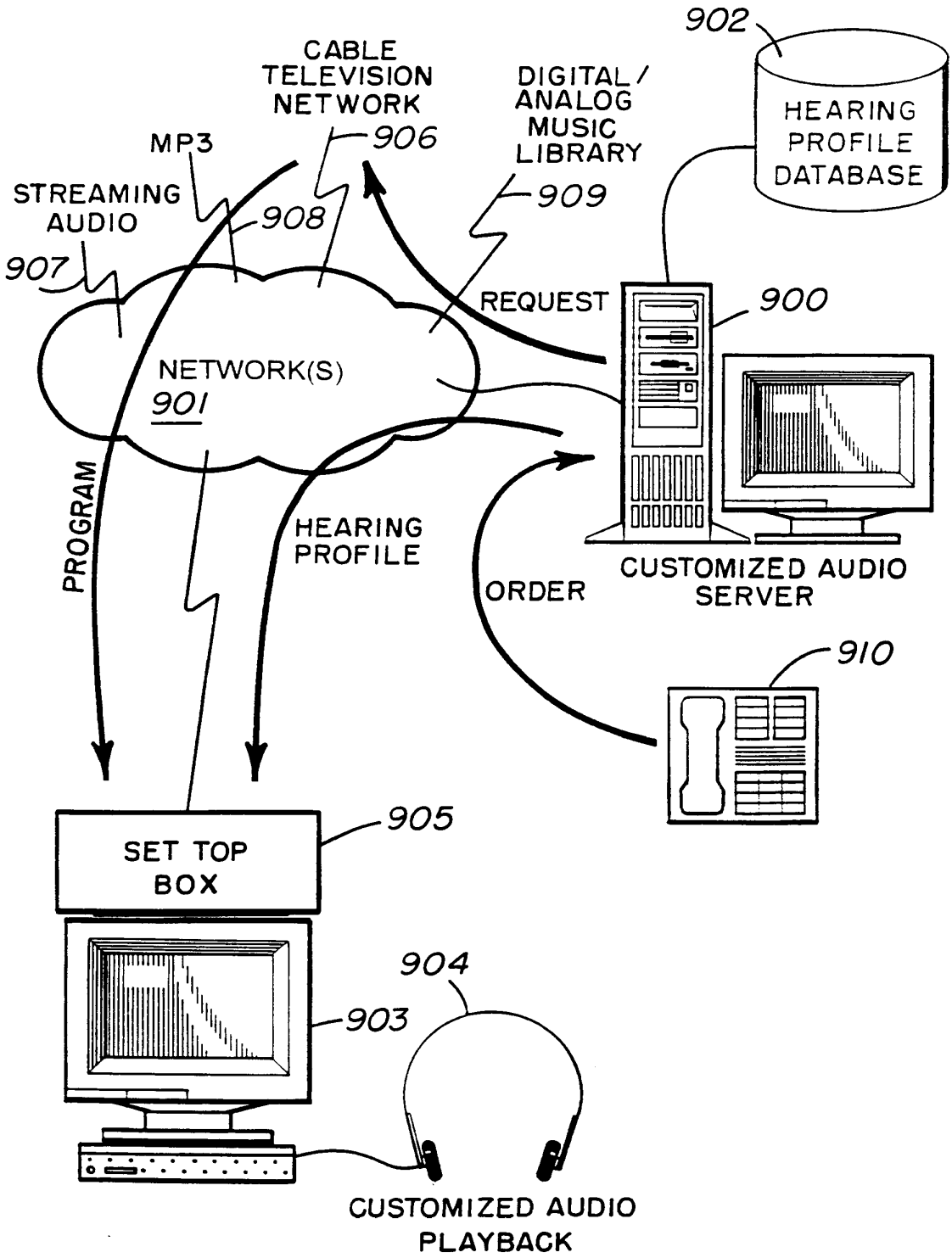

902
HEARING PROFILE DATABASE
CABLE TELEVISION NETWORK
906
DIGITAL / ANALOG MUSIC LIBRARY
909
MP3
908
STREAMING AUDIO
907
REQUEST
900
NETWORK(S)
901
PROGRAM
HEARING PROFILE
ORDER
CUSTOMIZED AUDIO SERVER
910
905
SET TOP BOX
904
903
CUSTOMIZED AUDIO PLAYBACK

FIG. 19

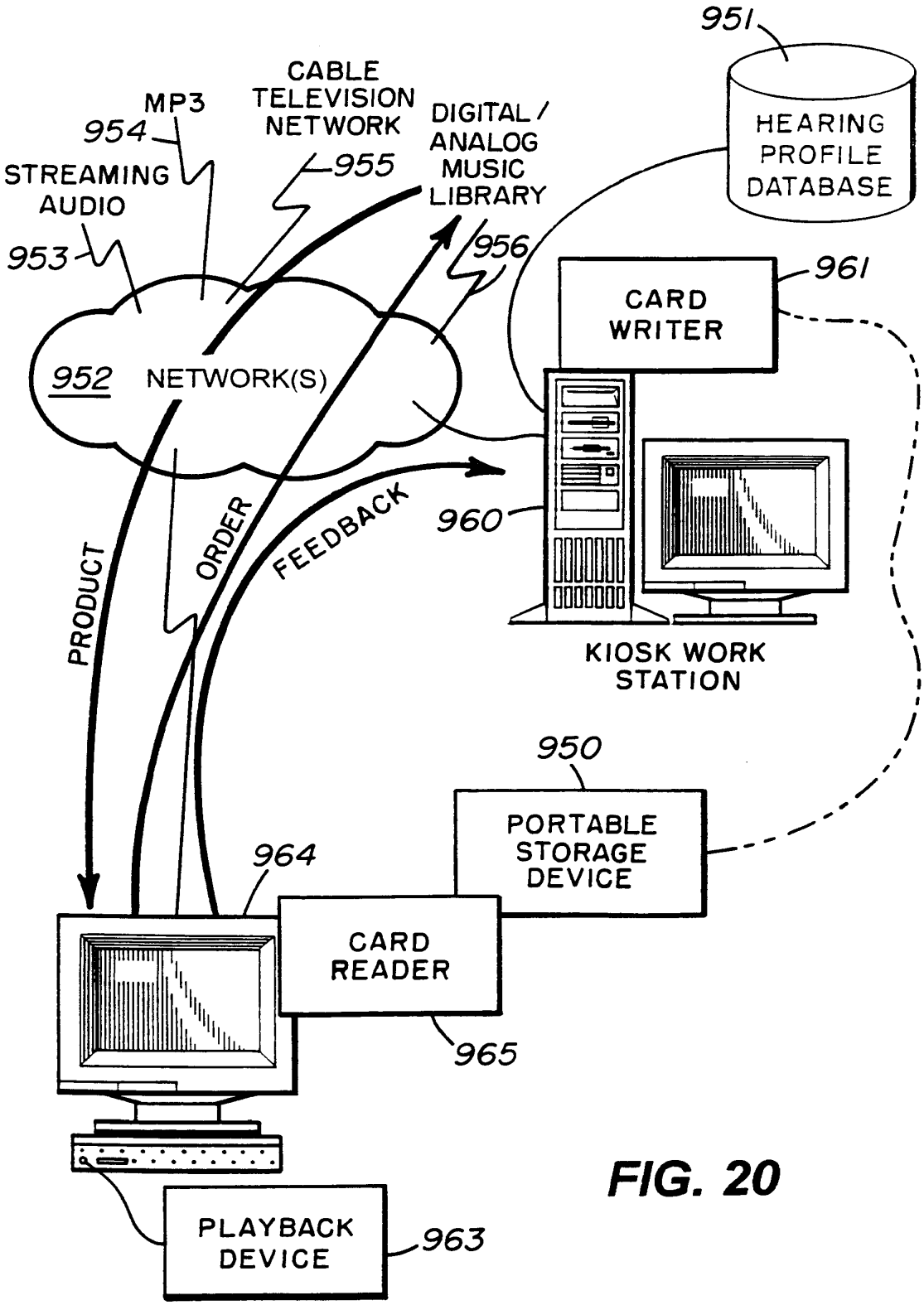

951
HEARING PROFILE DATABASE
CABLE TELEVISION NETWORK
MP3
954
STREAMING AUDIO
953
955
DIGITAL / ANALOG MUSIC LIBRARY
956
961
CARD WRITER
952 NETWORK(S)
PRODUCT
ORDER
FEEDBACK
960
KIOSK WORK STATION
950
PORTABLE STORAGE DEVICE
964
CARD READER
965
PLAYBACK DEVICE
963

FIG. 20

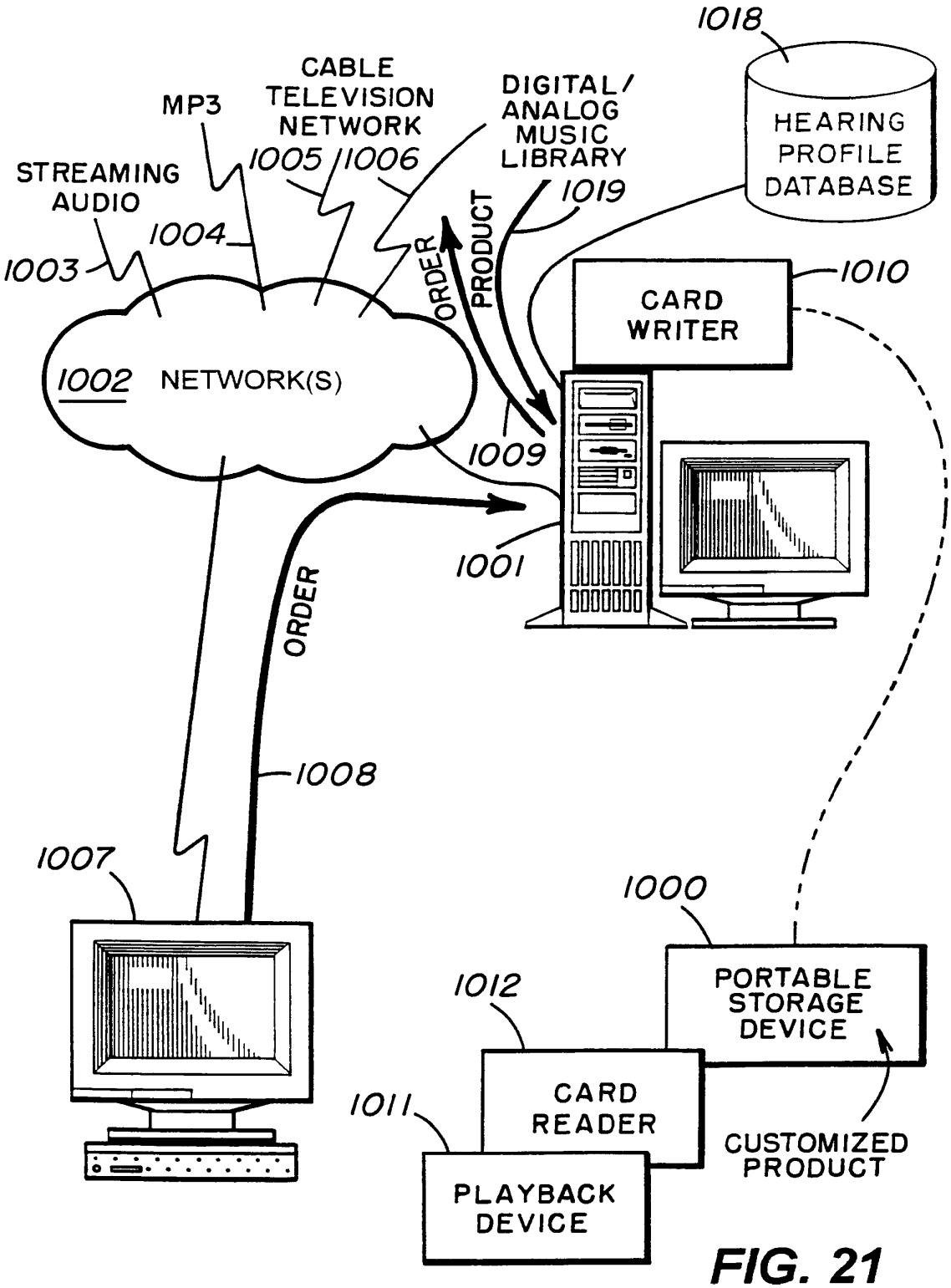

1018
HEARING PROFILE DATABASE
CABLE TELEVISION NETWORK
MP3
DIGITAL/ ANALOG MUSIC LIBRARY
STREAMING AUDIO
1005
1006
1019
1004
1003
ORDER
PRODUCT
1010
CARD WRITER
1002 NETWORK(S)
1009
1001
ORDER
1008
1007
1000
PORTABLE STORAGE DEVICE
1012
CARD READER
1011
CUSTOMIZED PRODUCT
PLAYBACK DEVICE

FIG. 21

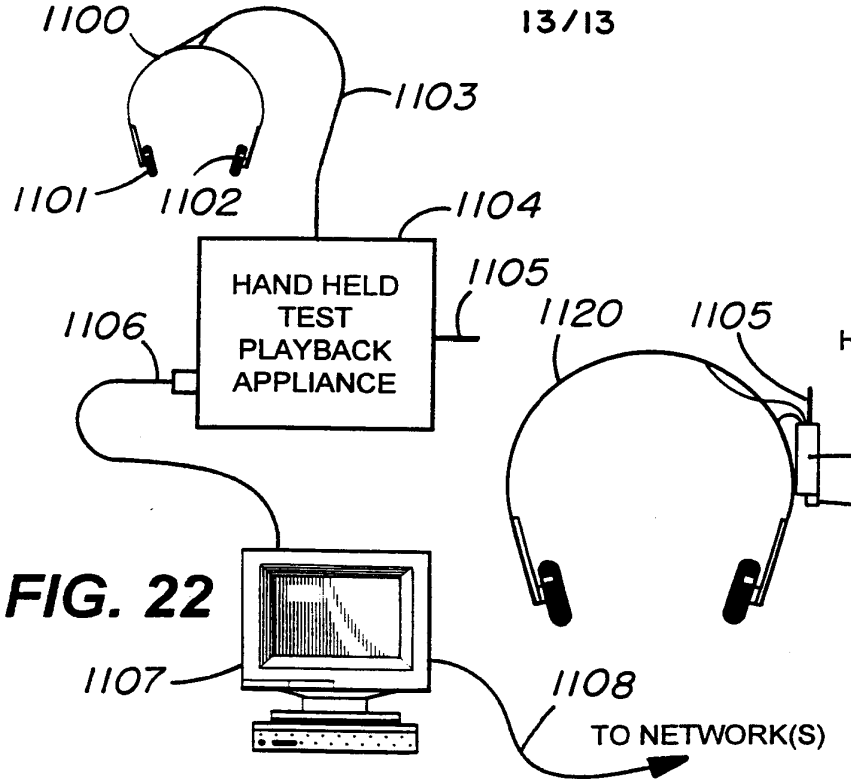


FIG. 22

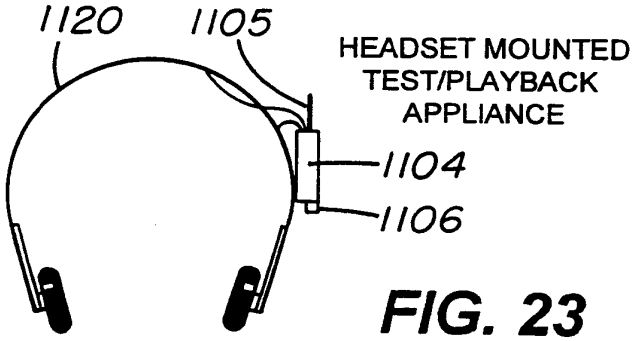


FIG. 23

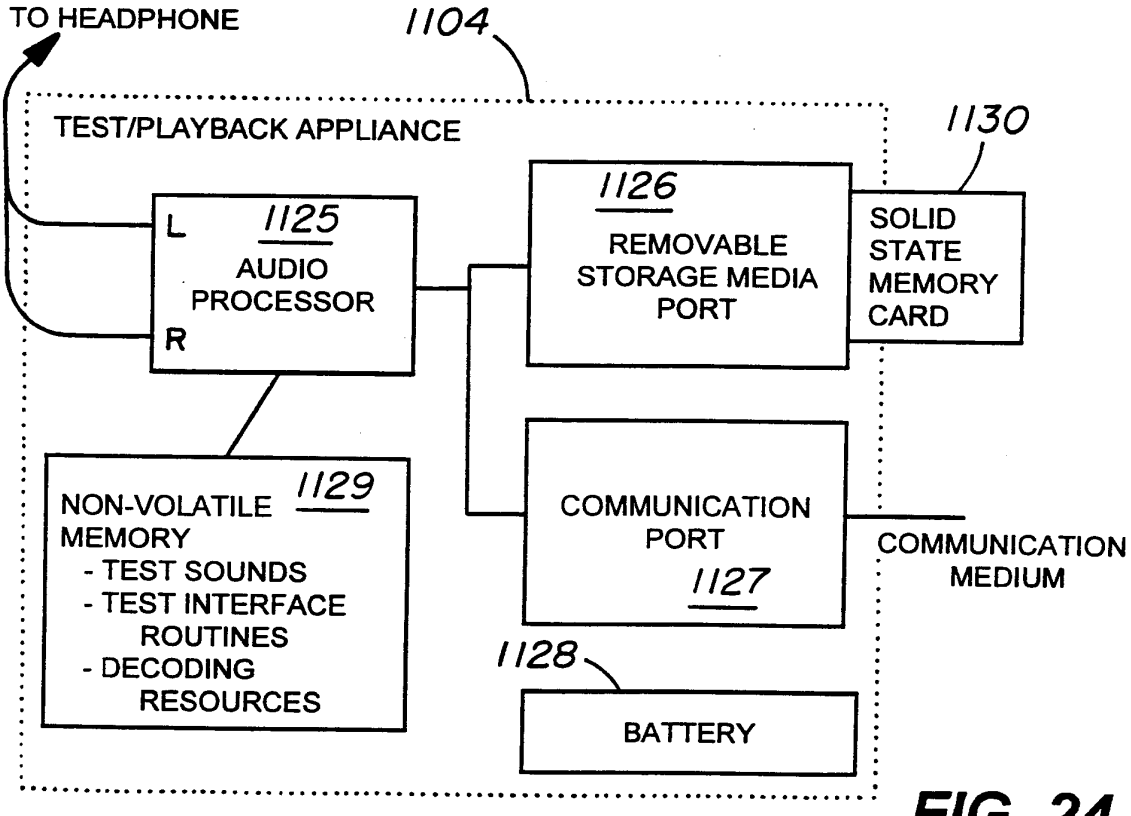


FIG. 24

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/26231

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :H04R 5/00, 1/10, 5/02
US CL :381/1, 310, 74, 303, 304, 305,

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 381/1, 310, 74, 303, 304, 305,

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

NONE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,371,799 A (LOWE et al) 06 December 1994, figs. 3-11.	1-188
Y	US 5,854,843 A (JACKNIN et al) 29 December 1998, fig. 1.	1-188
Y	US 5,495,534 A (INANAGA et al) 27 February 1996, figs. 1-6.	1-188
Y	US 5,452,359 A (INANAGA et al) 19 September 1995, figs. 1-6.	1-188

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search 15 NOVEMBER 2000	Date of mailing of the international search report 26 JAN 2001
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer MINSUN OH HARVEY Telephone No. (703) 308-6741

Form PCT/ISA/210 (second sheet) (July 1998)★

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: HOWELL et al.

Attorney Docket No.: IPVCP006X1C8

Application No.: 17/942,347

Examiner: ELAHEE, MD S.

Filed: September 12, 2022

Group: 2653

Title: WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT

CERTIFICATE OF ELECTRONIC FILING

I hereby certify that this correspondence is being transmitted electronically to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on April 7, 2023.

Signed: /Angela D. Nijim/ Printed Name: Angela D. Nijim

PRELIMINARY AMENDMENT

Mail Stop _____
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Prior to an Office Action on the merits, please amend the above-identified as follows:

Amendments to the Claims are reflected in the listing of claims which begin on page 2 of this paper.

Remarks/Arguments begin on page 5 of this paper.

Amendments to the Claims:
The listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently amended) A wireless headset for a user comprising:

a first printed circuit board provided in the headset, the first printed circuit board having at least one electrical component attached thereon, the at least one electrical component being electrically connected to a plurality of other electrical components, each of the plurality of other electrical components being provided at least partially in the headset;

a plurality of speakers in the headset;

a plurality of microphones in the headset; and

wireless communication circuitry,

wherein the at least one electrical component or the plurality of other electrical components include at least a controller,

wherein the at least a controller is configured to facilitate modifying power within a certain range of frequencies based on at least one hearing characteristic of the user, to help the user hear audio outputs presented to the user via the plurality of speakers,

wherein the wireless communication circuitry is configured to wirelessly receive a message,

wherein at least if the message is a text message, the at least a controller is configured to have at least a portion of the text message presented to the user,

wherein at least if the message is an audio message, the at least a controller is configured to have at least a portion of the audio message presented to the user, and

wherein the plurality of speakers are configured to present at least a portion of the message, if the at least a portion of the message is to be presented in an audio manner~~, and~~

~~wherein at least a microphone in the plurality of microphones is configured to receive an audio response for the message from the user~~.

2. (Previously presented) A wireless headset as recited in claim 1 comprising an accelerometer.

3. (Previously presented) A wireless headset as recited in claim 1 comprising a first connector that includes a plurality of conductive pads that are configured to couple with a second connector external to the headset, wherein each of the conductive pads is configured to be in contact with a corresponding metallic contact of the second connector when the first connector is connected to the second connector.

4. (Previously presented) A wireless headset as recited in claim 1, wherein the wireless communication circuitry is configured to couple to at least a Bluetooth network.

5. (Currently amended) A wireless headset as recited in claim 1, wherein the at least a controller is configured to facilitate voice recognition, including recognizing at least a spoken term received via ~~the~~ at least a microphone in the headset.

6. (Cancelled)

7. (New) A wireless headset as recited in claim 1, wherein the headset includes a pair of ear buds, each configured to be placed in an ear of the user.

8. (New) A wireless headset as recited in claim 1, wherein at least a microphone in the headset is configured to receive an audio response for the message from the user.

9. (New) A wireless headset as recited in claim 8, wherein the at least a controller is configured to facilitate converting the audio response into text to be wirelessly transmitted.

REMARKS

Please enter this Amendment prior to examination on the merits.

Respectfully submitted,

/Peter P. Tong/

Peter P. Tong
Reg. No. 35,757

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

34071 7590 04/19/2023

IPVENTURE, INC.
4010 Moorpark Avenue
Suite 211
San Jose, CA 95117

EXAMINER
ELAHEE, MD S

ART UNIT	PAPER NUMBER
2653	

DATE MAILED: 04/19/2023

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/942,347	09/12/2022	Thomas A. Howell	IPVCP006X1C8	1038

TITLE OF INVENTION: WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1200	$0.00	$0.00	$1200	07/19/2023

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 40% the amount of undiscounted fees, and micro entity fees are 20% the amount of undiscounted fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications. **Because electronic patent issuance may occur shortly after issue fee payment, any desired continuing application should preferably be filed prior to payment of this issue fee in order not to jeopardize copendency.**

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

34071 7590 04/19/2023
IPVENTURE, INC.
4010 Moorpark Avenue
Suite 211
San Jose, CA 95117

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/942,347	09/12/2022	Thomas A. Howell	IPVCP006X1C8	1038

TITLE OF INVENTION: WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1200	$0.00	$0.00	$1200	07/19/2023

EXAMINER	ART UNIT	CLASS-SUBCLASS
ELAHEE, MD S	2653	381-327000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/AIA/122 or PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/47 or PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1_____
2_____
3_____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. Fees submitted: ❑Issue Fee ❑Publication Fee (if required)

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

❑ Electronic Payment via Patent Center or EFS-Web ❑ Enclosed check ❑ Non-electronic payment by credit card (Attach form PTO-2038)

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. **Change in Entity Status** (from status indicated above)

❑ Applicant certifying micro entity status. See 37 CFR 1.29

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

❑ Applicant asserting small entity status. See 37 CFR 1.27

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

❑ Applicant changing to regular undiscounted fee status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/942,347	09/12/2022	Thomas A. Howell	IPVCP006X1C8	1038

34071 7590 04/19/2023

IPVENTURE, INC.
4010 Moorpark Avenue
Suite 211
San Jose, CA 95117

EXAMINER	
ELAHEE, MD S	

ART UNIT	PAPER NUMBER
2653	

DATE MAILED: 04/19/2023

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 17/942,347	Applicant(s) Howell et al.	
	Examiner MD S ELAHEE	Art Unit 2653	AIA (FITF) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☑ This communication is responsive to 4/7/2023.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☑ The allowed claim(s) is/are 1-5 and 7-9 . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information , please see **http://www.uspto.gov/patents/init_events/pph/index.jsp** or send an inquiry to **PPHfeedback@uspto.gov.**

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some* c) ☐ None of the:

   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☑ Notice of References Cited (PTO-892)
2. ☑ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.
4. ☑ Interview Summary (PTO-413), Paper No./Mail Date. _____.
5. ☐ Examiner's Amendment/Comment
6. ☑ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/MD S ELAHEE/
Primary Examiner, Art Unit 2653

Notice of Pre-AIA or AIA Status

The present application is being examined under the pre-AIA first to invent provisions.

DETAILED ACTION

Allowable Subject Matter

1. Claims 1-5 and 7-9 are allowed.

2. The following is an examiner's statement of reasons for allowance: The invention as claimed is not disclosed nor rendered obvious in view of any prior art. As to independent claim 1, all prior art fail to teach or suggest, alone or in combination, the recited method that allows wireless headset for a user comprising: a first printed circuit board provided in the headset, the first printed circuit board having at least one electrical component attached thereon, the at least one electrical component being electrically connected to a plurality of other electrical components, each of the plurality of other electrical components being provided at least partially in the headset; a plurality of speakers in the headset; a plurality of microphones in the headset; and wireless communication circuitry, wherein the at least one electrical component or the plurality of other electrical components include at least a controller, wherein the at least a controller is configured to facilitate modifying power within a certain range of frequencies based on at least one hearing characteristic of the user, to help the user hear audio outputs presented to the user via the plurality of speakers, wherein the wireless communication circuitry is configured to wirelessly receive a message, wherein at least if the message is a text message, the at least a controller is configured to have at least a portion of the text message presented to the user, wherein at least if the message is an audio

message, the at least a controller is configured to have at least a portion of the audio message presented to the user, and wherein the plurality of speakers are configured to present at least a portion of the message, if the at least a portion of the message is to be presented in an audio manner.

3. Claims 2-5 and 7-9 are dependent upon claim 1, therefore, these claims are allowed.

4. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to MD S ELAHEE whose telephone number is (571)272-7536. The examiner can normally be reached on Monday thru Friday; 8:30AM to 5:00PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, FAN TSANG can be reached on 571-272-7547. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/MD S ELAHEE/
MD SHAFIUL ALAM ELAHEE
Primary Examiner
Art Unit 2653
April 17, 2023

Examiner-Initiated Interview Summary	**Application No.** 17/942,347	**Applicant(s)** Howell et al.		
	Examiner MD S ELAHEE	**Art Unit** 2653	**AIA (First Inventor to File) Status** No	**Page** 1 of 1

All Participants (applicant, applicants representative, PTO personnel)	**Title**	**Type**
MD S ELAHEE	Primary Examiner	Telephonic
PETER TONG	Agent	

Date of Interview: 07 April 2023

Issues Discussed:

35 U.S.C. 103

Examiner found a prior art of Cheung (US Patent No. 8,582,789) that belong to IpVenture, Inc. However, the applicant's representative confirmed that the assignee of the application, IngenioSpec, LLC and the prior art of Cheung (US Patent No. 8,582,789) are belong to the same entity. Therefore, Examiner can not make any prior art rejection.

/MD S ELAHEE/ Primary Examiner, Art Unit 2653	

Applicant is reminded that a complete written statement as to the substance of the interview must be made of record in the application file. It is the applicants responsibility to provide the written statement, unless the interview was initiated by the Examiner and the Examiner has indicated that a written summary will be provided. See MPEP 713.04
Please further see:
MPEP 713.04
Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews, paragraph (b)
37 CFR § 1.2 Business to be transacted in writing

Applicant recordation instructions: It is not necessary for applicant to provide a separate record of the substance of interview.

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

Notice of References Cited	Application/Control No. 17/942,347	Applicant(s)/Patent Under Reexamination Howell et al.	
	Examiner MD S ELAHEE	Art Unit 2653	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20120283894-A1	11-2012	Naboulsi; Mouhamad Ahmad	G08B21/06	701/1
*	B	US-8582789-B2	11-2013	Cheung; Kwok Wai	H04S1/00	381/381
	C					
	D					
	E					
	F					
	G					
	H					
	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/942,347	Howell et al.
	Examiner	**Art Unit**
	MD S ELAHEE	2653

CPC						
Symbol					**Type**	**Version**
G02C	/	11	/	10	F	2013-01-01
G06F	/	1	/	163	I	2013-01-01
H04M	/	1	/	05	I	2013-01-01
G10L	/	15	/	26	I	2013-01-01
H04M	/	1	/	6066	I	2013-01-01
H04M	/	2250	/	02	A	2013-01-01

CPC Combination Sets							
Symbol					**Type**	**Set**	**Ranking**	**Version**
	/		/					

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	8	
/MD S ELAHEE/ Primary Examiner, Art Unit 2653	17 April 2023	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

U.S. Patent and Trademark Office — Part of Paper No.: 20230416

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/942,347	Howell et al.
	Examiner	**Art Unit**
	MD S ELAHEE	2653

INTERNATIONAL CLASSIFICATION					
CLAIMED					
H04R	/	25	/	00	

NON-CLAIMED					
	/		/		

US ORIGINAL CLASSIFICATION	
CLASS	**SUBCLASS**
381	327

CROSS REFERENCES(S)						
CLASS	**SUBCLASS (ONE SUBCLASS PER BLOCK)**					

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	8	
/MD S ELAHEE/ Primary Examiner, Art Unit 2653	17 April 2023	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

U.S. Patent and Trademark Office — Part of Paper No.: 20230416

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/942,347	Howell et al.
	Examiner	Art Unit
	MD S ELAHEE	2653

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIMS

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1														
2	2														
3	3														
4	4														
5	5														
	6														
6	7														
7	8														
8	9														

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	8	
/MD S ELAHEE/ Primary Examiner, Art Unit 2653	17 April 2023	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

U.S. Patent and Trademark Office Part of Paper No.: 20230416

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/942,347	Howell et al.
	Examiner	Art Unit
	MD S ELAHEE	2653

CPC - Searched*		
Symbol	**Date**	**Examiner**
G02C11/10 OR H04M1/05 OR H04M1/6066 OR G06F1/163 OR G10L15/26 OR H04M2250/02 OR H04S1/00	04/16/2023	ME
G08B21/06	04/16/2023	ME

CPC Combination Sets - Searched*		
Symbol	**Date**	**Examiner**

US Classification - Searched*			
Class	**Subclass**	**Date**	**Examiner**
381	327	04/16/2023	ME

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	**Date**	**Examiner**
PE2E SEARCH	04/17/2023	ME
ASSIGNEE AND INVENTORS SEARCH	04/10/2023	ME
IP.COM	04/16/2023	ME
IP.COM	04/10/2023	ME
GOOGLE SEARCH	04/16/2023	ME

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/942,347	Howell et al.
	Examiner	Art Unit
	MD S ELAHEE	2653

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
PE2E INTERFERENCE SEARCH		04/16/2023	ME

Bibliographic Data

Application No: 17/942,347

Foreign Priority claimed: ○ Yes ◉ No

35 USC 119 (a-d) conditions met: ☐ Yes ☑ No ☐ Met After Allowance

Verified and Acknowledged: /MD S ELAHEE/ Examiner's Signature | Initials

Title: WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
09/12/2022	381	2653	IPVCP006X1C8
RULE			

APPLICANTS

IngenioSpec, LLC,

INVENTORS

Thomas A. Howell, San Jose, CA, UNITED STATES

David Chao, Saratoga, CA, UNITED STATES

C. Douglass Thomas, Saratoga, CA, UNITED STATES

Peter P. Tong, Mountain View, CA, UNITED STATES

CONTINUING DATA

This application is a CON of 16429181 06/03/2019 PAT 11513371

16429181 is a CON of 13831445 03/14/2013 PAT 10310296

13831445 is a CON of 12803732 07/01/2010 PAT 8434863

12803732 is a CON of 11546685 10/11/2006 PAT 7806525

11546685 has PRO of 60846150 09/20/2006

11546685 has PRO of 60787850 04/01/2006

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11546685 is a CIP of 11183256 07/15/2005 PAT 7500747

11183256 has PRO of 60647826 01/31/2005

11183256 has PRO of 60647836 01/31/2005

11183256 has PRO of 60620238 10/18/2004

11183256 has PRO of 60618107 10/12/2004

FOREIGN APPLICATIONS

IF REQUIRED, FOREIGN LICENSE GRANTED**

09/27/2022

STATE OR COUNTRY

UNITED STATES

ADDRESS

IPVENTURE, INC.
4010 Moorpark Avenue
Suite 211
San Jose, CA 95117
UNITED STATES

FILING FEE RECEIVED

$2,240

Main Concept Text
==========

A wireless headset for a user comprising: a first printed circuit board provided in the headset, the first printed circuit board having at least one electrical component attached thereon, the at least one electrical component being electrically connected to a plurality of other electrical components, each of the plurality of other electrical components being provided at least partially in the headset; a plurality of speakers in the headset; a plurality of microphones in the headset; and wireless communication circuitry, wherein the at least one electrical component or the plurality of other electrical components include at least a controller, wherein the at least a controller is configured to facilitate modifying power within a certain range of frequencies based on at least one hearing characteristic of the user, to help the user hear audio outputs presented to the user via the plurality of speakers, wherein the wireless communication circuitry is configured to wirelessly receive a message, wherein at least if the message is a text message, the at least a controller is configured to have at least a portion of the text message presented to the user, wherein at least if the message is an audio message, the at least a controller is configured to have at least a portion of the audio message presented to the user, and wherein the plurality of speakers are configured to present at least a portion of the message, if the at least a portion of the message is to be presented in an audio manner.

(No Concept Modifiers)
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(No Filters)
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Options
==========

De-dup: None
Relevance Cut-off: None
Sort: Relevance

Content: Patents + NPL (192)
==========

US Patents
US Designs
US Applications
EPO Patents
EPO Applications
China Patents
China Applications
Japan Patents

Japan Applications
Korea Patents
Korea Applications
WIPO Applications
Argentina Patents
Argentina Applications
Brazil Patents
Brazil Applications
Canada Patents
Canada Applications
Chile Patents
Chile Applications
Colombia Applications
Costa Rica Applications
Cuba Patents
Cuba Applications
Dominican Republic Applications
Ecuador Patents
Ecuador Applications
El Salvador Applications
Guatemala Applications
Honduras Applications
Mexico Patents
Mexico Applications
Nicaragua Patents
Panama Applications
Peru Applications
Trinidad & Tobago Patents
Uruguay Applications
Austria Patents
Austria Applications
Belarus Patents
Belgium Patents
Belgium Applications
Bosnia & Herzegovina Patents
Bosnia & Herzegovina Applications
Bulgaria Patents
Bulgaria Applications
Croatia Patents
Croatia Applications
Czech Republic Patents
Czech Republic Applications
Czechoslovakia Patents
Czechoslovakia Applications
Denmark Patents
Denmark Applications
Estonia Patents
Estonia Applications

EUIPO Patents
Finland Patents
Finland Applications
France Patents
France Applications
Germany Patents
Germany Applications
Great Britain Patents
Great Britain Applications
Greece Patents
Greece Applications
Hungary Patents
Hungary Applications
Iceland Patents
Iceland Applications
Ireland Patents
Ireland Applications
Italy Patents
Italy Applications
Latvia Patents
Latvia Applications
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Lithuania Applications
Luxembourg Patents
Luxembourg Applications
Malta Patents
Monaco Patents
Montenegro Patents
Montenegro Applications
Netherlands Patents
Netherlands Applications
Norway Patents
Norway Applications
Poland Patents
Poland Applications
Portugal Patents
Portugal Applications
Republic of Moldova Patents
Republic of Moldova Applications
Romania Patents
Romania Applications
San Marino Patents
San Marino Applications
Serbia Patents
Serbia Applications
Slovakia Patents
Slovakia Applications
Slovenia Patents

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Spain Applications
Sweden Patents
Sweden Applications
Switzerland Patents
Switzerland Applications
Ukraine Patents
Yugoslavia/Serbia and Montenegro Patents
Yugoslavia/Serbia and Montenegro Applications
Armenia Patents
Australia Patents
Australia Applications
Cyprus Patents
Gulf Cooperation Council Patents
Hong Kong Patents
India Patents
India Applications
Indonesia Patents
Indonesia Applications
Israel Patents
Israel Applications
Jordan Patents
Jordan Applications
Kyrgyzstan Patents
Macao Applications
Malaysia Patents
Mongolia Patents
New Zealand Patents
Philippines Patents
Philippines Applications
Saudi Arabia Patents
Saudi Arabia Applications
Singapore Patents
Singapore Applications
Taiwan Patents
Taiwan Applications
Tajikistan Patents
Tajikistan Applications
Thailand Patents
Thailand Applications
Uzbekistan Patents
Vietnam Patents
Algeria Patents
ARIPO Patents
ARIPO Applications
Egypt Patents
Kenya Patents
Malawi Patents

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OAPI Patents
South Africa Patents
Tunisia Applications
Zambia Patents
Zimbabwe Patents
EAPO Patents
EAPO Applications
Georgia Patents
Georgia Applications
Kazakhstan Patents
Kazakhstan Applications
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Russia Applications
Turkey Patents
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IP.com Prior Art Database: Software Patent Institute
OnePetro.org: Periodicals at OnePetro.org
OnePetro.org: Conferences at OnePetro.org
Other Literature: IBM Redbooks
Other Literature: PubMed Central
Other Literature: arXiv.org

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	9	"16429181"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/10 07:02 AM
L3	87	((("INGENIOSPEC") near3 ("LLC"))).AS,AANM.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/10 07:19 AM
L5	42578	((("HOWELL") near3 ("Thomas")) OR (("CHAO") near3 ("David")) OR (("THOMAS") near3 ("C")) OR (("TONG") near3 ("Peter"))).INV.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/10 07:20 AM
L6	87	L3 AND L5	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU,	OR	ON	ON	2023/04/10 07:20 AM

			CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L7	79840	(modif$5 WITH power).clm.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/10 07:21 AM
L8	2	6 AND 7	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/10 07:21 AM
L9	3	"20200413206"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA,	OR	ON	ON	2023/04/10 07:35 AM

			VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L10	3	"20170289687"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/10 07:39 AM
L11	50	(modif$4 OR chang$4 OR adjust$4 OR alter$4) near4 power WITH frequenc$4 NEAR (based OR depend$4 OR accord$4) WITH (hear$$ OR listen$4)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/10 07:44 AM
L12	2	"20080279410" AND ((modif$4 OR chang$4 OR adjust$4 OR alter$4) near4 power WITH frequenc$4 WITH (hear$$ OR listen$4))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/10 07:54 AM
L13	2	"20080279410" AND ((modif$4 OR chang$4 OR adjust$4 OR alter$4) near4 power WITH frequenc$4 SAME (hear$$ OR	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB,	OR	ON	ON	2023/04/10 07:54 AM

		listen$4))	HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L14	2	"20080279410" AND (power WITH frequenc$4 WITH (hear$$ OR listen$4))	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/10 07:55 AM
L15	2	6 AND 11	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/10 08:19 AM
L16	5	L11 AND (@ad<"20030415" OR @rlad<"20020415" OR @ptad<"20030415")	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT;	OR	ON	ON	2023/04/15 04:29 PM

			IBM_TDB)				
L17	1873	(modif$4 OR chang$4 OR adjust$4 OR alter$4) near4 power WITH frequenc$4 WITH (hear$$ OR listen$4)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/15 04:33 PM
L18	147	L17 SAME speaker	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/15 04:35 PM
L19	31	L18 AND (@ad<"20030415" OR @rlad<"20020415" OR @ptad<"20030415")	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/15 04:35 PM
L20	425937	(headset OR headband OR headphone OR ((ear OR head) ADJ (set OR band OR phone)) OR earset OR earband OR earbud OR (ear ADJ (bud OR cup)) OR earcup OR	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV,	OR	ON	ON	2023/04/16 05:18 PM

		earphone) WITH (speaker OR transducer)	MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L21	7539	(printed ADJ circuit ADJ board) WITH (headset OR headband OR headphone OR ((ear OR head) ADJ (set OR band OR phone)) OR earset OR earband OR earbud OR (ear ADJ (bud OR cup)) OR earcup OR earphone)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 05:19 PM
L22	4020	20 AND 21	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 05:19 PM
L23	6	22 AND 17	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 05:19 PM
L24	359563	eyewear OR (eye ADJ	(US-PGPUB; USPAT;	OR	ON	ON	2023/04/16

		(glass OR wear)) OR eyeglass	USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				05:21 PM
L25	778	(printed ADJ circuit ADJ board) WITH L24	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 05:22 PM
L26	2	25 AND 17	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 05:22 PM
L27	390857	(audio OR voice OR speech OR utter$4 OR audibl$4 OR convsrsat$4 OR talk$4) NEAR message	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL,	OR	ON	ON	2023/04/16 05:25 PM

			PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L28	563906	text NEAR message	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 05:25 PM
L29	39	27 AND 17	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 05:26 PM
L30	4	28 AND 29	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 05:26 PM
L31	309290	(headset OR headband OR headphone OR ((ear OR head) ADJ	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY,	OR	ON	ON	2023/04/16 05:27 PM

		(set OR band OR phone)) OR earset OR earband OR earbud OR (ear ADJ (bud OR cup)) OR earcup OR earphone) WITH microphone	CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L32	4143	31 AND 21	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 05:27 PM
L33	6	32 AND 17	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 05:28 PM
L34	56	(modif$4 OR chang$4 OR adjust$4 OR alter$4) near4 (strength OR voltage) WITH frequenc$4 NEAR (based OR depend$4 OR accord$4) WITH (hear$$ OR listen$4)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH,	OR	ON	ON	2023/04/16 06:22 PM

			TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L35	6	L34 AND (@ad<"20030415" OR @rlad<"20020415" OR @ptad<"20030415")	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 06:22 PM
L36	190249	(G02C11/10 OR H04M1/05 OR H04M1/6066 OR G06F1/163 OR G10L15/26 OR H04M2250/02 OR H04S1/00).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 10:11 PM
L37	3429	(modif$4 OR chang$4 OR adjust$4 OR alter$4 OR updat$5) near4 (power OR strength OR voltage) WITH frequenc$4 WITH (hear$5 OR listen$4)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 10:13 PM
L38	23	36 AND 37	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA,	OR	ON	ON	2023/04/16 10:13 PM

			EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L39	2	L38 AND (@ad<"20030415" OR @rlad<"20020415" OR @ptad<"20030415")	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 10:14 PM
L40	8	32 AND 37	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 10:15 PM
L42	44	(modif$4 OR chang$4 OR adjust$4 OR alter$4) near4 power WITH frequenc$4 NEAR (based OR depend$4 OR accord$4) WITH (hear$3 OR listen$4)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO;	OR	ON	ON	2023/04/16 10:17 PM

			JPO; DERWENT; IBM_TDB)				
L43	3	L42 AND (@ad<"20030415" OR @rlad<"20020415" OR @ptad<"20030415")	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 10:18 PM
L44	266	L37 SAME speaker	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 10:19 PM
L45	53	L44 AND (@ad<"20030415" OR @rlad<"20020415" OR @ptad<"20030415")	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 10:20 PM
L46	8	22 AND 37	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS,	OR	ON	ON	2023/04/16 10:20 PM

			IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L47	46	(modif$4 OR chang$4 OR adjust$4 OR alter$4) near4 (strength OR voltage) WITH frequenc$4 NEAR (based OR depend$4 OR accord$4) WITH (hear$4 OR listen$4)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 10:24 PM
L48	5	L47 AND (@ad<"20030415" OR @rlad<"20020415" OR @ptad<"20030415")	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 10:24 PM
L49	48	(modif$4 OR chang$4 OR adjust$4 OR alter$4) near4 power WITH frequenc$4 NEAR (based OR depend$4 OR accord$4) WITH (hear$5 OR listen$4)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 10:26 PM

L50	5	L49 AND (@ad<"20030415" OR @rlad<"20020415" OR @ptad<"20030415")	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 10:27 PM
L51	13775	G08B21/06.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 10:35 PM
L52	14	51 AND 37	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 10:36 PM
L53	359	381/327.ccls.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL,	OR	ON	ON	2023/04/16 11:43 PM

			NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L54	1	37 AND 53	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/17 11:41 AM

PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

PE2E SEARCH - Search History (Prior Art)

There are no Prior Art searches to show.

PE2E SEARCH - Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
N1	156	(modif$4 OR chang$4 OR adjust$4 OR alter$4) near4 power WITH frequenc$4 WITH (hear$$ OR listen$4)	(US-PGPUB)	OR	ON	ON	2023/04/16 05:33 PM
N2	6	N1 AND (@ad<"20030415" OR @rlad<"20020415" OR @ptad<"20030415")	(US-PGPUB)	OR	ON	ON	2023/04/16 05:34 PM
N3	156	(modif$4 OR chang$4 OR adjust$4 OR alter$4) near4 power WITH frequenc$4 WITH (hear$5 OR listen$4)	(US-PGPUB)	OR	ON	ON	2023/04/16 10:27 PM
N4	238	(modif$4 OR chang$4 OR adjust$4 OR alter$4) near4 (power OR strength OR voltage) WITH frequenc$4 WITH (hear$5 OR listen$4)	(US-PGPUB)	OR	ON	ON	2023/04/16 10:28 PM
N5	256	(modif$4 OR chang$4 OR adjust$4 OR alter$4 OR updat$4) near4 (power OR strength OR voltage) WITH frequenc$4 WITH (hear$5 OR listen$4)	(US-PGPUB)	OR	ON	ON	2023/04/16 10:28 PM
N6	15	N5 AND (@ad<"20030415" OR @rlad<"20020415" OR @ptad<"20030415")	(US-PGPUB)	OR	ON	ON	2023/04/16 10:29 PM

Web Search History

date, time	web site	search string
4/16/2023 6:44:16 PM	Google Patents	Search Term 1 (modifying power) (hearing characteristic)
4/16/2023 6:46:03 PM	Google Patents	Search Term 1 (modifying power) (hearing characteristic) Before Priority Date: priority:20030415

Form 1449 (Modified)	Atty. Docket No.	IPVCP006X1C8
	Application No.:	17/942,347
Information Disclosure	Applicant	HOWELL et al.
Statement By Applicant	Filing Date	September 12, 2022
	Group	OPAP
(Use Several Sheets if Necessary)		Page 1 of 2

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Examiner Initial	No.	Patent No.	Date	Patentee	Class	Sub-class	Filing Date
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	2.	2012/0101411 A1	Apr-12	Hausdorff et al.			
	3.	2015/0277123 A1	Oct-15	CHAUM et al.			
	4.	2015/0338677 A1	Nov-15	Block			
	5.	2016/0098874 A1	Apr-16	Handville et al.			
	6.	2019/0004325 A1	Jan-19	Connor			
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	11.	10,515,623 B1	Dec-19	Grizzel			
	12.	10,802,582 B1	Oct-20	Clements			
	13.	10,964,190 B2	Mar-21	Peyrard			
	14.	11,069,358 B1	Jul-21	Harper			
	15.	11,513,371 B2	Nov-22	Howell et al.			

Foreign Documents

Init.		Document No.	Date	Country	Class	Subclass	Translation Yes	Translation No
		EP 1027626 B1	Mar-16	Europe				
		EP 2290433 B1	Apr-16	Europe				

Other Documents (Including Author, Title, Date, Pertinent Pages, etc.)

	A	Notice of Allowance for U.S. Patent Application No. 16/821,810, dated October 19, 2022.
	B	Notice of Allowance for U.S. Patent Application No. 17/484,080, dated September 13, 2022.
	C	Office Action for U.S. Patent Application No. 17/873,104, dated October 6, 2022.
	D	Office Action for U.S. Patent Application No. 17/873,104, dated November 6, 2022.

Examiner	Date Considered

Examiner: Initial citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /M.S.E/

Form 1449 (Modified) **Information Disclosure Statement By Applicant** (Use Several Sheets if Necessary)	Atty. Docket No.	IPVCP006X1C8
	Application No.:	17/942,347
	Applicant	HOWELL et al.
	Filing Date	September 12, 2022
	Group	OPAP
		Page 2 of 2

	E	Notice of Allowance for U.S. Patent Application No. 17/395,509, dated September 9, 2022.
	F	Notice of Allowance for U.S. Patent Application No. 17/737,866, dated September 16, 2022.
	G	Office Action for U.S. Patent Application No. 16/424,018, dated September 6, 2022.

Examiner	Date Considered
/MD S ELAHEE/	04/16/2023

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: HOWELL et al.	Attorney Docket No.: IPVCP006X1C8
Application No.: 17/942,347	Examiner: ELAHEE MD S.
Filed: September 12, 2022	Group: 2653
Title: WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT	

/MD S ELAHEE/

04/17/2023

INFORMATION DISCLOSURE STATEMENT
37 CFR §§1.56 AND 1.97(b)

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

The references listed in the attached PTO Form 1449, copies of which are attached, may be material to examination of the above-identified patent application. Applicants submit these references in compliance with their duty of disclosure pursuant to 37 CFR §§1.56 and 1.97. The Examiner is requested to make these references of official record in this application.

This Information Disclosure Statement is not to be construed as a representation that a search has been made, that additional information material to the examination of this application does not exist, or that these references indeed constitute prior art.

This Information Disclosure Statement is: (i) filed within three (3) months of the filing date of the above-referenced application, (ii) believed to be filed before the mailing date of a first Office Action on the merits, or (iii) believed to be filed before the mailing of a first Office Action after the filing of a Request for Continued Examination under §1.114.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /M.S.E/

Accordingly, it is believed that no fees are due in connection with the filing of this Information Disclosure Statement. However, if it is determined that any fees are due, the Commissioner is hereby authorized to charge such fees to Deposit Account 50-3874(Order No. IPVCP006X1C8).

Respectfully submitted,

/Peter P. Tong/

Peter P. Tong
Registration No. 35,757

4010 Moorpark Avenue
Suite 211
San Jose, CA 95117

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /M.S.E/

Main Concept Text
==========
wherein the at least a controller is configured to facilitate modifying power within a certain range of frequencies based on at least one hearing characteristic of the user, to help the user hear audio outputs presented to the user via the plurality of speakers

(No Concept Modifiers)
==========

(No Filters)
==========

Options
=======
De-dup: None
Relevance Cut-off: None
Sort: Relevance

Content: Patents + NPL (192)
==========
US Patents
US Designs
US Applications
EPO Patents
EPO Applications
China Patents
China Applications
Japan Patents
Japan Applications
Korea Patents
Korea Applications
WIPO Applications
Argentina Patents
Argentina Applications
Brazil Patents
Brazil Applications
Canada Patents
Canada Applications
Chile Patents
Chile Applications
Colombia Applications
Costa Rica Applications
Cuba Patents

Cuba Applications
Dominican Republic Applications
Ecuador Patents
Ecuador Applications
El Salvador Applications
Guatemala Applications
Honduras Applications
Mexico Patents
Mexico Applications
Nicaragua Patents
Panama Applications
Peru Applications
Trinidad & Tobago Patents
Uruguay Applications
Austria Patents
Austria Applications
Belarus Patents
Belgium Patents
Belgium Applications
Bosnia & Herzegovina Patents
Bosnia & Herzegovina Applications
Bulgaria Patents
Bulgaria Applications
Croatia Patents
Croatia Applications
Czech Republic Patents
Czech Republic Applications
Czechoslovakia Patents
Czechoslovakia Applications
Denmark Patents
Denmark Applications
Estonia Patents
Estonia Applications
EUIPO Patents
Finland Patents
Finland Applications
France Patents
France Applications
Germany Patents
Germany Applications
Great Britain Patents
Great Britain Applications
Greece Patents
Greece Applications
Hungary Patents
Hungary Applications
Iceland Patents
Iceland Applications

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Italy Applications
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Latvia Applications
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Lithuania Applications
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Luxembourg Applications
Malta Patents
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Montenegro Applications
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Norway Applications
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Poland Applications
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Republic of Moldova Applications
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Serbia Applications
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Slovakia Applications
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Sweden Applications
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Switzerland Applications
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Armenia Patents
Australia Patents
Australia Applications
Cyprus Patents
Gulf Cooperation Council Patents
Hong Kong Patents

India Patents
India Applications
Indonesia Patents
Indonesia Applications
Israel Patents
Israel Applications
Jordan Patents
Jordan Applications
Kyrgyzstan Patents
Macao Applications
Malaysia Patents
Mongolia Patents
New Zealand Patents
Philippines Patents
Philippines Applications
Saudi Arabia Patents
Saudi Arabia Applications
Singapore Patents
Singapore Applications
Taiwan Patents
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Thailand Patents
Thailand Applications
Uzbekistan Patents
Vietnam Patents
Algeria Patents
ARIPO Patents
ARIPO Applications
Egypt Patents
Kenya Patents
Malawi Patents
Morocco Patents
Morocco Applications
OAPI Patents
South Africa Patents
Tunisia Applications
Zambia Patents
Zimbabwe Patents
EAPO Patents
EAPO Applications
Georgia Patents
Georgia Applications
Kazakhstan Patents
Kazakhstan Applications
Russia Patents
Russia Applications

Turkey Patents
Turkey Applications
IEEE Xplore Publications: IEEE Periodicals
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IEEE Xplore Publications: IEEE Early Access
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IEEE Xplore Publications: SMPTE Conferences
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IP.com Prior Art Database: The IP.com Journal
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IP.com Prior Art Database: Legacy Journals
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OnePetro.org: Periodicals at OnePetro.org
OnePetro.org: Conferences at OnePetro.org
Other Literature: IBM Redbooks
Other Literature: PubMed Central
Other Literature: arXiv.org

Form 1449 (Modified)	Atty. Docket No.	IPVCP006X1C8
	Application No.:	Not Yet Assigned
Information Disclosure Statement By Applicant	Applicant	HOWELL et al.
	Filing Date	Filed Herewith
	Group	Not Yet Assigned
(Use Several Sheets if Necessary)		Page 1 of 15

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Examiner	Date Considered
/MD S ELAHEE/	04/16/2023

Examiner: Initial citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /M.S.E/

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Information Disclosure Statement By Applicant	Applicant	HOWELL et al.
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	Group	Not Yet Assigned
(Use Several Sheets if Necessary)		Page 2 of 15

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Examiner	Date Considered
/MD S ELAHEE/	04/16/2023

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	92.	2009/0059381 A1	Mar-09	Jannard			
	93.	2009/0073375 A1	Mar-09	Nakada			
	94.	2009/0141233 A1	Jun-09	Howell et al.			
	95.	2009/0147215 A1	Jun-09	Howell et al.			
	96.	2009/0156128 A1	Jun-09	Franson et al.			
	97.	2009/0251660 A1	Oct-09	Figler et al.			
	98.	2009/0251661 A1	Oct-09	Fuziak, Jr.			
	99.	2009/0296044 A1	Dec-09	Howell et al.			
	100.	2010/0061579 A1	Mar-10	Rickards et al.			
	101.	2010/0079356 A1	Apr-10	Hoellwarth			
	102.	2010/0110368 A1	May-10	Chaum			
	103.	2010/0245754 A1	Sep-10	Matsumoto et al.			
	104.	2010/0296045 A1	Nov-10	Agnoli et al.			
	105.	2010/0309426 A1	Dec-10	Howell et al.			
	106.	2011/0102734 A1	May-11	Howell et al.			
	107.	2011/0164122 A1	Jul-11	Hardacker			
	108.	2011/0187990 A1	Aug-11	Howell et al.			
	109.	2011/0241976 A1	Oct-11	Boger et al.			
	110.	2011/0273365 A1	Nov-11	West et al.			
	111.	2012/0033061 A1	Feb-12	Ko et al.			
	112.	2012/0050668 A1	Mar-12	Howell et al.			
	113.	2012/0062357 A1	Mar-12	Slamka			
	114.	2012/0133885 A1	May-12	Howell et al.			

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	116.	2013/0072828 A1	Mar-13	Sweis et al.			
	117.	2013/0077175 A1	Mar-13	Hotta et al.			
	118.	2013/0143519 A1	Jun-13	Doezema			
	119.	2013/0172691 A1	Jul-13	Tran			
	120.	2013/0201440 A1	Aug-13	Howell et al.			
	121.	2013/0308089 A1	Nov-13	Howell et al.			
	122.	2014/0132913 A1	May-14	Sweis et al.			
	123.	2014/0176902 A1	Jun-14	Sweis et al.			
	124.	2014/0198293 A1	Jul-14	Sweis et al.			
	125.	2014/0226838 A1	Aug-22	Wingate et al.			
	126.	2014/0268008 A1	Sep-14	Howell et al.			
	127.	2014/0268013 A1	Sep-14	Howell et al.			
	128.	2014/0268017 A1	Sep-14	Sweis et al.			
	129.	2014/0361185 A1	Dec-14	Howell et al.			
	130.	2015/0085245 A1	Mar-15	Howell et al.			
	131.	2015/0230988 A1	Aug-15	Chao et al.			
	132.	2015/0253590 A1	Sep-15	Howell et al.			
	133.	2016/0246075 A9	Aug-16	Howell et al.			
	134.	2016/0302992 A1	Oct-16	Sweis et al.			
	135.	2017/0068117 A9	Mar-17	Howell et al.			
	136.	2017/0074721 A1	Mar-17	Howell et al.			
	137.	2017/0090219 A1	Mar-17	Howell et al.			
	138.	2017/0131575 A1	May-17	Howell et al.			
	139.	2017/0146829 A1	May-17	Howell et al.			
	140.	2017/0303187 A1	Oct-17	Crouthamel et al.			
	141.	2018/0122208 A1	May-18	Peyrard			
	142.	2018/0314079 A1	Nov-18	Chao et al.			
	143.	2018/0335650 A1	Nov-18	Howell et al.			

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	145.	2019/0033622 A1	Jan-19	Olgun et al.			
	146.	2019/0033623 A1	Jan-19	Howell et al.			
	147.	2019/0187492 A1	Jun-19	Howell et al.			
	148.	2019/0272800 A1	Sep-19	Tao et al.			
	149.	2019/0278110 A1	Sep-19	Howell et al.			
	150.	2019/0285913 A1	Sep-19	Howell et al.			
	151.	2019/0310132 A1	Oct-19	Howell et al.			
	152.	2019/0318589 A1	Oct-19	Howell et al.			
	153.	2019/0369402 A1	Dec-19	Woodman et al.			
	154.	2019/0387351 A1	Dec-19	Lyren et al.			
	155.	2020/0012127 A1	Jan-20	Howell et al.			
	156.	2020/0218094 A1	Jul-20	Howell et al.			
	157.	2020/0364992 A1	Nov-20	Howell et al.			
	158.	2021/0026146 A1	Jan-21	Harder et al.			
	159.	2021/0271116 A1	Sep-21	Chao et al.			
	160.	2021/0364827 A9	Nov-21	Howell et al.			
	161.	2021/0364828 A1	Nov-21	Howell et al.			
	162.	2022/0011603 A1	Jan-22	Howell et al.			
	163.	2022/0054092 A1	Feb-22	Howell et al.			
	164.	2022/0178743 A1	Jun-22	Howell et al.			
	165.	320,558	Jun-1885	Hull			
	166.	669,949	Mar-1901	Underwood			
	167.	1,255,265	Feb-1918	Zachara			
	168.	1,917,745	Jul-33	Weiss			
	169.	2,249,572	Jul-41	Lieber			
	170.	2,638,532	May-53	Brady			
	171.	2,794,085	May-57	De Angelis			
	172.	2,818,511	Dec-57	Ullery et al.			

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	173.	2,830,132	Apr-58	Borg			
	174.	2,874,230	Feb-59	Carlson			
	175.	2,904,670	Sep-59	Calmes			
	176.	3,060,308	Oct-62	Fortuna			
	177.	3,597,054	Aug-71	Winter			
	178.	3,710,115	Jan-73	Jubb			
	179.	3,858,001	Dec-74	Bonne			
	180.	3,883,701	May-75	Delorenzo			
	181.	4,165,487	Aug-79	Corderman			
	182.	4,254,451	Mar-81	Cochran, Jr.			
	183.	4,283,127	Aug-81	Rosenwinkel et al.			
	184.	4,322,585	Mar-82	Liautaud			
	185.	4,348,664	Sep-82	Boschetti et al.			
	186.	4,389,217	Jun-83	Baughman et al.			
	187.	4,526,473	Jul-85	Zahn, III			
	188.	4,535,244	Aug-85	Burnham			
	189.	4,608,492	Aug-86	Burnham			
	190.	4,683,587	Jul-87	Silverman			
	191.	4,751,691	Jun-88	Perera			
	192.	4,757,714	Jul-88	Purdy et al.			
	193.	4,773,095	Sep-88	Zwicker et al.			
	194.	4,806,011	Feb-89	Bettinger			
	195.	4,822,160	April-89	Tsai			
	196.	4,822,161	Apr-89	Jimmy			
	197.	4,851,686	Jul-89	Pearson			
	198.	4,856,086	Aug-89	McCullough			
	199.	4,859,047	Aug-89	Badewitz			
	200.	4,882,769	Nov-89	Gallimore			
	201.	4,904,078	Feb-90	Gorike			

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	202.	4,942,629	Jul-90	Stadlmann			
	203.	4,962,469	Oct-90	Ono et al.			
	204.	4,967,268	Oct-90	Lipton et al.			
	205.	4,985,632	Jan-91	Bianco et al.			
	206.	5,008,548	Apr-91	Gat			
	207.	5,015,086	May-91	Okaue et al.			
	208.	5,020,150	May-91	Shannon			
	209.	5,026,151	Jun-91	Waltuck et al.			
	210.	5,036,311	Jul-91	Moran et al.			
	211.	5,050,150	Sep-91	Ikeda			
	212.	5,064,410	Nov-91	Frenkel et al.			
	213.	5,093,576	Mar-92	Edmond et al.			
	214.	5,106,179	Apr-92	Kamaya et al.			
	215.	5,144,344	Sep-92	Takahashi et al.			
	216.	5,148,023	Sep-92	Hayashi et al.			
	217.	5,151,600	Sep-92	Black			
	218.	5,161,250	Nov-92	Ianna et al			
	219.	5,172,256	Dec-92	Sethofer et al.			
	220.	5,264,877	Nov-93	Hussey			
	221.	5,306,917	Apr-94	Black et al.			
	222.	5,353,378	Oct-94	Hoffman et al.			
	223.	5,359,370	Oct-94	Mugnier			
	224.	5,359,444	Oct-94	Piosenka et al.			
	225.	5,367,345	Nov-94	da Silva			
	226.	5,379,464	Jan-95	Schleger et al.			
	227.	5,382,986	Jan-95	Black et al.			
	228.	5,394,005	Feb-95	Brown et al.			
	229.	5,452,026	Sep-95	Marcy, III			
	230.	5,452,480	Sep-95	Ryden			

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	231.	5,455,637	Oct-95	Kallman et al.			
	232.	5,455,640	Oct-95	Gertsikov			
	233.	5,457,751	Oct-95	Such			
	234.	5,463,428	Oct-95	Lipton et al.			
	235.	5,475,798	Dec-95	Handlos			
	236.	5,500,532	Mar-96	Kozicki			
	237.	5,510,961	Apr-96	Peng			
	238.	5,513,384	Apr-96	Brennan et al.			
	239.	5,533,130	Jul-96	Staton			
	240.	5,541,641	Jul-96	Shimada			
	241.	5,581,090	Dec-96	Goudjil			
	242.	5,585,871	Dec.-96	Linden			
	243.	5,589,398	Dec-96	Krause et al.			
	244.	5,590,417	Dec-96	Rydbeck			
	245.	5,606,743	Feb-97	Vogt et al.			
	246.	5,608,808	Mar-97	da Silva			
	247.	5,634,201	May-97	Mooring			
	248.	5,671,035	Sep-97	Barnes			
	249.	5,686,727	Nov-97	Reenstra et al.			
	250.	5,694,475	Dec-97	Boyden			
	251.	5,715,323	Feb-98	Walker			
	252.	5,737,436	Apr-98	Boyden et al.			
	253.	5,777,715	Jul-98	Kruegle et al.			
	254.	5,818,381	Oct-98	Williams			
	255.	5,835,185	Nov-98	Kallman et al.			
	256.	5,900,720	May-99	Kallman et al.			
	257.	5,903,395	May-99	Rallison et al.			
	258.	5,923,398	Jul-99	Goldman			
	259.	5,941,837	Aug-99	Amano et al.			

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	260.	5,946,071	Aug-99	Feldman			
	261.	5,949,516	Sep-99	McCurdy			
	262.	5,966,746	Oct-99	Reedy et al.			
	263.	5,980,037	Nov-99	Conway			
	264.	5,988,812	Nov-99	Wingate			
	265.	5,991,085	Nov-99	Rallison et al.			
	266.	5,992,996	Nov-99	Sawyer			
	267.	5,995,592	Nov-99	Shirai et al.			
	268.	6,091,546	Jul-00	Spitzer			
	269.	6,010,216	Jan-00	Jesiek			
	270.	6,013,919	Jan-00	Schneider et al.			
	271.	6,028,627	Feb-00	Helmsderfer			
	272.	6,046,455	Apr-00	Ribi et al.			
	273.	6,060,321	May-00	Hovorka			
	274.	6,061,580	May-00	Altschul et al.			
	275.	6,091,546	Jul-00	Spitzer			
	276.	6,091,832	Jul-00	Shurman et al.			
	277.	6,115,177	Sep-00	Vossler			
	278.	6,132,681	Oct-00	Faran et al.			
	279.	6,145,983	Nov-00	Schiffer			
	280.	6,154,552	Nov-00	Koroljow et al.			
	281.	6,176,576 B1	Jan-01	Green et al.			
	282.	6,225,897 B1	May-01	Doyle et al.			
	283.	6,231,181 B1	May-01	Swab			
	284.	6,236,969 B1	May-01	Ruppert et al.			
	285.	6,243,578 B1	Jun-01	Koike			
	286.	6,259,367 B1	Jul-01	Klein			
	287.	6,270,466 B1	Aug-01	Weinstein et al.			
	288.	6,292,213 B1	Sep-01	Jones			

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	289.	6,292,685 B1	Sep-01	Pompei			
	290.	6,301,050 B1	Oct-01	DeLeon			
	291.	6,301,367 B1	Oct-01	Boyden et al.			
	292.	6,307,526 B1	Oct-01	Mann			
	293.	6,343,858 B1	Feb-02	Zelman			
	294.	6,346,929 B1	Feb-02	Fukushima et al.			
	295.	6,349,001 B1	Feb-02	Spitzer			
	296.	6,349,422 B1	Feb-02	Schleger et al.			
	297.	6,409,335 B1	Jun-02	Lipawsky			
	298.	6,409,338 B1	Jun-02	Jewell			
	299.	6,426,719 B1	Jul-02	Nagareda et al.			
	300.	6,431,705 B1	Aug-02	Linden			
	301.	6,474,816 B2	Nov-02	Butler et al.			
	302.	6,478,736 B1	Nov-02	Mault			
	303.	6,506,142 B2	Jan-03	Itoh et al.			
	304.	6,511,175 B2	Jan-03	Hay et al.			
	305.	6,513,532 B2	Feb-03	Mault et al.			
	306.	6,517,203 B1	Feb-03	Blum et al.			
	307.	6,539,336 B1	Mar-03	Vock et al.			
	308.	6,542,081 B2	Apr-03	Torch			
	309.	6,546,101 B1	Apr-03	Murray et al.			
	310.	6,554,763 B1	Apr-03	Amano et al.			
	311.	6,582,075 B1	Jun-03	Swab et al.			
	312.	6,619,799 B1	Sep-03	Blum et al.			
	313.	6,629,076 B1	Sep-03	Haken			
	314.	6,717,737 B1	Apr-04	Haglund			
	315.	6,729,726 B2	May-04	Miller et al.			
	316.	6,736,759 B1	May-04	Stubbs et al.			
	317.	6,764,194 B1	Jul-04	Cooper			

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	318.	6,769,767 B2	Aug-04	Swab et al.			
	319.	6,771,423 B2	Aug-04	Geist			
	320.	6,788,309 B1	Sep-04	Swan et al.			
	321.	6,792,401 B1	Sep-04	Nigro et al.			
	322.	6,816,314 B2	Nov-04	Shimizu et al.			
	323.	6,824,265 B1	Nov-04	Harper			
	324.	6,857,741 B2	Feb-05	Blum et al.			
	325.	6,871,951 B2	Mar-05	Blum et al.			
	326.	6,879,930 B2	Apr-05	Sinclair et al.			
	327.	6,912,386 B1	Jun-05	Himberg et al.			
	328.	6,929,365 B2	Aug-05	Swab et al.			
	329.	6,932,090 B1	Aug-05	Reschke et al.			
	330.	6,947,219 B1	Sep-05	Ou			
	331.	7,004,582 B2	Feb-06	Jannard et al.			
	332.	7,013,009 B2	Mar-06	Warren			
	333.	7,023,594 B2	Apr-06	Blum et al.			
	334.	7,030,902 B2	Apr-06	Jacobs			
	335.	7,031,667 B2	Apr-06	Horiguchi			
	336.	7,033,025 B2	Apr-06	Winterbotham			
	337.	7,059,717 B2	Jun-06	Bloch			
	338.	7,073,905 B2	Jul-06	Da Pra'			
	339.	7,079,876 B2	Jul-06	Levy			
	340.	7,123,215 B2	Oct-06	Nakada			
	341.	7,192,136 B2	Mar-07	Howell et al.			
	342.	7,255,437 B2	Aug-07	Howell et al.			
	343.	7,265,358 B2	Sep-07	Fontaine			
	344.	7,274,292 B2	Sep-07	Velhal et al.			
	345.	7,289,767 B2	Oct-07	Lai			
	346.	7,312,699 B2	Dec-07	Chornenky			

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	347.	7,331,666 B2	Feb-08	Swab et al.			
	348.	7,376,238 B1	May-08	Rivas et al.			
	349.	7,380,936 B2	Jun-08	Howell et al.			
	350.	7,401,918 B2	Jul-08	Howell et al.			
	351.	7,405,801 B2	Jul-08	Jacobs			
	352.	7,429,965 B2	Sep-08	Weiner			
	353.	7,438,409 B2	Oct-08	Jordan			
	354.	7,438,410 B1	Oct-08	Howell et al.			
	355.	7,445,332 B2	Nov-08	Jannard et al.			
	356.	7,481,531 B2	Jan-09	Howell et al.			
	357.	7,500,746 B2	Mar-09	Howell et al.			
	358.	7,500,747 B2	Mar-09	Howell et al.			
	359.	7,512,414 B2	Mar-09	Jannard et al.			
	360.	7,517,083 B2	Apr-09	Blum et al.			
	361.	7,527,374 B2	May-09	Chou			
	362.	7,543,934 B2	Jun-09	Howell et al.			
	363.	7,581,833 B2	Sep-09	Howell et al.			
	364.	7,621,634 B2	Nov-09	Howell et al.			
	365.	7,648,236 B1	Jan-10	Dobson			
	366.	7,677,723 B2	Mar-10	Howell et al.			
	367.	7,760,898 B2	Jul-10	Howell et al.			
	368.	7,771,046 B2	Aug-10	Howell et al.			
	369.	7,792,552 B2	Sep-10	Thomas et al.			
	370.	7,806,525 B2	Oct-10	Howell et al.			
	371.	7,922,321 B2	Apr-11	Howell et al.			
	372.	7,976,159 B2	Jul-11	Jacobs et al.			
	373.	8,109,629 B2	Feb-12	Howell et al.			
	374.	8,142,015 B2	Mar-12	Paolino			
	375.	8,174,569 B2	May-12	Tanijiri et al.			

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Form 1449 (Modified)	Atty. Docket No.	IPVCP006X1C8
	Application No.:	Not Yet Assigned
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	B	Notice of Allowance for U.S. Patent Application No. 17/949,029, dated March 1, 2023.
	C	Notice of Allowance for U.S. Patent Application No. 17/873,104, dated December 16, 2022.
	D	Notice of Allowance for U.S. Patent Application No. 17/873,104, dated March 22, 2023.
	E	Notice of Allowance for U.S. Patent Application No. 17/395,509, dated December 19, 2022.
	F	Office Action for U.S. Patent Application No. 16/182,969, dated January 24, 2023.
	G	Office Action for U.S. Patent Application No. 16/424,018, dated November 25, 2022.
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	A	Notice of Allowance for U.S. Patent Application No. 11/183,269, dated December 10, 2010.
	B	Office Action for U.S. Patent Application No. 11/183,269, dated May 25, 2010.
	C	Final Office Action for U.S. Patent Application No. 11/183,269, dated February 17, 2010.
	D	Office Action for U.S. Patent Application No. 11/183,269, dated June 23, 2009.
	E	Office Action for U.S. Patent Application No. 11/183,269, dated December 4, 2008.
	F	Final Office Action for U.S. Patent Application No. 11/183,269, dated June 5, 2008.
	G	Office Action for U.S. Patent Application No. 11/183,269, dated October 18, 2007.
	H	Restriction Requirement for U.S. Patent Application No. 11/183,269, dated June 25, 2007.
	I	Office Action for U.S. Patent Application No. 13/085,402, dated April 19, 2012.
	J	Notice of Allowance for U.S. Patent Application No. 13/085,402, dated August 2, 2012.
	K	Notice of Allowance for U.S. Patent Application No. 13/085,402, dated November 13, 2012.
	L	Notice of Allowance for U.S. Patent Application No. 13/085,402, dated February 20, 2013.
	M	Notice of Allowance for U.S. Patent Application No. 13/085,402, dated June 14, 2013.
	N	Office Action for U.S. Patent Application No. 13/955,336, dated December 5, 2013.
	O	Notice of Allowance for U.S. Patent Application No. 13/955,336, dated April 28, 2014.
	P	Notice of Allowance for U.S. Patent Application No. 13/955,336, dated August 18, 2014.
	Q	Notice of Allowance for U.S. Patent Application No. 13/955,336, dated October 7, 2014.
	R	Notice of Allowance for U.S. Patent Application No. 13/955,336, dated November 3, 2014.
	S	Office Action for U.S. Patent Application No. 14/557,409, dated June 11, 2015.
	T	Notice of Allowance for U.S. Patent Application No 14/557,409, dated January 14, 2016.
	U	Notice of Allowance for U.S. Patent Application No. 14/557,409, dated April 28, 2016.
	V	Notice of Allowance for U.S. Patent Application No. 14/557,409, dated August 8, 2016.
	W	Notice of Allowance for U.S. Patent Application No. 14/557,409, dated November 4, 2016.
	X	Corrected Notice of Allowance for U.S. Patent Application No. 14/557,409, dated December 12, 2016.
	Y	Office Action for U.S. Patent Application No. 15/375,423, dated March 27, 2017.
	Z	Notice of Allowance for U.S. Patent Application No. 15/375,423, dated July 5, 2017.

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	AB	Notice of Allowance for U.S. Patent Application No. 15/375,423, dated March 23, 2018.
	AC	Notice of Allowance for U.S. Patent Application No. 15/375,423, dated July 13, 2018.
	AD	Office Action for U.S. Patent Application No. 16/049,120, dated February 28, 2020.
	AE	Notice of Allowance for U.S. Patent Application No. 16/049,120, dated June 3, 2020.
	AF	Notice of Allowance for U.S. Patent Application No. 16/049,120, dated September 21, 2020.
	AG	Notice of Allowance for U.S. Patent Application No. 16/049,120, dated February 23, 2021.
	AH	Notice of Allowance for U.S. Patent Application No. 16/049,120, dated June 3, 2021.
	AI	Notice of Allowance for U.S. Patent Application No. 16/049,120, dated September 20, 2021.
	AJ	Notice of Allowance for U.S. Patent Application No. 16/574,254, dated April 16, 2021.
	AK	Notice of Allowance for U.S. Patent Application No. 16/574,254, dated August 9, 2021.
	AL	Office Action for U.S. Patent Application No. 16/821,810, dated February 2, 2022.
	AM	Notice of Allowance for U.S. Patent Application No. 16/821,810, dated April 6, 2022.
	AN	Office Action for U.S. Patent Application No. 17/484,080, dated January 21, 2022.
	AO	Notice of Allowance for U.S. Patent Application No. 17/484,080, dated May 31, 2022.
	AP	Restriction Requirement for U.S. Patent Application No. 11/580,222, dated June 18, 2008.
	AQ	Office Action for U.S. Patent Application No. 11/580,222, dated September 12, 2008.
	AR	Office Action for U.S. Patent Application No. 11/580,222, dated January 28, 2009.
	AS	Notice of Allowance for U.S. Patent Application No. 11/580,222, dated April 20, 2009.
	AT	U.S. Patent Application No. 12/462,286, filed July 31, 2009.
	AU	Restriction Requirement for U.S. Patent Application No. 12/462,286, dated September 17, 2010.
	AV	Office Action for U.S. Patent Application No. 12/462,286, dated January 13, 2011.
	AW	Notice of Allowance for U.S. Patent Application No. 12/462,286, dated June 24, 2011.
	AX	Notice of Allowance for U.S. Patent Application No. 12/462,286, dated November 22, 2011.
	AY	Office Action for U.S. Patent Application No. 13/367,346, dated May 15, 2013.
	AZ	Notice of Allowance for U.S. Patent Application No. 13/367,346, dated October 10, 2013.
	BA	Office Action for U.S. Patent Application No. 13/367,346, dated January 28, 2014.
	BB	Notice of Allowance for U.S. Patent Application No. 13/367,346, dated August 15, 2014.
	BC	Notice of Allowance for U.S. Patent Application No. 13/367,346, dated March 19, 2015.
	BD	Office Action ffor U.S. Patent Application No. 14/715,501, dated September 23, 2015.
	BE	Office Action for U.S. Patent Application No. 14/715,501, dated March 25, 2016.
	BF	Office Action for U.S. Patent Application No. 14/715,501, dated October 17, 2016.
	BG	Office Action for U.S. Patent Application No. 14/715,501, dated July 20, 2017.

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	BI	Notice of Allowance for U.S. Patent Application No. 14/715,501, dated May 9, 2018.
	BJ	Notice of Allowance for U.S. Patent Application No. 14/715,501, dated September 11, 2018.
	BK	Office Action for U.S. Patent Application No. 16/127,957, dated June 4, 2020.
	BL	Office Action for U.S. Patent Application No. 16/127,957, dated September 30, 2020.
	BM	Notice of Allowance for U.S. Patent Application No. 16/127,957, dated December 21, 2020.
	BN	Notice of Allowance for U.S. Patent Application No. 17/395,509, dated May 6, 2022.
	BO	Notice of Allowance for U.S. Patent Application No. 16/182,969, dated January 28, 2022.
	BP	Office Action for U.S. Patent Application No. 16/182,969, dated June 24, 2020.
	BQ	Notice of Allowance for U.S. Patent Application No. 16/182,969, dated October 14, 2020.
	BR	Notice of Allowance for U.S. Patent Application No. 16/182,969, dated September 1, 2021.
	BS	U.S. Patent Application No. 12/806,312, filed August 10, 2010.
	BT	Office Action for U.S. Patent Application No. 12/806,312, dated April 20, 2012.
	BU	Office Action for U.S. Patent Application No. 12/806,312, dated September 25, 2012.
	BV	Notice of Allowance for U.S. Patent Application No. 12/806,312, dated December 14, 2012.
	BW	Notice of Allowance for U.S. Patent Application No. 12/806,312, dated March 29, 2013.
	BX	U.S. Patent Application No. 13/831,512, filed March 14, 2013.
	BY	Office Action for U.S. Patent Application No. 13/831,512, dated June 4, 2013.
	BZ	Office Action for U.S. Patent Application No. 13/831,512, dated February 24, 2014.
	CA	Office Action for U.S. Patent Application No. 13/831,512, dated July 2, 2014.
	CB	Office Action for U.S. Patent Application No. 13/831,512, dated January 21, 2015.
	CC	Office Action for U.S. Patent Application No. 13/831,512, dated May 29, 2015.
	CD	Office Action for U.S. Patent Application No. 13/831,512, dated February 24, 2016.
	CE	Notice of Allowance for U.S. Patent Application No. 13/831,512, dated August 1, 2016.
	CF	Notice of Allowance for U.S. Patent Application No. 13/831,512, dated October 25, 2016.
	CG	Notice of Allowance for U.S. Patent Application No. 13/831,512, dated January 30, 2017.
	CH	Notice of Allowance for U.S. Patent Application No. 13/831,512, dated February 21, 2017.
	CI	Office Action for U.S. Patent Application No. 15/396,428, dated February 16, 2018.
	CJ	Office Action for U.S. Patent Application No. 15/396,428, dated June 21, 2018.
	CK	Office Action for U.S. Patent Application No. 15/409,723, dated April 23, 2018.
	CL	Office Action for U.S. Patent Application No. 15/409,723, dated October 31, 2018.
	CM	Notice of Allowance for U.S. Patent Application No. 11/183,256, dated January 13, 2009.
	CN	Office Action for U.S. Patent Application No. 11/183,256, dated September 12, 2008.

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	CO	Notice of Allowance for U.S. Patent Application No. 11/183,256, dated July 8, 2008.
	CP	Office Action for U.S. Patent Application No. 11/183,256, dated January 25, 2008.
	CQ	Restriction Requirement for U.S. Patent Application No. 11/183,256, dated October 17, 2007.
	CR	Restriction Requirement for U.S. Patent Application No. 11/183,256, dated June 28, 2007.
	CS	Notice of Allowance for U.S. Patent Application No. 11/546,685, dated February 17, 2010.
	CT	Notice of Allowance for U.S. Patent Application No. 11/546,685, dated September 18, 2009.
	CU	Office Action for U.S. Patent Application No. 11/546,685, dated March 5, 2009.
	CV	Restriction Requirement for U.S. Patent Application No. 11/546,685, dated January 27, 2009.
	CW	US Patent Application No. 12/803,732, filed July 1, 2010.
	CX	Notice of Allowance for U.S. Patent Application No. 12/803,732, dated September 1, 2011.
	CY	Notice of Allowance for U.S. Patent Application No. 12/803,732, dated November 15, 2011.
	CZ	Notice of Allowance for U.S. Patent Application No. 12/803,732, dated January 30, 2012.
	DA	Notice of Allowance for U.S. Patent Application No. 12/803,732, dated April 17, 2012.
	DB	Notice of Allowance for U.S. Patent Application No. 12/803,732, dated July 5, 2012.
	DC	Notice of Allowance for U.S. Patent Application No. 12/803,732, dated October 19, 2012.
	DD	Notice of Allowance for U.S. Patent Application No. 12/803,732, dated February 13, 2013.
	DE	Office Action for U.S. Patent Application No. 13/291,020, dated June 4, 2012.
	DF	Office Action for U.S. Patent Application No. 13/291,020, dated April 23, 2012.
	DG	Notice of Allowance for U.S. Patent Application No. 13/291,020, dated August 2, 2012.
	DH	Notice of Allowance for U.S. Patent Application No. 13/291,020, dated November 2, 2012.
	DI	Notice of Allowance for U.S. Patent Application No. 13/291,020, dated February 11, 2013.
	DJ	U.S. Patent Application No. 13/831,419, filed March 14, 2013.
	DK	Office Action for U.S. Patent Application No. 13/831,419, dated April 27, 2015.
	DL	Office Action for U.S. Patent Application No. 13/831,419, dated August 12, 2015.
	DM	Notice of Allowance for U.S. Patent Application No. 13/831,419, dated January 28, 2016.
	DN	Office Action for U.S. Patent Application No. 13/831,419, dated April 28, 2016.
	DO	Office Action for U.S. Patent Application No. 13/831,419, dated November 17, 2016.
	DP	Office Action for U.S. Patent Application No. 13/831,419, dated February 1, 2017.
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	DR	Office Action for U.S. Patent Application No. 13/831,419, dated October 20, 2017.
	DS	Office Action for U.S. Patent Application No. 13/831,419, dated June 8, 2018.
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	DV	Notice of Allowance for U.S. Patent Application No. 13/831,445, dated October 21, 2016.
	DW	Notice of Allowance for U.S. Patent Application No. 13/831,445, dated January 9, 2017.
	DX	Corrected Notice of Allowance for U.S. Patent Application No. 13/831,445, dated January 23, 2017.
	DY	Notice of Allowance for U.S. Patent Application No. 13/831,445, dated April 25, 2017.
	DZ	Office Action for U.S. Patent Application No. 13/831,445, dated February 6, 2018.
	EA	Notice of Allowance for U.S. Patent Application No. 13/831,445, dated August 8, 2018.
	EB	Office Action for U.S. Patent Application No. 16/429,181, dated September 30, 2020.
	EC	Notice of Allowance for U.S. Patent Application No. 16/429,181, dated February 1, 2021.
	ED	Notice of Allowance for U.S. Patent Application No. 16/429,181, dated June 17, 2021.
	EE	Notice of Allowance for U.S. Patent Application No. 16/429,181, dated August 19, 2021.
	EF	Notice of Allowance for U.S. Patent Application No. 16/429,181, dated October 4, 2021.
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	EH	Notice of Allowance for U.S. Patent Application No. 16/429,181, dated August 10, 2022.
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	EJ	Notice of Allowance for U.S. Patent Application No. 16/424,018, dated October 20, 2020.
	EK	Notice of Allowance for U.S. Patent Application No. 16/424,018, dated March 8, 2021.
	EL	Office Action for U.S. Patent Application No. 16/424,018, dated May 13, 2021.
	EM	Office Action for U.S. Patent Application No. 16/424,018, dated September 3, 2021.
	EN	Notice of Allowance for U.S. Patent Application No. 16/424,018, dated November 2, 2021
	EO	Office Action for U.S. Patent Application No. 16/424,018, dated January 24, 2022.
	EP	Notice of Allowance for U.S. Patent Application No. 16/424,018, dated June 10, 2022.
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Examiner	Date Considered
/MD S ELAHEE/	04/16/2023

Examiner: Initial citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /M.S.E/

Form 1449 (Modified)	Atty. Docket No.	IPVCP006X1C8
	Application No.:	17/942,347
Information Disclosure Statement By Applicant	Applicant	HOWELL et al.
	Filing Date	September 12, 2022
	Group	NOT YET ASSIGNED
(Use Several Sheets if Necessary)		Page 7 of 9

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	FA	"Motorola and Oakley Introduce First Bluetooth Sunglasses-Cutting Edge RAZRWire Line Offers Consumers On-The-Go Connections", Motorola Mediacenter-Press Release, February 14, 2005, pp. 1-2.
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Examiner	/MD S ELAHEE/	Date Considered	04/16/2023

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	Application No.:	17/942,347
Information Disclosure Statement By Applicant	Applicant	HOWELL et al.
	Filing Date	September 12, 2022
	Group	NOT YET ASSIGNED
(Use Several Sheets if Necessary)		Page 8 of 9

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Examiner	Date Considered
/MD S ELAHEE/	04/16/2023

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Form 1449 (Modified)	Atty. Docket No.	IPVCP006X1C8
	Application No.:	17/942,347
Information Disclosure Statement By Applicant	Applicant	HOWELL et al.
	Filing Date	September 12, 2022
	Group	NOT YET ASSIGNED
(Use Several Sheets if Necessary)		Page 9 of 9

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Examiner	Date Considered
/MD S ELAHEE/	04/16/2023

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PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 17/942,347	Filing Date 09/12/2022	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $100 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $480 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	05/19/2023	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 31	Minus	** 20	= 11		x $100 =	1100
	Independent (37 CFR 1.16(h))	* 3	Minus	*** 3	= 0		x $480 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	1100

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/ALLYSON PURNELL/
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PTO/SB/30EFS (01-22)
Approved for use through 05/31/2024. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL
(Submitted Only via EFS-Web)

Application Number	17942347	Filing Date	2022-09-12	Docket Number (if applicable)	IPVCP006X1C8	Art Unit	2653
First Named Inventor	HOWELL et al.			Examiner Name	ELAHEE, MD S		

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV

SUBMISSION REQUIRED UNDER 37 CFR 1.114

Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

- ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____
- ☐ Other _____

☒ Enclosed

- ☒ Amendment/Reply
- ☒ Information Disclosure Statement (IDS)
- ☐ Affidavit(s)/ Declaration(s)
- ☐ Other _____

MISCELLANEOUS

☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months _____
(Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

☐ Other _____

FEES

☒ **The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.**
The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to Deposit Account No 503874

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

☒ Patent Practitioner Signature

Applicant Signature

PTO/SB/30EFS (01-22)
Approved for use through 05/31/2024. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Signature of Registered U.S. Patent Practitioner			
Signature	/Peter P. Tong/	Date (YYYY-MM-DD)	2023-05-19
Name	Peter P. Tong	Registration Number	35757

This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: HOWELL et al.

Application No.: 17/942,347

Filed: September 12, 2022

Title: WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT

Attorney Docket No.: IPVCP006X1C8

Examiner: ELAHEE, MD S.

Group: 2653

AMENDMENT A TRANSMITTAL

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Transmitted herewith is an Amendment in the above-identified application.

The fee has been calculated as shown below.

	Claims After Amendment		Highest Previously Paid For	Present Extra	Small Entity Rate Fee	Large Entity Rate Fee
Total Claims	31	MINUS	20	11	x 40 =	x 100 = 1100
Independent Claims	3	MINUS	3	00	x 192 =	x 480 =
Multiple Dependent Claim Present and Fee Not Previously Paid					$	$
				Total	$0.00	$1100.00

☐ Applicant(s) hereby petition for a _____- month extension(s) of time to respond to the aforementioned Office Action.

☒ Applicant(s) believe that no (additional) Extension of Time is required; however, if it is determined that such an extension is required, Applicant(s) hereby petition that such an extension be granted and authorize the Commissioner to charge the required fees for an Extension of Time under 37 CFR 1.136 to Deposit Account No. 50-3874 (Order No. IPVCP006X1C8).

☒ Any fees due are being paid electronically herewith.

☒ Please charge any additional fees required to facilitate filing the enclosed response, to Deposit Account No. 50-3874 (Order No. IPVCP006X1C8).

Respectfully submitted,

/Peter P. Tong/

Peter P. Tong
Reg. No. 35,757

Electronic Patent Application Fee Transmittal

Application Number:	17942347
Filing Date:	12-Sep-2022
Title of Invention:	WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT
First Named Inventor/Applicant Name:	Thomas A. Howell
Filer:	Peter P. Tong/Angela Nijim
Attorney Docket Number:	IPVCP006X1C8

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
CLAIMS IN EXCESS OF 20	1202	11	100	1100
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
RCE- 1ST REQUEST	1801	1	1360	1360
		Total in USD ($)		**2460**

Electronic Acknowledgement Receipt	
EFS ID:	48016608
Application Number:	17942347
International Application Number:	
Confirmation Number:	1038
Title of Invention:	WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT
First Named Inventor/Applicant Name:	Thomas A. Howell
Customer Number:	34071
Filer:	Peter P. Tong/Angela Nijim
Filer Authorized By:	Peter P. Tong
Attorney Docket Number:	IPVCP006X1C8
Receipt Date:	19-MAY-2023
Filing Date:	12-SEP-2022
Time Stamp:	13:14:55
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$2460
RAM confirmation Number	E20235ID15559521
Deposit Account	503874
Authorized User	Angela Nijim
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.21 (Miscellaneous fees and charges)	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	IPVCP006X1C8_IDSTrans_5-23.pdf	19715 caf95d7a1f633e3787ef60829c9548c24cd89130	no	2
Warnings:					
Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	IPVCP006X1C8_1449_5-23.pdf	21882 4fb929b5c7d9502ea69c1e0a63549e0ec017579d	no	1
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	Request for Continued Examination (RCE)	IPVCP006X1C8_RCE_5-23.pdf	1667145 265465af88098410cdf4ff23b942890c53629163	no	3
Warnings:					
Information:					
4	Transmittal Letter	IPVCP006X1C8_AmdATrans_5-23.pdf	16579 49254522fe89fb84d1bcef3a198de0fe3977369f	no	1
Warnings:					
Information:					
5	Amendment Submitted/Entered with Filing of Continued Prosecution Application (CPA)/Request for Continued Examination(RCE)	IPVCP006X1C8_AmdA_AsFiled_5-23.pdf	61799 cfe7fb8e9ddb1b1a331a304e9d8c7a1d8ad4e4bb	no	11
Warnings:					
Information:					
6	Fee Worksheet (SB06)	fee-info.pdf	40623 43e58504b685fe85fed800d4f1db01041bd95861	no	2
Warnings:					

Information:	
Total Files Size (in bytes):	1827743

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: HOWELL et al.	Attorney Docket No.: IPVCP006X1C8
Application No.: 17/942,347	Examiner: ELAHEE MD S.
Filed: September 12, 2022	Group: 2653
Title: WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT	

INFORMATION DISCLOSURE STATEMENT
37 CFR §§1.56 AND 1.97(b)

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

The references listed in the attached PTO Form 1449, copies of which are attached, may be material to examination of the above-identified patent application. Applicants submit these references in compliance with their duty of disclosure pursuant to 37 CFR §§1.56 and 1.97. The Examiner is requested to make these references of official record in this application.

This Information Disclosure Statement is not to be construed as a representation that a search has been made, that additional information material to the examination of this application does not exist, or that these references indeed constitute prior art.

This Information Disclosure Statement is: (i) filed within three (3) months of the filing date of the above-referenced application, (ii) believed to be filed before the mailing date of a first Office Action on the merits, or (iii) believed to be filed before the mailing of a first Office Action after the filing of a Request for Continued Examination under §1.114.

Accordingly, it is believed that no fees are due in connection with the filing of this Information Disclosure Statement. However, if it is determined that any fees are due, the Commissioner is hereby authorized to charge such fees to Deposit Account 50-3874(Order No. IPVCP006X1C8).

Respectfully submitted,

/Peter P. Tong/

Peter P. Tong
Registration No. 35,757

4010 Moorpark Avenue
Suite 211
San Jose, CA 95117

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: HOWELL et al.

Attorney Docket No.: IPVCP006X1C8

Application No.: 17/942,347

Examiner: ELAHEE, MD S.

Filed: September 12, 2022

Group: 2653

Title: WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT

CERTIFICATE OF ELECTRONIC FILING

I hereby certify that this correspondence is being transmitted electronically to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on May 19, 2023.

Signed: /Angela D. Nijim/ Printed Name: Angela D. Nijim

AMENDMENT A

Mail Stop _____
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

In response to the Notice of Allowance dated April 19, 2023, please amend the above-identified patent application as follows:

Amendments to the Claims are reflected in the listing of claims which begins on page 2 of this paper.

Remarks/Arguments begin on page 11 of this paper.

Amendments to the Claims:

The listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently amended) A wireless headset for a user comprising:

a ~~first~~ printed circuit board provided in the headset, the ~~first~~ printed circuit board having at least one electrical component attached thereon, the at least one electrical component being electrically connected to a plurality of other electrical components, each of the plurality of other electrical components being provided at least partially in the headset;

a speaker ~~plurality of speakers~~ in the headset;

a microphone ~~plurality of microphones~~ in the headset; and

wireless communication circuitry,

wherein the at least one electrical component or the plurality of other electrical components include at least a controller,

wherein the at least a controller is configured to facilitate modifying power within a certain range of frequencies based on at least one hearing characteristic of the user, to help the user hear audio outputs presented to the user via at least the speaker ~~the plurality of speakers~~,

wherein the wireless communication circuitry is configured to wirelessly receive a message,

wherein ~~at least~~ if the message is a text message, the at least a controller is configured to have at least a portion of the text message presented to the user,

wherein ~~at least~~ if the message is an audio message, the at least a controller is configured to have at least a portion of the audio message presented to the user, and

wherein at least the speaker is ~~the plurality of speakers are~~ configured to present at least a portion of the message, [if] when the at least a portion of the message is to be presented in an audio manner.

2. (Previously presented) A wireless headset as recited in claim 1 comprising an accelerometer.

3. (Previously presented) A wireless headset as recited in claim 1 comprising a first connector that includes a plurality of conductive pads that are configured to couple with a second connector external to the headset, wherein each of the conductive pads is configured to be in contact with a corresponding metallic contact of the second connector when the first connector is connected to the second connector.

4. (Previously presented) A wireless headset as recited in claim 1, wherein the wireless communication circuitry is configured to couple to at least a Bluetooth network.

5. (Currently amended) A wireless headset as recited in claim 1, wherein the at least a controller is configured to facilitate voice recognition, including recognizing at least a spoken term received via at least [a] the microphone in the headset.

6. (Cancelled)

7. (Currently amended) A wireless headset as recited in claim 1, wherein the headset includes at least an ear bud ~~a pair of ear buds, each~~ configured to be placed in an ear of the user.

8. (Currently amended) A wireless headset as recited in claim 1, wherein at least [a] the microphone in the headset is configured to receive an audio response for the message from the user.

9. (Previously presented) A wireless headset as recited in claim 8, wherein the at least a controller is configured to facilitate converting the audio response into text to be wirelessly transmitted.

10. (New) A wireless headset as recited in claim 1,

wherein wireless headset comprises another microphone,

wherein the microphone is configured to be located closer to mouth of the user than the another microphone when the headset is worn by the user,

wherein at least the another microphone is configured to capture at least ambient noise, and

wherein at least a portion of signals from the microphone is configured to be reduced based on signals from the another microphone at least for reducing at least a portion of the ambient noise in signals from the microphone.

11. (New) A wireless wearable device configured to secure to the head of a user, with the device proximate to at least one ear of the user to at least help the user hear, the wireless wearable device comprising:

a printed circuit board provided in the wireless wearable device, the printed circuit board having at least one electrical component attached thereon, the at least one electrical component being electrically connected to a plurality of other electrical components, each of the plurality of other electrical components being provided at least partially in the wireless wearable device;

a speaker in the wireless wearable device;

a microphone in the wireless wearable device; and

wireless communication circuitry,

wherein the at least one electrical component or the plurality of other electrical components include at least a controller,

wherein the at least a controller is configured to facilitate modifying power to help the user hear outputs presented to the user via at least the speaker,

wherein the wireless communication circuitry is configured to wirelessly receive a message from a mobile phone via at least a Bluetooth network,

wherein if the message is a text message, the at least a controller is configured to have at least a portion of the text message presented to the user,

wherein if the message is an audio message, the at least a controller is configured to have at least a portion of the audio message presented to the user,

wherein the wireless wearable device comprises another microphone,

wherein the microphone is configured to be located closer to mouth of the user than the another microphone when the wireless wearable device is worn by the user,

wherein at least the another microphone is configured to capture at least ambient noise, and

wherein at least a portion of signals from the microphone is configured to be reduced based on signals from the another microphone at least for reducing at least a portion of the ambient noise in signals from the microphone.

12. (New) A wireless wearable device as recited in claim 11 comprising a storage medium configured to store at least computer program codes for voice recognition, wherein at least the microphone is configured to receive at least a term, with the at least a term recognized using at least the computer program codes for voice recognition.

13. (New) A wireless wearable device as recited in claim 11 comprising an optical indicator configured to illuminate in a predetermined manner to provide an indication regarding a status of the wireless wearable device.

14. (New) A wireless wearable device as recited in claim 11, wherein the wireless wearable device is configured to enable the user to receive and respond to the message hands-free, using at least the speaker and at least the microphone.

15. (New) A wireless wearable device as recited in claim 11 comprising a sensor configured to at least provide an indication regarding the wireless wearable device being worn.

16. (New) A wireless wearable device as recited in claim 11 comprising a motion sensor.

17. (New) A wireless wearable device as recited in claim 11 comprising an accelerometer.

18. (New) A wireless wearable device as recited in claim 11 comprising a touch-sensitive input surface configured to receive at least a touch input to generate at least an electrical signal for an operation of the wireless wearable device.

19. (New) A wireless wearable device as recited in claim 18,

wherein the touch input received at the touch-sensitive input includes a movement with a direction, and

wherein the direction of movement is determined, with the operation of the wireless wearable device dependent on the determined direction.

20. (New) A wireless wearable device as recited in claim 11 comprising a pressure sensor.

21. (New) A wireless wearable device as recited in claim 20, wherein the pressure sensor includes a Hall-effect sensor.

22. (New) A wireless wearable device as recited in claim 11 comprising a first connector that includes a plurality of conductive pads that are configured to couple with a second connector external to the wireless wearable device, wherein each of the conductive pads is configured to be in contact with a corresponding metallic contact of the second connector when the first connector is connected to the second connector.

23. (New) A wireless wearable device as recited in claim 11 comprising a display.

24. (New) A wireless wearable device as recited in claim 11 comprising a camera.

25. (New) A wireless wearable device as recited in claim 11 comprising a storage medium configured to store at least computer program codes for voice recognition,

wherein at least the microphone is configured to receive at least a term, with the at least a term recognized using at least the computer program codes for voice recognition, and

wherein the wireless wearable device is configured to enable the user to receive and respond to the message hands-free, using at least the speaker and at least the microphone.

26. (New) A wireless wearable device as recited in claim 25 comprising:

a sensor configured to at least provide an indication regarding the wireless wearable device being worn;

a touch-sensitive input surface configured to receive at least a touch input to generate at least an electrical signal for an operation of the wireless wearable device; and

a first connector that includes a plurality of conductive pads that are configured to couple with a second connector external to the wireless wearable device, wherein each of the conductive pads is configured to be in contact with a corresponding metallic contact of the second connector when the first connector is connected to the second connector.

27. (New) A wireless wearable device as recited in claim 26 comprising a camera.

28. (New) A wireless wearable device as recited in claim 25 comprising:

a sensor configured to at least provide an indication regarding the wireless wearable device being worn;

a pressure sensor; and

a first connector that includes a plurality of conductive pads that are configured to couple with a second connector external to the wireless wearable device, wherein each of the conductive pads is configured to be in contact with a

corresponding metallic contact of the second connector when the first connector is connected to the second connector.

29. (New) A wireless wearable device as recited in claim 28 comprising a touch-sensitive input surface configured to receive at least a touch input to generate at least an electrical signal for an operation of the wireless wearable device.

30. (New) A wireless wearable device as recited in claim 25 comprising:

a sensor configured to at least provide an indication regarding the wireless wearable device being worn;

an accelerometer;

a display; and

a camera.

31. (New) A wireless wearable device as recited in claim 30 comprising a pressure sensor.

32. (New) A wireless wearable device configured to secure to the head of a user, with the device proximate to at least one ear of the user to at least help the user hear, the wireless wearable device comprising:

a printed circuit board provided in the wireless wearable device, the printed circuit board having at least one electrical component attached thereon, the at least one electrical component being electrically connected to a plurality of other electrical components, each of the plurality of other electrical components being provided at least partially in the wireless wearable device;

a speaker in the wireless wearable device;

a microphone in the wireless wearable device;

wireless communication circuitry;

a storage medium configured to store at least computer program codes for voice recognition;

a sensor configured to at least provide an indication regarding the wireless wearable device being worn;

a pressure sensor; and

a first connector that includes a plurality of conductive pads that are configured to couple with a second connector external to the wireless wearable device, wherein each of the conductive pads is configured to be in contact with a corresponding metallic contact of the second connector when the first connector is connected to the second connector,

wherein at least the microphone is configured to receive at least a term, with the at least a term recognized using at least the computer program codes for voice recognition,

wherein the at least one electrical component or the plurality of other electrical components include at least a controller,

wherein the at least a controller is configured to facilitate modifying power to help the user hear outputs presented to the user via at least the speaker,

wherein the wireless communication circuitry is configured to wirelessly receive a message from a mobile phone via at least a Bluetooth network,

wherein if the message is a text message, the at least a controller is configured to have at least a portion of the text message presented to the user,

wherein if the message is an audio message, the at least a controller is configured to have at least a portion of the audio message presented to the user,

wherein the wireless wearable device is configured to enable the user to receive and respond to the message hands-free, using at least the speaker and at least the microphone,

wherein the wireless wearable device comprises another microphone,

wherein the microphone is configured to be located closer to mouth of the user than the another microphone when the wireless wearable device is worn by the user,

wherein at least the another microphone is configured to capture at least ambient noise, and

wherein at least a portion of signals from the microphone is configured to be reduced based on signals from the another microphone at least for reducing at least a portion of the ambient noise in signals from the microphone.

REMARKS

Applicants have previously presented claims 1-5 and 7-9 for examination. The Examiner has allowed the claims, which Applicants acknowledge with gratitude. By this amendment, Applicants have amended claims 1, 5, 7 and 8; and have added claims 10-32. Accordingly, claims 1-5, and 7-32 are pending. Reconsideration of the application and an early Notice of Allowance are earnestly solicited.

If there are any issues remaining which the Examiner believes could be resolved through either a Supplemental Response or an Examiner's Amendment, the Examiner is respectfully requested to contact the undersigned representative at the telephone number listed below.

Respectfully submitted,

/Peter P. Tong/

Peter P. Tong
Reg. No. 35,757

Form 1449 (Modified)	Atty. Docket No.	IPVCP006X1C8
	Application No.:	17/942,347
Information Disclosure Statement By Applicant	Applicant	HOWELL et al.
	Filing Date	September 12, 2022
	Group	2653
(Use Several Sheets if Necessary)		Page 1 of 1

U.S. Patent Documents

Examiner Initial	No.	Patent No.	Date	Patentee	Class	Sub-class	Filing Date
	1.	2022/0357599 A1	Nov-22	Howell et al.			
	2.	11,644,361 B2	May-23	Howell et al.			
	3.	11,644,693 B2	May-23	Howell et al.			
	4.						
	5.						
	6.						
	7.						
	8.						
	9.						
	10.						

Foreign Documents

							Translation	
Init.		Document No.	Date	Country	Class	Subclass	Yes	No

Other Documents (Including Author, Title, Date, Pertinent Pages, etc.)

	A	Office Action for U.S. Patent Application No. 17/949,029, dated November 23, 2022.
	B	Notice of Allowance for U.S. Patent Application No. 17/395,509, dated April 26, 2023.
	C	Notice of Allowance for U.S. Patent Application No. 17/737,866, dated January 17, 2023.
	D	Notice of Allowance for U.S. Patent Application No. 17/737,866, dated May 15, 2023.
	E	Notice of Allowance for U.S. Patent Application No.17/964,853, dated March 8, 2023.
	F	
	G	

Examiner	Date Considered

Examiner: Initial citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/942,347	09/12/2022	Thomas A. Howell	IPVCP006X1C8	1038

34071 7590 06/07/2023

IPVENTURE, INC.
4010 Moorpark Avenue
Suite 211
San Jose, CA 95117

EXAMINER	
ELAHEE, MD S	

ART UNIT	PAPER NUMBER
2653	

MAIL DATE	DELIVERY MODE
06/07/2023	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Examiner-Initiated Interview Summary	**Application No.** 17/942,347	**Applicant(s)** Howell et al.		
	Examiner MD S ELAHEE	**Art Unit** 2653	**AIA (First Inventor to File) Status** No	**Page** 1 of 1

All Participants (applicant, applicants representative, PTO personnel)	**Title**	**Type**
MD S ELAHEE	Primary Examiner	Telephonic
PETER TONG	Agent	

Date of Interview: 02 June 2023

Issues Discussed:

Proposed Amendment(s)

Examiner suggested the applicant's representative to incorporate "modifying power within a certain range of frequencies based on at least one hearing characteristic of the user" in independent claims 11, 32. However, the applicant's representative refused to incorporate the limitation. Instead, the applicant's representative suggests to incorporate either "modifying power within a certain range of frequencies" or " modifying power based on at least one hearing characteristic of the user". Examiner will perform update search to make the determination whether the suggested phrase will overcome any prior art rejection.

/MD S ELAHEE/ Primary Examiner, Art Unit 2653	

Applicant is reminded that a complete written statement as to the substance of the interview must be made of record in the application file. It is the applicants responsibility to provide the written statement, unless the interview was initiated by the Examiner and the Examiner has indicated that a written summary will be provided. See MPEP 713.04
Please further see:
MPEP 713.04
Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews, paragraph (b)
37 CFR § 1.2 Business to be transacted in writing

Applicant recordation instructions: It is not necessary for applicant to provide a separate record of the substance of interview.

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
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Alexandria, Virginia 22313-1450
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NOTICE OF ALLOWANCE AND FEE(S) DUE

34071 7590 07/03/2023

IPVENTURE, INC.
4010 Moorpark Avenue
Suite 211
San Jose, CA 95117

EXAMINER
ELAHEE, MD S

ART UNIT	PAPER NUMBER
2653	

DATE MAILED: 07/03/2023

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/942,347	09/12/2022	Thomas A. Howell	IPVCP006X1C8	1038

TITLE OF INVENTION: WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1200	$0.00	$0.00	$1200	10/03/2023

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 40% the amount of undiscounted fees, and micro entity fees are 20% the amount of undiscounted fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications. **Because electronic patent issuance may occur shortly after issue fee payment, any desired continuing application should preferably be filed prior to payment of this issue fee in order not to jeopardize copendency.**

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

34071 7590 07/03/2023
IPVENTURE, INC.
4010 Moorpark Avenue
Suite 211
San Jose, CA 95117

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/942,347	09/12/2022	Thomas A. Howell	IPVCP006X1C8	1038

TITLE OF INVENTION: WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1200	$0.00	$0.00	$1200	10/03/2023

EXAMINER	ART UNIT	CLASS-SUBCLASS
ELAHEE, MD S	2653	381-327000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/AIA/122 or PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/47 or PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1_____
2_____
3_____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. Fees submitted: ❑Issue Fee ❑Publication Fee (if required)

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

❑ Electronic Payment via Patent Center or EFS-Web ❑ Enclosed check ❑ Non-electronic payment by credit card (Attach form PTO-2038)

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. **Change in Entity Status** (from status indicated above)

❑ Applicant certifying micro entity status. See 37 CFR 1.29

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

❑ Applicant asserting small entity status. See 37 CFR 1.27

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

❑ Applicant changing to regular undiscounted fee status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/942,347	09/12/2022	Thomas A. Howell	IPVCP006X1C8	1038

34071 7590 07/03/2023

IPVENTURE, INC.
4010 Moorpark Avenue
Suite 211
San Jose, CA 95117

EXAMINER	
ELAHEE, MD S	
ART UNIT	PAPER NUMBER
2653	

DATE MAILED: 07/03/2023

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 17/942,347	Applicant(s) Howell et al.	
	Examiner MD S ELAHEE	Art Unit 2653	AIA (FITF) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☑ This communication is responsive to 05/19/2023.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☑ The allowed claim(s) is/are 1-5 and 7-32 . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information , please see **http://www.uspto.gov/patents/init_events/pph/index.jsp** or send an inquiry to **PPHfeedback@uspto.gov.**

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some* c) ☐ None of the:

   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☑ Notice of References Cited (PTO-892)
2. ☑ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.
5. ☑ Examiner's Amendment/Comment
6. ☑ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/MD S ELAHEE/
Primary Examiner, Art Unit 2653

DETAILED ACTION

EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Mr. Peter Tong on 06/02/2023.

In claim 11, line 14, after "modifying power" add -- based on at least one hearing characteristic of the user,--.

In claim 32, line 27, after "modifying power" add -- based on at least one hearing characteristic of the user,--.

Allowable Subject Matter

2. Claims 1-5 and 7-32 are allowed.

3. The following is an examiner's statement of reasons for allowance: The invention as claimed is not disclosed nor rendered obvious in view of any prior art. As to independent claim 1, all prior art fail to teach or suggest, alone or in combination, the recited wireless headset for a user that allows a printed circuit board provided in the headset, the printed circuit board having at least one electrical component attached thereon, the at least one electrical component being electrically connected to a plurality of other electrical components, each of the plurality of other electrical components being provided at least partially in the headset; a speaker in the headset; a microphone in the headset; and wireless communication circuitry, wherein the at least one electrical component

or the plurality of other electrical components include at least a controller, wherein the at least a controller is configured to facilitate modifying power within a certain range of frequencies based on at least one hearing characteristic of the user, to help the user hear audio outputs presented to the user via at least the speaker, wherein the wireless communication circuitry is configured to wirelessly receive a message, wherein if the message is a text message, the at least a controller is configured to have at least a portion of the text message presented to the user, wherein if the message is an audio message, the at least a controller is configured to have at least a portion of the audio message presented to the user, and wherein at least the speaker is configured to present at least a portion of the message, when the at least a portion of the message is to be presented in an audio manners. No prior art was found that discloses or teaches the limitations of claim 1.

4. As to independent claim 11, all prior art fail to teach or suggest, alone or in combination, the recited wireless wearable device that allows to secure to the head of a user, with the device proximate to at least one ear of the user to at least help the user hear, the wireless wearable device comprising: a printed circuit board provided in the wireless wearable device, the printed circuit board having at least one electrical component attached thereon, the at least one electrical component being electrically connected to a plurality of other electrical components, each of the plurality of other electrical components being provided at least partially in the wireless wearable device; a speaker in the wireless wearable device; a microphone in the wireless wearable device; and wireless communication circuitry, wherein the at least one electrical component or the plurality of other electrical components include at least a controller, wherein the at least a controller is configured to facilitate modifying power based on at least one hearing characteristic of the user, to help the user hear outputs presented to the user via at least the speaker, wherein the wireless communication circuitry is configured to wirelessly receive a message from a mobile phone via at

least a Bluetooth network, wherein if the message is a text message, the at least a controller is configured to have at least a portion of the text message presented to the user, wherein if the message is an audio message, the at least a controller is configured to have at least a portion of the audio message presented to the user, wherein the wireless wearable device comprises another microphone, wherein the microphone is configured to be located closer to mouth of the user than the another microphone when the wireless wearable device is worn by the user, wherein at least the another microphone is configured to capture at least ambient noise, and wherein at least a portion of signals from the microphone is configured to be reduced based on signals from the another microphone at least for reducing at least a portion of the ambient noise in signals from the microphone. No prior art was found that discloses or teaches the limitations of claim 11.

5. As to independent claim 32, all prior art fail to teach or suggest, alone or in combination, the recited wireless wearable device that allows to secure to the head of a user, with the device proximate to at least one ear of the user to at least help the user hear, the wireless wearable device comprising: a printed circuit board provided in the wireless wearable device, the printed circuit board having at least one electrical component attached thereon, the at least one electrical component being electrically connected to a plurality of other electrical components, each of the plurality of other electrical components being provided at least partially in the wireless wearable device; a speaker in the wireless wearable device; a microphone in the wireless wearable device; wireless communication circuitry; a storage medium configured to store at least computer program codes for voice recognition; a sensor configured to at least provide an indication regarding the wireless wearable device being worn; a pressure sensor; and a first connector that includes a plurality of conductive pads that are configured to couple with a second connector external to the wireless wearable device, wherein each of the conductive pads is configured to be in contact with

a corresponding metallic contact of the second connector when the first connector is connected to the second connector, wherein at least the microphone is configured to receive at least a term, with the at least a term recognized using at least the computer program codes for voice recognition, wherein the at least one electrical component or the plurality of other electrical components include at least a controller, wherein the at least a controller is configured to facilitate modifying power based on at least one hearing characteristic of the user, to help the user hear outputs presented to the user via at least the speaker, wherein the wireless communication circuitry is configured to wirelessly receive a message from a mobile phone via at least a Bluetooth network, wherein if the message is a text message, the at least a controller is configured to have at least a portion of the text message presented to the user, wherein if the message is an audio message, the at least a controller is configured to have at least a portion of the audio message presented to the user, wherein the wireless wearable device is configured to enable the user to receive and respond to the message hands-free, using at least the speaker and at least the microphone, wherein the wireless wearable device comprises another microphone, wherein the microphone is configured to be located closer to mouth of the user than the another microphone when the wireless wearable device is worn by the user, wherein at least the another microphone is configured to capture at least ambient noise, and wherein at least a portion of signals from the microphone is configured to be reduced based on signals from the another microphone at least for reducing at least a portion of the ambient noise in signals from the microphone. No prior art was found that discloses or teaches the limitations of claim 32.

6. Claims 2-5, 7-10 and 12-31 are dependent upon claims 1 and 11, respectively, therefore, claims 2-5, 7-10 and 12-31 are allowed.

7. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to MD S ELAHEE whose telephone number is (571)272-7536. The examiner can normally be reached on Monday thru Friday; 8:30AM to 5:00PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, FAN TSANG can be reached on 571-272-7547. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/MD S ELAHEE/
MD SHAFIUL ALAM ELAHEE
Primary Examiner
Art Unit 2653
June 23, 2023

Notice of References Cited	Application/Control No. 17/942,347	Applicant(s)/Patent Under Reexamination Howell et al.	
	Examiner MD S ELAHEE	Art Unit 2653	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20030063763-A1	04-2003	Allred, Rustin W.	H04R25/70	381/314
	B					
	C					
	D					
	E					
	F					
	G					
	H					
	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
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	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/942,347	Howell et al.
	Examiner	Art Unit
	MD S ELAHEE	2653

CPC - Searched*		
Symbol	**Date**	**Examiner**
G02C11/10 OR H04M1/05 OR H04M1/6066 OR G06F1/163 OR G10L15/26 OR H04M2250/02 OR H04S1/00	04/16/2023	ME
G08B21/06	04/16/2023	ME
G08B21/06 OR G02C11/10	06/02/2023	ME
H04R25/70	06/23/2023	ME

CPC Combination Sets - Searched*		
Symbol	**Date**	**Examiner**

US Classification - Searched*			
Class	**Subclass**	**Date**	**Examiner**
381	327	04/16/2023	ME

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	**Date**	**Examiner**
PE2E SEARCH	06/23/2023	ME
ASSIGNEE AND INVENTORS SEARCH	04/10/2023	ME
IP.COM	06/23/2023	ME
IP.COM	06/23/2023	ME
GOOGLE SEARCH	04/16/2023	ME

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/942,347	Howell et al.
	Examiner	Art Unit
	MD S ELAHEE	2653

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**
PE2E INTERFERENCE SEARCH		06/02/2023	ME

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/942,347	Howell et al.
	Examiner	**Art Unit**
	MD S ELAHEE	2653

CPC						
Symbol					**Type**	**Version**
G02C	/	11	/	10	F	2013-01-01
G06F	/	1	/	163	I	2013-01-01
H04M	/	1	/	05	I	2013-01-01
G10L	/	15	/	26	I	2013-01-01
H04M	/	1	/	6066	I	2013-01-01
H04M	/	2250	/	02	A	2013-01-01

CPC Combination Sets							
Symbol					**Type**	**Set**	**Ranking**	**Version**
	/		/					

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	31	
/MD S ELAHEE/ Primary Examiner, Art Unit 2653	23 June 2023	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

U.S. Patent and Trademark Office — Part of Paper No.: 20230622

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/942,347	Howell et al.
	Examiner	**Art Unit**
	MD S ELAHEE	2653

INTERNATIONAL CLASSIFICATION					
CLAIMED					
H04R	/	25	/	00	
NON-CLAIMED					
	/		/		

US ORIGINAL CLASSIFICATION	
CLASS	**SUBCLASS**
381	327

CROSS REFERENCES(S)						
CLASS	**SUBCLASS (ONE SUBCLASS PER BLOCK)**					

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	31	
/MD S ELAHEE/ Primary Examiner, Art Unit 2653	23 June 2023	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

U.S. Patent and Trademark Office — Part of Paper No.: 20230622

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/942,347	Howell et al.
	Examiner	**Art Unit**
	MD S ELAHEE	2653

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIMS

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1	9	10	18	19	27	28								
2	2	10	11	19	20	28	29								
3	3	11	12	20	21	29	30								
4	4	12	13	21	22	30	31								
5	5	13	14	22	23	31	32								
	6	14	15	23	24										
6	7	15	16	24	25										
7	8	16	17	25	26										
8	9	17	18	26	27										

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	31	
/MD S ELAHEE/ Primary Examiner, Art Unit 2653	23 June 2023	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

U.S. Patent and Trademark Office — Part of Paper No.: 20230622

Main Concept Text
==========
A wireless headset for a user comprising: a printed circuit board provided in the headset, the printed circuit board having at least one electrical component attached thereon, the at least one electrical component being electrically connected to a plurality of other electrical components, each of the plurality of other electrical components being provided at least partially in the headset; a speaker in the headset; a microphone in the headset; and wireless communication circuitry, wherein the at least one electrical component or the plurality of other electrical components include at least a controller, wherein the at least a controller is configured to facilitate modifying power within a certain range of frequencies based on at least one hearing characteristic of the user, to help the user hear audio outputs presented to the user via at least the speaker, wherein the wireless communication circuitry is configured to wirelessly receive a message, wherein if the message is a text message, the at least a controller is configured to have at least a portion of the text message presented to the user, wherein if the message is an audio message, the at least a controller is configured to have at least a portion of the audio message presented to the user, and wherein at least the speaker is configured to present at least a portion of the message, when the at least a portion of the message is to be presented in an audio manners.

(No Concept Modifiers)
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(No Filters)
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Options
=======
De-dup: None
Relevance Cut-off: None
Sort: Relevance

Content: Patents + NPL (192)
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US Patents
US Designs
US Applications
EPO Patents
EPO Applications
China Patents
China Applications
Japan Patents
Japan Applications
Korea Patents
Korea Applications

WIPO Applications
Argentina Patents
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Other Literature: IBM Redbooks
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Main Concept Text
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A wireless wearable device configured to secure to the head of a user, with the device proximate to at least one ear of the user to at least help the user hear, the wireless wearable device comprising: a printed circuit board provided in the wireless wearable device, the printed circuit board having at least one electrical component attached thereon, the at least one electrical component being electrically connected to a plurality of other electrical components, each of the plurality of other electrical components being provided at least partially in the wireless wearable device; a speaker in the wireless wearable device; a microphone in the wireless wearable device; wireless communication circuitry; a storage medium configured to store at least computer program codes for voice recognition; a sensor configured to at least provide an indication regarding the wireless wearable device being worn; a pressure sensor; and a first connector that includes a plurality of conductive pads that are configured to couple with a second connector external to the wireless wearable device, wherein each of the conductive pads is configured to be in contact with a corresponding metallic contact of the second connector when the first connector is connected to the second connector, wherein at least the microphone is configured to receive at least a term, with the at least a term recognized using at least the computer program codes for voice recognition, wherein the at least one electrical component or the plurality of other electrical components include at least a controller, wherein the at least a controller is configured to facilitate modifying power based on at least one hearing characteristic of the user, to help the user hear outputs presented to the user via at least the speaker, wherein the wireless communication circuitry is configured to wirelessly receive a message from a mobile phone via at least a Bluetooth network, wherein if the message is a text message, the at least a controller is configured to have at least a portion of the text message presented to the user, wherein if the message is an audio message, the at least a controller is configured to have at least a portion of the audio message presented to the user, wherein the wireless wearable device is configured to enable the user to receive and respond to the message hands-free, using at least the speaker and at least the microphone, wherein the wireless wearable device comprises another microphone, wherein the microphone is configured to be located closer to mouth of the user than the another microphone when the wireless wearable device is worn by the user, wherein at least the another microphone is configured to capture at least ambient noise, and wherein at least a portion of signals from the microphone is configured to be reduced based on signals from the another microphone at least for reducing at least a portion of the ambient noise in signals from the microphone.

(No Concept Modifiers)
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(No Filters)
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Options

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De-dup: None
Relevance Cut-off: None
Sort: Relevance

Content: Patents + NPL (192)
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US Patents
US Designs
US Applications
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EPO Applications
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OnePetro.org: Conferences at OnePetro.org
Other Literature: IBM Redbooks
Other Literature: PubMed Central
Other Literature: arXiv.org

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L56	29368	(G08B21/06 OR G02C11/10).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/06/02 12:45 PM
L57	3467	(modif$4 OR chang$4 OR adjust$4 OR alter$5 OR updat$5) near4 (power OR strength OR voltage) WITH frequenc$4 WITH (hear$5 OR listen$4)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/06/02 12:59 PM
L58	24	57 AND 56	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/06/02 12:59 PM

PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L60	438745	((head WITH wear$4) OR headset OR headband OR headphone OR ((ear OR head) ADJ (set OR band OR phone)) OR earset OR earband OR earbud OR (ear ADJ (bud OR cup)) OR earcup OR earphone) WITH (speaker OR transducer)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/06/02 06:07 PM
L63	6945	(chang$4 OR modif$5 OR updat$4 OR alter$4 OR adjust$5 OR switch$4 OR transform$4 OR variation OR varie$2 OR vary$3 OR variance OR turn$4) near4 (power OR strength OR voltage) WITH frequenc$4 WITH (hear$5 OR listen$4)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/06/02 09:41 PM
L64	467	63 AND 60	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/06/02 09:42 PM
L65	61	64 AND (@ad<"20030415" OR @rlad<"20020415" OR @ptad<"20030415")	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU,	OR	ON	ON	2023/06/02 09:42 PM

			CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L66	13758	H04R25/70.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/06/23 10:34 PM
L67	17	64 AND 66	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/06/23 10:35 PM

PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

Form 1449 (Modified)	Atty. Docket No.	IPVCP006X1C8
	Application No.:	17/942,347
Information Disclosure Statement By Applicant	Applicant	HOWELL et al.
	Filing Date	September 12, 2022
	Group	2653
(Use Several Sheets if Necessary)		Page 1 of 1

U.S. Patent Documents

Examiner Initial	No.	Patent No.	Date	Patentee	Class	Sub-class	Filing Date
	1.	2022/0357599 A1	Nov-22	Howell et al.			
	2.	11,644,361 B2	May-23	Howell et al.			
	3.	11,644,693 B2	May-23	Howell et al.			
	4.						
	5.						
	6.						
	7.						
	8.						
	9.						
	10.						

Foreign Documents

							Translation	
Init.		Document No.	Date	Country	Class	Subclass	Yes	No

Other Documents (Including Author, Title, Date, Pertinent Pages, etc.)

	A	Office Action for U.S. Patent Application No. 17/949,029, dated November 23, 2022.
	B	Notice of Allowance for U.S. Patent Application No. 17/395,509, dated April 26, 2023.
	C	Notice of Allowance for U.S. Patent Application No. 17/737,866, dated January 17, 2023.
	D	Notice of Allowance for U.S. Patent Application No. 17/737,866, dated May 15, 2023.
	E	Notice of Allowance for U.S. Patent Application No.17/964,853, dated March 8, 2023.
	F	
	G	

Examiner	Date Considered
/MD S ELAHEE/	06/02/2023

Examiner: Initial citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /M.S.E/

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	9	"16429181"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/10 07:02 AM
L3	87	((("INGENIOSPEC") near3 ("LLC"))).AS,AANM.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/10 07:19 AM
L5	42578	((("HOWELL") near3 ("Thomas")) OR (("CHAO") near3 ("David")) OR (("THOMAS") near3 ("C")) OR (("TONG") near3 ("Peter"))).INV.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/10 07:20 AM
L6	87	L3 AND L5	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU,	OR	ON	ON	2023/04/10 07:20 AM

			CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L7	79840	(modif$5 WITH power).clm.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/10 07:21 AM
L8	2	6 AND 7	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/10 07:21 AM
L9	3	"20200413206"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA,	OR	ON	ON	2023/04/10 07:35 AM

			VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L10	3	"20170289687"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/10 07:39 AM
L11	50	(modif$4 OR chang$4 OR adjust$4 OR alter$4) near4 power WITH frequenc$4 NEAR (based OR depend$4 OR accord$4) WITH (hear$$ OR listen$4)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/10 07:44 AM
L12	2	"20080279410" AND ((modif$4 OR chang$4 OR adjust$4 OR alter$4) near4 power WITH frequenc$4 WITH (hear$$ OR listen$4))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/10 07:54 AM
L13	2	"20080279410" AND ((modif$4 OR chang$4 OR adjust$4 OR alter$4) near4 power WITH frequenc$4 SAME (hear$$ OR	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB,	OR	ON	ON	2023/04/10 07:54 AM

		listen$4))	HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L14	2	"20080279410" AND (power WITH frequenc$4 WITH (hear$$ OR listen$4))	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/10 07:55 AM
L15	2	6 AND 11	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/10 08:19 AM
L16	5	L11 AND (@ad<"20030415" OR @rlad<"20020415" OR @ptad<"20030415")	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT;	OR	ON	ON	2023/04/15 04:29 PM

			IBM_TDB)				
L17	1873	(modif$4 OR chang$4 OR adjust$4 OR alter$4) near4 power WITH frequenc$4 WITH (hear$$ OR listen$4)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/15 04:33 PM
L18	147	L17 SAME speaker	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/15 04:35 PM
L19	31	L18 AND (@ad<"20030415" OR @rlad<"20020415" OR @ptad<"20030415")	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/15 04:35 PM
L20	425937	(headset OR headband OR headphone OR ((ear OR head) ADJ (set OR band OR phone)) OR earset OR earband OR earbud OR (ear ADJ (bud OR cup)) OR earcup OR	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV,	OR	ON	ON	2023/04/16 05:18 PM

		earphone) WITH (speaker OR transducer)	MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L21	7539	(printed ADJ circuit ADJ board) WITH (headset OR headband OR headphone OR ((ear OR head) ADJ (set OR band OR phone)) OR earset OR earband OR earbud OR (ear ADJ (bud OR cup)) OR earcup OR earphone)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 05:19 PM
L22	4020	20 AND 21	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 05:19 PM
L23	6	22 AND 17	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 05:19 PM
L24	359563	eyewear OR (eye ADJ	(US-PGPUB; USPAT;	OR	ON	ON	2023/04/16

		(glass OR wear)) OR eyeglass	USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				05:21 PM
L25	778	(printed ADJ circuit ADJ board) WITH L24	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 05:22 PM
L26	2	25 AND 17	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 05:22 PM
L27	390857	(audio OR voice OR speech OR utter$4 OR audibl$4 OR convsrsat$4 OR talk$4) NEAR message	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL,	OR	ON	ON	2023/04/16 05:25 PM

			PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L28	563906	text NEAR message	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 05:25 PM
L29	39	27 AND 17	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 05:26 PM
L30	4	28 AND 29	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 05:26 PM
L31	309290	(headset OR headband OR headphone OR ((ear OR head) ADJ	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY,	OR	ON	ON	2023/04/16 05:27 PM

		(set OR band OR phone)) OR earset OR earband OR earbud OR (ear ADJ (bud OR cup)) OR earcup OR earphone) WITH microphone	CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L32	4143	31 AND 21	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 05:27 PM
L33	6	32 AND 17	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 05:28 PM
L34	56	(modif$4 OR chang$4 OR adjust$4 OR alter$4) near4 (strength OR voltage) WITH frequenc$4 NEAR (based OR depend$4 OR accord$4) WITH (hear$$ OR listen$4)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH,	OR	ON	ON	2023/04/16 06:22 PM

			TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L35	6	L34 AND (@ad<"20030415" OR @rlad<"20020415" OR @ptad<"20030415")	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 06:22 PM
L36	190249	(G02C11/10 OR H04M1/05 OR H04M1/6066 OR G06F1/163 OR G10L15/26 OR H04M2250/02 OR H04S1/00).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 10:11 PM
L37	3429	(modif$4 OR chang$4 OR adjust$4 OR alter$4 OR updat$5) near4 (power OR strength OR voltage) WITH frequenc$4 WITH (hear$5 OR listen$4)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 10:13 PM
L38	23	36 AND 37	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA,	OR	ON	ON	2023/04/16 10:13 PM

			EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L39	2	L38 AND (@ad<"20030415" OR @rlad<"20020415" OR @ptad<"20030415")	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 10:14 PM
L40	8	32 AND 37	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 10:15 PM
L42	44	(modif$4 OR chang$4 OR adjust$4 OR alter$4) near4 power WITH frequenc$4 NEAR (based OR depend$4 OR accord$4) WITH (hear$3 OR listen$4)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO;	OR	ON	ON	2023/04/16 10:17 PM

			JPO; DERWENT; IBM_TDB)				
L43	3	L42 AND (@ad<"20030415" OR @rlad<"20020415" OR @ptad<"20030415")	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 10:18 PM
L44	266	L37 SAME speaker	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 10:19 PM
L45	53	L44 AND (@ad<"20030415" OR @rlad<"20020415" OR @ptad<"20030415")	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 10:20 PM
L46	8	22 AND 37	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS,	OR	ON	ON	2023/04/16 10:20 PM

			IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L47	46	(modif$4 OR chang$4 OR adjust$4 OR alter$4) near4 (strength OR voltage) WITH frequenc$4 NEAR (based OR depend$4 OR accord$4) WITH (hear$4 OR listen$4)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 10:24 PM
L48	5	L47 AND (@ad<"20030415" OR @rlad<"20020415" OR @ptad<"20030415")	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 10:24 PM
L49	48	(modif$4 OR chang$4 OR adjust$4 OR alter$4) near4 power WITH frequenc$4 NEAR (based OR depend$4 OR accord$4) WITH (hear$5 OR listen$4)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 10:26 PM

L50	5	L49 AND (@ad<"20030415" OR @rlad<"20020415" OR @ptad<"20030415")	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 10:27 PM
L51	13775	G08B21/06.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 10:35 PM
L52	14	51 AND 37	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/16 10:36 PM

PE2E SEARCH - Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
N1	156	(modif$4 OR chang$4 OR adjust$4 OR alter$4) near4 power WITH frequenc$4 WITH	(US-PGPUB)	OR	ON	ON	2023/04/16 05:33 PM

		(hear$$ OR listen$4)					
N2	6	N1 AND (@ad<"20030415" OR @rlad<"20020415" OR @ptad<"20030415")	(US-PGPUB)	OR	ON	ON	2023/04/16 05:34 PM
N3	156	(modif$4 OR chang$4 OR adjust$4 OR alter$4) near4 power WITH frequenc$4 WITH (hear$5 OR listen$4)	(US-PGPUB)	OR	ON	ON	2023/04/16 10:27 PM
N4	238	(modif$4 OR chang$4 OR adjust$4 OR alter$4) near4 (power OR strength OR voltage) WITH frequenc$4 WITH (hear$5 OR listen$4)	(US-PGPUB)	OR	ON	ON	2023/04/16 10:28 PM
N5	256	(modif$4 OR chang$4 OR adjust$4 OR alter$4 OR updat$4) near4 (power OR strength OR voltage) WITH frequenc$4 WITH (hear$5 OR listen$4)	(US-PGPUB)	OR	ON	ON	2023/04/16 10:28 PM
N6	15	N5 AND (@ad<"20030415" OR @rlad<"20020415" OR @ptad<"20030415")	(US-PGPUB)	OR	ON	ON	2023/04/16 10:29 PM

PE2E SEARCH - Search History (Prior Art)

There are no Prior Art searches to show.

PE2E SEARCH - Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
N7	256	(modif$4 OR chang$4 OR adjust$4 OR alter$5 OR updat$4) near4 (power OR strength OR voltage) WITH frequenc$4 WITH (hear$5 OR listen$4)	(US-PGPUB)	OR	ON	ON	2023/06/02 03:41 PM
N8	15	N7 AND (@ad<"20030415" OR @rlad<"20020415" OR @ptad<"20030415")	(US-PGPUB)	OR	ON	ON	2023/06/02 03:41 PM
N9	493	(chang$4 OR modif$5 OR updat$4 OR alter$4 OR adjust$5 OR switch$4 OR transform$4 OR variation OR varie$2 OR vary$3 OR variance OR turn$4) near4 (power OR strength OR voltage) WITH frequenc$4 WITH (hear$5 OR listen$4)	(US-PGPUB)	OR	ON	ON	2023/06/02 03:42 PM
N10	37	N9 AND (@ad<"20030415" OR @rlad<"20020415" OR @ptad<"20030415")	(US-PGPUB)	OR	ON	ON	2023/06/02 03:43 PM

Form 1449 (Modified)	Atty. Docket No.	IPVCP006X1C8
	Application No.:	17/942,347
Information Disclosure Statement By Applicant	Applicant	HOWELL et al.
	Filing Date	September 12, 2022
	Group	2653
(Use Several Sheets if Necessary)		Page 1 of 1

U.S. Patent Documents

Examiner Initial	No.	Patent No.	Date	Patentee	Class	Sub-class	Filing Date
	1.	2,725,462	Nov-55	Vorgang			
	2.						
	3.						
	4.						
	5.						
	6.						
	7.						
	8.						
	9.						
	10.						

Foreign Documents

							Translation	
Init.		Document No.	Date	Country	Class	Subclass	Yes	No

Other Documents (Including Author, Title, Date, Pertinent Pages, etc.)

	A	Notice of Allowance for U.S. Patent Application No. 17/484,080, dated June 1, 2023.
	B	Notice of Allowance for U.S. Patent Application No. 17/949,029, dated July 3, 2023.
	C	Notice of Allowance for U.S. Patent Application No. 16/182,969, dated June 30, 2023.
	D	Office Action for U.S. Patent Application No. 18/129,660, dated May 19, 2023.
	E	Office Action for U.S. Patent Application No. 18/129,660, dated July 7, 2023.
	F	
	G	

Examiner	Date Considered

Examiner: Initial citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Electronic Patent Application Fee Transmittal

Application Number:	17942347
Filing Date:	12-Sep-2022
Title of Invention:	WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT
First Named Inventor/Applicant Name:	Thomas A. Howell
Filer:	Peter P. Tong/Angela Nijim
Attorney Docket Number:	IPVCP006X1C8

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
SUBMISSION- INFORMATION DISCLOSURE STMT	1806	1	260	260
		Total in USD ($)		**260**

Electronic Acknowledgement Receipt	
EFS ID:	48279772
Application Number:	17942347
International Application Number:	
Confirmation Number:	1038
Title of Invention:	WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT
First Named Inventor/Applicant Name:	Thomas A. Howell
Customer Number:	34071
Filer:	Peter P. Tong/Angela Nijim
Filer Authorized By:	Peter P. Tong
Attorney Docket Number:	IPVCP006X1C8
Receipt Date:	11-JUL-2023
Filing Date:	12-SEP-2022
Time Stamp:	16:03:43
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$260
RAM confirmation Number	E20237AG04298098
Deposit Account	503874
Authorized User	Angela Nijim
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.21 (Miscellaneous fees and charges)	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	IPVCP006X1C8_IDSAfterNoA_7-23.pdf	21376 9dffad27a576309d17ffbfa99257489e9a19ad36	no	2
Warnings:					
Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	IPVCP006X1C8_1449_7-23.pdf	21705 15bd7a067aa48c9c15f9e3b63b410562d9e18b1c	no	1
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	Fee Worksheet (SB06)	fee-info.pdf	38351 0140d9771636c4bc8b9bbf6cba82b598f6ec0081	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	81432		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: HOWELL et al.	Attorney Docket No.: IPVCP006X1C8
Application No.: 17/942,347	Examiner: ELAHEE, MD S
Filed: September 12, 2022	Group: 2653
Title: WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT	

INFORMATION DISCLOSURE STATEMENT AFTER FINAL ACTION OR NOTICE OF ALLOWANCE (37 CFR §§ 1.56 AND 1.97(d))

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

The references listed in the attached PTO Form 1449, a copy of which is attached, may be material to examination of the above-identified patent application. Applicants submit this reference in compliance with their duty of disclosure pursuant to 37 CFR §§1.56 and 1.97. The Examiner is requested to make this citation of official record in this application.

This Information Disclosure Statement is not to be construed as a representation that a search has been made, that additional information material to the examination of this application does not exist, or that this reference indeed constitutes prior art.

This Information Disclosure Statement is being filed after the mailing date of final action under §1.113 or a notice of allowance under §1.311, but before payment of the issue fee.

Accompanying this Information Disclosure Statement is the fee set forth in 37 CFR 1.17(p).

The undersigned hereby states:

☐ that each item of information contained in the Information Disclosure Statement was first cited in a communication from a foreign patent office in a counterpart foreign application no more than three months prior to the filing of the Information Disclosure Statement, or

☒ that no item of information contained in the Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign application, and to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the Information Disclosure Statement was known to any individual designated in § 1.56(c) more than three months prior to the filing of the Information Disclosure Statement.

Electronic Fee in payment of the Information Disclosure Statement Fee is provided herewith. If it is determined that any additional fees are due, the Commissioner is hereby authorized to charge such fees to Deposit Account 50-3874 (Order No. IPVCP006X1C8).

Respectfully submitted,

/Peter P. Tong/

Peter P. Tong
Registration No. 35,757

4010 Moorpark Avenue
Suite 211
San Jose, CA 95117

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 17/942,347	Filing Date 09/12/2022	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	6 minus 20 =	* 0		x $ 100 =	0
INDEPENDENT CLAIMS (37 CFR 1.16(h))	1 minus 3 =	* 0		x $ 480 =	0
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	0

APPLICATION AS AMENDED - PART II

AMENDMENT	08/08/2023	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 32	Minus	** 31	= 1		x $ 100 =	100
	Independent (37 CFR 1.16(h))	* 4	Minus	*** 3	= 1		x $ 480 =	480
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	580

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $ 0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $ 0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/GERALDINE L STANLEY/
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PTO/SB/30EFS (01-22)
Approved for use through 05/31/2024. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL
(Submitted Only via EFS-Web)

Application Number	17942347	Filing Date	2022-09-12	Docket Number (if applicable)	IPVCP006X1C8	Art Unit	2653
First Named Inventor	HOWELL et al.			Examiner Name	ELAHEE, MD S		

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV

SUBMISSION REQUIRED UNDER 37 CFR 1.114

Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

- ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____
- ☐ Other _____

☒ Enclosed

- ☒ Amendment/Reply
- ☒ Information Disclosure Statement (IDS)
- ☐ Affidavit(s)/ Declaration(s)
- ☐ Other _____

MISCELLANEOUS

☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months _____ (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

☐ Other _____

FEES

☒ **The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.**
The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to Deposit Account No 503874

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

☒ Patent Practitioner Signature

Applicant Signature

PTO/SB/30EFS (01-22)
Approved for use through 05/31/2024. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Signature of Registered U.S. Patent Practitioner			
Signature	/Peter P. Tong/	Date (YYYY-MM-DD)	2023-08-08
Name	Peter P. Tong	Registration Number	35757

This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal

Application Number:	17942347
Filing Date:	12-Sep-2022
Title of Invention:	WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT
First Named Inventor/Applicant Name:	Thomas A. Howell
Filer:	Peter P. Tong/Angela Nijim
Attorney Docket Number:	IPVCP006X1C8

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
CLAIMS IN EXCESS OF 20	1202	1	100	100
INDEPENDENT CLAIMS IN EXCESS OF 3	1201	1	480	480
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
RCE- 2ND AND SUBSEQUENT REQUEST	1820	1	2000	2000
		Total in USD ($)		**2580**

Electronic Acknowledgement Receipt	
EFS ID:	48402735
Application Number:	17942347
International Application Number:	
Confirmation Number:	1038
Title of Invention:	WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT
First Named Inventor/Applicant Name:	Thomas A. Howell
Customer Number:	34071
Filer:	Peter P. Tong/Angela Nijim
Filer Authorized By:	Peter P. Tong
Attorney Docket Number:	IPVCP006X1C8
Receipt Date:	08-AUG-2023
Filing Date:	12-SEP-2022
Time Stamp:	14:20:06
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$2580
RAM confirmation Number	E202388E22269576
Deposit Account	503874
Authorized User	Angela Nijim
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.21 (Miscellaneous fees and charges)	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	IPVCP006X1C8_IDSTrans_8-23.pdf	19715 864bd9f96b5fd7417ad515cc21aa817d15c33e4f	no	2
Warnings:					
Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	IPVCP006X1C8_1449_8-23.pdf	21339 72186c46341dc99f0c4acadf1595ee66e37e27a8	no	1
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	Transmittal Letter	IPVCP006X1C8_AmdBTrans_8-23.pdf	16692 40595faebb08e8963d30c41b7b9ef1a2070b9d01	no	1
Warnings:					
Information:					
4	Request for Continued Examination (RCE)	IPVCP006X1C8_RCE_8-23.pdf	1667145 cff92568ea9d3df83f4e92767bc7b83045f9954b	no	3
Warnings:					
Information:					
5	Amendment Submitted/Entered with Filing of Continued Prosecution Application (CPA)/Request for Continued Examination(RCE)	IPVCP006X1C8_AmdB_AsFiled_8-23.pdf	67919 2b7cef3a779d1ceb9f3d1ff651315391e0dc8c02	no	12
Warnings:					
Information:					
6	Fee Worksheet (SB06)	fee-info.pdf	42830 8e7884d1207ce258e0a3e8b8aaa3ae81ed41461f	no	2
Warnings:					

Information:	
Total Files Size (in bytes):	1835640

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

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National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: HOWELL et al.	Attorney Docket No.: IPVCP006X1C8
Application No.: 17/942,347	Examiner: ELAHEE MD S.
Filed: September 12, 2022	Group: 2653
Title: WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT	

INFORMATION DISCLOSURE STATEMENT
37 CFR §§1.56 AND 1.97(b)

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

The references listed in the attached PTO Form 1449, copies of which are attached, may be material to examination of the above-identified patent application. Applicants submit these references in compliance with their duty of disclosure pursuant to 37 CFR §§1.56 and 1.97. The Examiner is requested to make these references of official record in this application.

This Information Disclosure Statement is not to be construed as a representation that a search has been made, that additional information material to the examination of this application does not exist, or that these references indeed constitute prior art.

This Information Disclosure Statement is: (i) filed within three (3) months of the filing date of the above-referenced application, (ii) believed to be filed before the mailing date of a first Office Action on the merits, or (iii) believed to be filed before the mailing of a first Office Action after the filing of a Request for Continued Examination under §1.114.

Accordingly, it is believed that no fees are due in connection with the filing of this Information Disclosure Statement. However, if it is determined that any fees are due, the Commissioner is hereby authorized to charge such fees to Deposit Account 50-3874(Order No. IPVCP006X1C8).

Respectfully submitted,

/Peter P. Tong/

Peter P. Tong
Registration No. 35,757

4010 Moorpark Avenue
Suite 211
San Jose, CA 95117

Form 1449 (Modified)	Atty. Docket No.	IPVCP006X1C8
	Application No.:	17/942,347
Information Disclosure Statement By Applicant	Applicant	HOWELL et al.
	Filing Date	September 12, 2022
	Group	2653
(Use Several Sheets if Necessary)		Page 1 of 1

U.S. Patent Documents

Examiner Initial	No.	Patent No.	Date	Patentee	Class	Sub-class	Filing Date
	1.	2022/0415338 A1	Dec-22	Howell et al.			
	2.	2023/0017635 A1	Jan-23	Howell et al.			
	3.	2023/0236444 A1	Jul-23	Howell et al.			
	4.	11,721,183 B2	Aug-23	Howell et al.			
	5.	11,733,549 B2	Aug-23	Howell et al.			
	6.						
	7.						
	8.						
	9.						
	10.						

Foreign Documents

							Translation	
Init.		Document No.	Date	Country	Class	Subclass	Yes	No

Other Documents (Including Author, Title, Date, Pertinent Pages, etc.)

	A	
	B	
	C	
	D	
	E	
	F	
	G	

Examiner	Date Considered

Examiner: Initial citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: HOWELL et al.

Application No.: 17/942,347

Filed: September 12, 2022

Title: WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT

Attorney Docket No.: IPVCP006X1C8

Examiner: ELAHEE, MD S.

Group: 2653

AMENDMENT B TRANSMITTAL

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Transmitted herewith is an Amendment in the above-identified application.

The fee has been calculated as shown below.

	Claims After Amendment		Highest Previously Paid For	Present Extra	Small Entity Rate Fee	Large Entity Rate Fee
Total Claims	32	MINUS	31	01	x 40 =	x 100 = 100
Independent Claims	4	MINUS	3	01	x 192 =	x 480 = 480
Multiple Dependent Claim Present and Fee Not Previously Paid					$	$
				Total	$0.00	$0.00

☐ Applicant(s) hereby petition for a _____- month extension(s) of time to respond to the aforementioned Office Action.

☒ Applicant(s) believe that no (additional) Extension of Time is required; however, if it is determined that such an extension is required, Applicant(s) hereby petition that such an extension be granted and authorize the Commissioner to charge the required fees for an Extension of Time under 37 CFR 1.136 to Deposit Account No. 50-3874 (Order No. IPVCP006X1C8).

☒ Any fees due are being paid electronically herewith.

☒ Please charge any additional fees required to facilitate filing the enclosed response, to Deposit Account No. 50-3874 (Order No. IPVCP006X1C8).

Respectfully submitted,

/Peter P. Tong/

Peter P. Tong
Reg. No. 35,757

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: HOWELL et al.

Attorney Docket No.: IPVCP006X1C8

Application No.: 17/942,347

Examiner: ELAHEE, MD S.

Filed: September 12, 2022

Group: 2653

Title: WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT

CERTIFICATE OF ELECTRONIC FILING

I hereby certify that this correspondence is being transmitted electronically to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on August 8, 2023.

Signed: /Angela D. Nijim/ Printed Name: Angela D. Nijim

AMENDMENT B

Mail Stop _____
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

In response to the Notice of Allowance dated July 3, 2023, please amend the above-identified patent application as follows:

Amendments to the Claims are reflected in the listing of claims which begins on page 2 of this paper.

Remarks/Arguments are on page 12 of this paper.

Amendments to the Claims:

The listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently amended) A wireless headset for a user comprising:

a printed circuit board provided in the headset, the printed circuit board having at least one electrical component attached thereon, the at least one electrical component being electrically connected to a plurality of other electrical components, each of the plurality of other electrical components being provided at least partially in the headset;

a speaker in the headset;

a microphone in the headset; and

wireless communication circuitry,

wherein the at least one electrical component or the plurality of other electrical components include at least a controller,

wherein the at least a controller is configured to facilitate modifying power within a ~~certain~~ range of frequencies based on at least one hearing characteristic of the user, to help the user hear audio outputs presented to the user via at least the speaker,

wherein the wireless communication circuitry is configured to wirelessly receive a message,

wherein if the message is a text message, the at least a controller is configured to have at least a portion of the text message presented to the user,

wherein if the message is an audio message, the at least a controller is configured to have at least a portion of the audio message presented to the user, and

wherein at least the speaker is configured to present at least a portion of the message, when the at least a portion of the message is to be presented in an audio manner.

2. (Previously presented) A wireless headset as recited in claim 1 comprising an accelerometer.

3. (Previously presented) A wireless headset as recited in claim 1 comprising a first connector that includes a plurality of conductive pads that are configured to couple with a second connector external to the headset, wherein each of the conductive pads is configured to be in contact with a corresponding metallic contact of the second connector when the first connector is connected to the second connector.

4. (Previously presented) A wireless headset as recited in claim 1, wherein the wireless communication circuitry is configured to couple to at least a Bluetooth network.

5. (Currently amended) A wireless headset as recited in claim 1, wherein the at least a controller is configured to facilitate voice recognition, including facilitating recognizing at least a ~~spoken term~~ word received via at least the microphone in the headset.

6. (Cancelled)

7. (Previously presented) A wireless headset as recited in claim 1, wherein the headset includes at least an ear bud configured to be placed in an ear of the user.

8. (Previously presented) A wireless headset as recited in claim 1, wherein at least the microphone in the headset is configured to receive an audio response for the message from the user.

9. (Previously presented) A wireless headset as recited in claim 8, wherein the at least a controller is configured to facilitate converting the audio response into text to be wirelessly transmitted.

10. (Previously presented) A wireless headset as recited in claim 1,

wherein wireless headset comprises another microphone,

wherein the microphone is configured to be located closer to mouth of the user than the another microphone when the headset is worn by the user,

wherein at least the another microphone is configured to capture at least ambient noise, and

wherein at least a portion of signals from the microphone is configured to be reduced based on signals from the another microphone at least for reducing at least a portion of the ambient noise in signals from the microphone.

11. (Currently amended) A wireless wearable device configured to secure to the head of a user, with the device proximate to at least one ear of the user to at least help the user hear, the wireless wearable device comprising:

a printed circuit board provided in the wireless wearable device, the printed circuit board having at least one electrical component attached thereon, the at least one electrical component being electrically connected to a plurality of other electrical components, each of the plurality of other electrical components being provided at least partially in the wireless wearable device;

a speaker in the wireless wearable device;

a microphone in the wireless wearable device; and

wireless communication circuitry,

wherein the at least one electrical component or the plurality of other electrical components include at least a controller,

wherein the at least a controller is configured to facilitate modifying power within a range of frequencies ~~based on at least one hearing characteristic of the user~~, to help the user hear outputs presented to the user via at least the speaker,

wherein the wireless communication circuitry is configured to wirelessly receive a message from a mobile phone via at least a Bluetooth network,

wherein if the message is a text message, the at least a controller is configured to have at least a notification ~~portion~~ of the text message presented to the user,

wherein if the message is an audio message, the at least a controller is configured to have at least a notification ~~portion~~ of the audio message presented to the user,

wherein the wireless wearable device comprises another microphone,

wherein the microphone is configured to be located closer to mouth of the user than the another microphone when the wireless wearable device is worn by the user,

wherein at least the another microphone is configured to capture at least ambient noise, and

wherein at least a portion of signals from the microphone is configured to be reduced based on signals from the another microphone at least for reducing at least a portion of the ambient noise in signals from the microphone.

12. (Currently amended) A wireless wearable device as recited in claim 11 comprising a storage medium configured to store at least computer program codes for facilitating voice recognition, wherein at least the microphone is configured to receive at least a ~~term~~ word, with the at least a ~~term~~ word recognized using at least the computer program codes for facilitating voice recognition.

13. (Previously presented) A wireless wearable device as recited in claim 11 comprising an optical indicator configured to illuminate in a predetermined manner to provide an indication regarding a status of the wireless wearable device.

14. (Previously presented) A wireless wearable device as recited in claim 11, wherein the wireless wearable device is configured to enable the user to receive and respond to the message hands-free, using at least the speaker and at least the microphone.

15. (Currently amended) A wireless wearable device as recited in claim 11 comprising a sensor configured to at least provide an indication regarding the wireless wearable device being used ~~worn~~.

16. (Previously presented) A wireless wearable device as recited in claim 11 comprising a motion sensor.

17. (Previously presented) A wireless wearable device as recited in claim 11 comprising an accelerometer.

18. (Previously presented) A wireless wearable device as recited in claim 11 comprising a touch-sensitive input surface configured to receive at least a touch input to generate at least an electrical signal for an operation of the wireless wearable device.

19. (Previously presented) A wireless wearable device as recited in claim 18,

wherein the touch input received at the touch-sensitive input includes a movement with a direction, and

wherein the direction of movement is determined, with the operation of the wireless wearable device dependent on the determined direction.

20. (Previously presented) A wireless wearable device as recited in claim 11 comprising a pressure sensor.

21. (Previously presented) A wireless wearable device as recited in claim 20, wherein the pressure sensor includes a Hall-effect sensor.

22. (Previously presented) A wireless wearable device as recited in claim 11 comprising a first connector that includes a plurality of conductive pads that are configured to couple with a second connector external to the wireless wearable device, wherein each of the conductive pads is configured to be in contact with a corresponding metallic contact of the second connector when the first connector is connected to the second connector.

23. (Previously presented) A wireless wearable device as recited in claim 11 comprising a display.

24. (Previously presented) A wireless wearable device as recited in claim 11 comprising a camera.

25. (Currently amended) A wireless wearable device as recited in claim 11 comprising a storage medium configured to store at least computer program codes for facilitating voice recognition,

wherein at least the microphone is configured to receive at least a ~~term~~ word, with the at least a ~~term~~ word recognized using at least the computer program codes for facilitating voice recognition, and

wherein the wireless wearable device is configured to enable the user to receive and respond to the message hands-free, using at least the speaker and at least the microphone.

26. (Currently amended) A wireless wearable device as recited in claim 25 comprising:

a sensor configured to at least provide an indication regarding the wireless wearable device being used ~~worn~~;

a touch-sensitive input surface configured to receive at least a touch input to generate at least an electrical signal for an operation of the wireless wearable device; and

a first connector that includes a plurality of conductive pads that are configured to couple with a second connector external to the wireless wearable device, wherein each of the conductive pads is configured to be in contact with a corresponding metallic contact of the second connector when the first connector is connected to the second connector.

27. (Previously presented) A wireless wearable device as recited in claim 26 comprising a camera.

28. (Currently amended) A wireless wearable device as recited in claim 25 comprising:

a sensor configured to at least provide an indication regarding the wireless wearable device being used ~~worn~~;

a pressure sensor; and

a first connector that includes a plurality of conductive pads that are configured to couple with a second connector external to the wireless wearable device, wherein each of the conductive pads is configured to be in contact with a corresponding metallic contact of the second connector when the first connector is connected to the second connector.

29. (Previously presented) A wireless wearable device as recited in claim 28 comprising a touch-sensitive input surface configured to receive at least a touch input to generate at least an electrical signal for an operation of the wireless wearable device.

30. (Currently amended) A wireless wearable device as recited in claim 25 comprising:

a sensor configured to at least provide an indication regarding the wireless wearable device being used ~~worn~~;

an accelerometer;

a display; and

a camera.

31. (Previously presented) A wireless wearable device as recited in claim 30 comprising a pressure sensor.

32. (Currently amended) A wireless wearable device configured to secure to the head of a user, with the device proximate to at least one ear of the user to at least help the user hear, the wireless wearable device comprising:

a printed circuit board provided in the wireless wearable device, the printed circuit board having at least one electrical component attached thereon, the at least one electrical component being electrically connected to a plurality of other

electrical components, each of the plurality of other electrical components being provided at least partially in the wireless wearable device;

a speaker in the wireless wearable device;

a microphone in the wireless wearable device;

wireless communication circuitry;

a storage medium configured to store at least computer program codes for facilitating voice recognition;

a sensor configured to at least provide an indication regarding the wireless wearable device being used ~~worn~~;

a pressure sensor; and

a first connector that includes a plurality of conductive pads that are configured to couple with a second connector external to the wireless wearable device, wherein each of the conductive pads is configured to be in contact with a corresponding metallic contact of the second connector when the first connector is connected to the second connector,

wherein at least the microphone is configured to receive at least a ~~term~~ word, with the at least a ~~term~~ word recognized using at least the computer program codes for facilitating voice recognition,

wherein the at least one electrical component or the plurality of other electrical components include at least a controller,

wherein the at least a controller is configured to facilitate modifying power based on at least one hearing characteristic of the user, to help the user hear outputs presented to the user via at least the speaker,

wherein the wireless communication circuitry is configured to wirelessly receive a message from a mobile phone via at least a Bluetooth network,

wherein if the message is a text message, the at least a controller is configured to have at least a notification ~~portion~~ of the text message presented to the user,

wherein if the message is an audio message, the at least a controller is configured to have at least a notification ~~portion~~ of the audio message presented to the user,

wherein the wireless wearable device is configured to enable the user to receive and respond to the message hands-free, using at least the speaker and at least the microphone,

wherein the wireless wearable device comprises another microphone,

wherein the microphone is configured to be located closer to mouth of the user than the another microphone when the wireless wearable device is worn by the user,

wherein at least the another microphone is configured to capture at least ambient noise, and

wherein at least a portion of signals from the microphone is configured to be reduced based on signals from the another microphone at least for reducing at least a portion of the ambient noise in signals from the microphone.

33. (New) A wearable device configured to secure to the head of a user, with the device proximate to at least one ear of the user to at least help the user hear, the wearable device comprising:

a printed circuit board provided in the wearable device, the printed circuit board having at least one electrical component attached thereon, the at least one electrical component being electrically connected to a plurality of other electrical components, each of the plurality of other electrical components being provided at least partially in the wearable device;

a speaker in the wearable device;

a microphone in the wearable device;

a camera;

a motion sensor;

a display; and

communication circuitry,

wherein the at least one electrical component or the plurality of other electrical components include at least a controller,

wherein the at least a controller is configured to facilitate modifying power within a range of frequencies, to help the user hear outputs presented to the user via at least the speaker,

wherein the communication circuitry is configured to receive a message from a mobile phone,

wherein if the message is a text message, the at least a controller is configured to have at least a notification of the text message presented to the user,

wherein if the message is an audio message, the at least a controller is configured to have at least a notification of the audio message presented to the user,

wherein the wearable device is configured to enable the user to receive and respond to the message hands-free, using at least the speaker and at least the microphone,

wherein the wearable device comprises another microphone,

wherein the microphone is configured to be located closer to mouth of the user than the another microphone when the wearable device is worn by the user,

wherein at least the another microphone is configured to capture at least ambient noise, and

wherein at least a portion of signals from the microphone is configured to be reduced based on signals from the another microphone at least for reducing at least a portion of the ambient noise in signals from the microphone.

REMARKS

Applicants have previously presented claims 1-5 and 7-32 for examination. The Examiner has allowed the claims, which Applicants acknowledge with gratitude. By this amendment, Applicants have amended claims 1, 5, 11, 12, 15, 25, 26, 28, 30, and 32; and have added claim 33. Accordingly, claims 1-5, and 7-33 are pending. Reconsideration of the application and an early Notice of Allowance are earnestly solicited.

If there are any issues remaining which the Examiner believes could be resolved through either a Supplemental Response or an Examiner's Amendment, the Examiner is respectfully requested to contact the undersigned representative at the telephone number listed below.

Respectfully submitted,

/Peter P. Tong/

Peter P. Tong
Reg. No. 35,757

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/942,347	09/12/2022	Thomas A. Howell	IPVCP006X1C8	1038

34071 7590 08/09/2023

IPVENTURE, INC.
4010 Moorpark Avenue
Suite 211
San Jose, CA 95117

EXAMINER	
ELAHEE, MD S	

ART UNIT	PAPER NUMBER
2653	

MAIL DATE	DELIVERY MODE
08/09/2023	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Corrected ***Notice of Allowability***	**Application No.** 17/942,347	**Applicant(s)** Howell et al.	
	Examiner MD S ELAHEE	**Art Unit** 2653	**AIA (FITF) Status** No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☑ This communication is responsive to 7/11/2023.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☑ The allowed claim(s) is/are 1-5 and 7-32 . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information , please see **http://www.uspto.gov/patents/init_events/pph/index.jsp** or send an inquiry to **PPHfeedback@uspto.gov.**

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some* c) ☐ None of the:

   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☑ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.
5. ☐ Examiner's Amendment/Comment
6. ☐ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/MD S ELAHEE/
Primary Examiner, Art Unit 2653

Form 1449 (Modified)	Atty. Docket No.	IPVCP006X1C8
	Application No.:	17/942,347
Information Disclosure Statement By Applicant	Applicant	HOWELL et al.
	Filing Date	September 12, 2022
	Group	2653
(Use Several Sheets if Necessary)		Page 1 of 1

U.S. Patent Documents

Examiner Initial	No.	Patent No.	Date	Patentee	Class	Sub-class	Filing Date
	1.	2,725,462	Nov-55	Vorgang			
	2.						
	3.						
	4.						
	5.						
	6.						
	7.						
	8.						
	9.						
	10.						

Foreign Documents

							Translation	
Init.		Document No.	Date	Country	Class	Subclass	Yes	No

Other Documents (Including Author, Title, Date, Pertinent Pages, etc.)

	A	Notice of Allowance for U.S. Patent Application No. 17/484,080, dated June 1, 2023.
	B	Notice of Allowance for U.S. Patent Application No. 17/949,029, dated July 3, 2023.
	C	Notice of Allowance for U.S. Patent Application No. 16/182,969, dated June 30, 2023.
	D	Office Action for U.S. Patent Application No. 18/129,660, dated May 19, 2023.
	E	Office Action for U.S. Patent Application No. 18/129,660, dated July 7, 2023.
	F	
	G	

Examiner	Date Considered
/MD S ELAHEE/	08/07/2023

Examiner: Initial citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /M.S.E/

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
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Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

34071 7590 08/14/2023

IPVENTURE, INC.
4010 Moorpark Avenue
Suite 211
San Jose, CA 95117

EXAMINER	
ELAHEE, MD S	
ART UNIT	PAPER NUMBER
2653	

DATE MAILED: 08/14/2023

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/942,347	09/12/2022	Thomas A. Howell	IPVCP006X1C8	1038

TITLE OF INVENTION: WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1200	$0.00	$0.00	$1200	11/14/2023

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 40% the amount of undiscounted fees, and micro entity fees are 20% the amount of undiscounted fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications. **Because electronic patent issuance may occur shortly after issue fee payment, any desired continuing application should preferably be filed prior to payment of this issue fee in order not to jeopardize copendency.**

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

34071 7590 08/14/2023
IPVENTURE, INC.
4010 Moorpark Avenue
Suite 211
San Jose, CA 95117

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/942,347	09/12/2022	Thomas A. Howell	IPVCP006X1C8	1038

TITLE OF INVENTION: WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1200	$0.00	$0.00	$1200	11/14/2023

EXAMINER	ART UNIT	CLASS-SUBCLASS
ELAHEE, MD S	2653	381-327000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/AIA/122 or PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/47 or PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. Fees submitted: ❑Issue Fee ❑Publication Fee (if required)

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

❑ Electronic Payment via Patent Center or EFS-Web ❑ Enclosed check ❑ Non-electronic payment by credit card (Attach form PTO-2038)

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. **Change in Entity Status** (from status indicated above)

❑ Applicant certifying micro entity status. See 37 CFR 1.29

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

❑ Applicant asserting small entity status. See 37 CFR 1.27

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

❑ Applicant changing to regular undiscounted fee status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/942,347	09/12/2022	Thomas A. Howell	IPVCP006X1C8	1038

34071 7590 08/14/2023

IPVENTURE, INC.
4010 Moorpark Avenue
Suite 211
San Jose, CA 95117

EXAMINER	
ELAHEE, MD S	
ART UNIT	PAPER NUMBER
2653	

DATE MAILED: 08/14/2023

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 17/942,347	Applicant(s) Howell et al.	
	Examiner MD S ELAHEE	Art Unit 2653	AIA (FITF) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☑ This communication is responsive to 8/8/2023.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☑ The allowed claim(s) is/are 1-5 and 7-33 . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information , please see **http://www.uspto.gov/patents/init_events/pph/index.jsp** or send an inquiry to **PPHfeedback@uspto.gov.**

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some* c) ☐ None of the:

   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☑ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.
4. ☑ Interview Summary (PTO-413), Paper No./Mail Date. _____.
5. ☐ Examiner's Amendment/Comment
6. ☑ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/MD S ELAHEE/
Primary Examiner, Art Unit 2653

Notice of Pre-AIA or AIA Status

The present application is being examined under the pre-AIA first to invent provisions.

DETAILED ACTION

Allowable Subject Matter

1. Claims 1-5 and 7-33 are allowed.

2. The following is an examiner's statement of reasons for allowance: The invention as claimed is not disclosed nor rendered obvious in view of any prior art. As to independent claim 1, all prior art fail to teach or suggest, alone or in combination, the recited wireless headset for a user that allows a printed circuit board provided in the headset, the printed circuit board having at least one electrical component attached thereon, the at least one electrical component being electrically connected to a plurality of other electrical components, each of the plurality of other electrical components being provided at least partially in the headset; a speaker in the headset; a microphone in the headset; and wireless communication circuitry, wherein the at least one electrical component or the plurality of other electrical components include at least a controller, wherein the at least a controller is configured to facilitate modifying power within a range of frequencies based on at least one hearing characteristic of the user, to help the user hear audio outputs presented to the user via at least the speaker, wherein the wireless communication circuitry is configured to wirelessly receive a message, wherein if the message is a text message, the at least a controller is configured to have at least a portion of the text message presented to the user, wherein if the message is an audio message, the at least a controller is configured to have at least a portion of the audio message presented to the user, and wherein at least the speaker is configured to present at least a portion of the message, when the at least a portion of the message is to be presented in an audio manners. No prior art was found that discloses or teaches the limitations of claim 1.

3. As to independent claim 11, all prior art fail to teach or suggest, alone or in combination, the recited wireless wearable device that allows to secure to the head of a user, with the device proximate to at least one ear of the user to at least help the user hear, the wireless wearable device comprising: a printed circuit board provided in the wireless wearable device, the printed circuit board having at least one electrical component attached thereon, the at least one electrical component being electrically connected to a plurality of other electrical components, each of the plurality of other electrical components being provided at least partially in the wireless wearable device; a speaker in the wireless wearable device; a microphone in the wireless wearable device; and wireless communication circuitry, wherein the at least one electrical component or the plurality of other electrical components include at least a controller, wherein the at least a controller is configured to facilitate modifying power within a range of frequencies, to help the user hear outputs presented to the user via at least the speaker, wherein the wireless communication circuitry is configured to wirelessly receive a message from a mobile phone via at least a Bluetooth network, wherein if the message is a text message, the at least a controller is configured to have at least a portion of the text message presented to the user, wherein if the message is an audio message, the at least a controller is configured to have at least a notification of the audio message presented to the user, wherein the wireless wearable device comprises another microphone, wherein the microphone is configured to be located closer to mouth of the user than the another microphone when the wireless wearable device is worn by the user, wherein at least the another microphone is configured to capture at least ambient noise, and wherein at least a portion of signals from the microphone is configured to be reduced based on signals from the another microphone at least for reducing at least a portion of the ambient noise in signals from the microphone. No prior art was found that discloses or teaches the limitations of claim 11.

4. As to independent claim 32, all prior art fail to teach or suggest, alone or in combination, the recited wireless wearable device that allows to secure to the head of a user, with the device proximate to at least one ear of the user to at least help the user hear, the wireless wearable device comprising: a printed circuit board provided in the wireless wearable device, the printed circuit board having at least one electrical component attached thereon, the at least one electrical component being electrically connected to a plurality of other electrical components, each of the plurality of other electrical components being provided at least partially in the wireless wearable device; a speaker in the wireless wearable device; a microphone in the wireless wearable device; wireless communication circuitry; a storage medium configured to store at least computer program codes for facilitating voice recognition; a sensor configured to at least provide an indication regarding the wireless wearable device being used; a pressure sensor; and a first connector that includes a plurality of conductive pads that are configured to couple with a second connector external to the wireless wearable device, wherein each of the conductive pads is configured to be in contact with a corresponding metallic contact of the second connector when the first connector is connected to the second connector, wherein at least the microphone is configured to receive at least a word, with the at least a word recognized using at least the computer program codes for facilitating voice recognition, wherein the at least one electrical component or the plurality of other electrical components include at least a controller, wherein the at least a controller is configured to facilitate modifying power based on at least one hearing characteristic of the user, to help the user hear outputs presented to the user via at least the speaker, wherein the wireless communication circuitry is configured to wirelessly receive a message from a mobile phone via at least a Bluetooth network, wherein if the message is a text message, the at least a controller is configured to have at least a notification of the text message presented to the user, wherein if the message is an audio

message, the at least a controller is configured to have at least a notification of the audio message presented to the user, wherein the wireless wearable device is configured to enable the user to receive and respond to the message hands-free, using at least the speaker and at least the microphone, wherein the wireless wearable device comprises another microphone, wherein the microphone is configured to be located closer to mouth of the user than the another microphone when the wireless wearable device is worn by the user, wherein at least the another microphone is configured to capture at least ambient noise, and wherein at least a portion of signals from the microphone is configured to be reduced based on signals from the another microphone at least for reducing at least a portion of the ambient noise in signals from the microphone. No prior art was found that discloses or teaches the limitations of claim 32.

5. As to independent claim 33, all prior art fail to teach or suggest, alone or in combination, the recited wireless wearable device that allows to secure to the head of a user, with the device proximate to at least one ear of the user to at least help the user hear, the wearable device comprising: a printed circuit board provided in the wearable device, the printed circuit board having at least one electrical component attached thereon, the at least one electrical component being electrically connected to a plurality of other electrical components, each of the plurality of other electrical components being provided at least partially in the wearable device; a speaker in the wearable device; a microphone in the wearable device; a camera; a motion sensor; a display; and communication circuitry, wherein the at least one electrical component or the plurality of other electrical components include at least a controller, wherein the at least a controller is configured to facilitate modifying power within a range of frequencies, to help the user hear outputs presented to the user via at least the speaker, wherein the communication circuitry is configured to receive a message from a mobile phone, wherein if the message is a text message, the at least a controller is

configured to have at least a notification of the text message presented to the user, wherein if the message is an audio message, the at least a controller is configured to have at least a notification of the audio message presented to the user, wherein the wearable device is configured to enable the user to receive and respond to the message hands-free, using at least the speaker and at least the microphone, wherein the wearable device comprises another microphone, wherein the microphone is configured to be located closer to mouth of the user than the another microphone when the wearable device is worn by the user, wherein at least the another microphone is configured to capture at least ambient noise, and wherein at least a portion of signals from the microphone is configured to be reduced based on signals from the another microphone at least for reducing at least a portion of the ambient noise in signals from the microphone.. No prior art was found that discloses or teaches the limitations of claim 33.

6. Claims 2-5, 7-10 and 12-31 are dependent upon claims 1 and 11, respectively, therefore, claims 2-5, 7-10 and 12-31 are allowed.

7. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to MD S ELAHEE whose telephone number is (571)272-7536. The examiner can normally be reached on Monday thru Friday; 8:30AM to 5:00PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, FAN TSANG can be reached on 571-272-7547. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/MD S ELAHEE/
MD SHAFIUL ALAM ELAHEE
Primary Examiner
Art Unit 2653
August 10, 2023

Applicant-Initiated Interview Summary	**Application No.** 17/942,347	**Applicant(s)** Howell et al.		
	Examiner MD S ELAHEE	**Art Unit** 2653	**AIA (First Inventor to File) Status** No	**Page** 1 of 1

All Participants (applicant, applicants representative, PTO personnel)	**Title**	**Type**
MD S ELAHEE	Primary Examiner	Telephonic
Peter Tong	Attorney	

Date of Interview: 03 August 2023

Issues Discussed:

Proposed Amendment(s)

In response to proposed amendment of claim 11 by incorporating "within a range of frequencies" instead of "based on at least one hearing characteristic of the user", examiner told the applicant's representative that this changes will require an additional time to make an update search.

/MD S ELAHEE/ Primary Examiner, Art Unit 2653	

Applicant is reminded that a complete written statement as to the substance of the interview must be made of record in the application file. It is the applicants responsibility to provide the written statement, unless the interview was initiated by the Examiner and the Examiner has indicated that a written summary will be provided. See MPEP 713.04
Please further see:
MPEP 713.04
Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews, paragraph (b)
37 CFR § 1.2 Business to be transacted in writing

Applicant recordation instructions: The formal written reply to the last Office action must include the substance of the interview. (See MPEP section 713.04). If a reply to the last Office action has already been filed, applicant is given a non-extendable period of the longer of one month or thirty days from this interview date, or the mailing date of this interview summary form, whichever is later, to file a statement of the substance of the interview.

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/942,347	Howell et al.
	Examiner	Art Unit
	MD S ELAHEE	2653

CPC - Searched*		
Symbol	**Date**	**Examiner**
G02C11/10 OR H04M1/05 OR H04M1/6066 OR G06F1/163 OR G10L15/26 OR H04M2250/02 OR H04S1/00	04/16/2023	ME
G08B21/06	04/16/2023	ME
G08B21/06 OR G02C11/10	06/02/2023	ME
H04R25/70	06/23/2023	ME
H04R25/70 OR G08B21/06 OR G02C11/10	08/10/2023	ME

CPC Combination Sets - Searched*		
Symbol	**Date**	**Examiner**

US Classification - Searched*			
Class	**Subclass**	**Date**	**Examiner**
381	327	04/16/2023	ME

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	**Date**	**Examiner**
PE2E SEARCH	08/10/2023	ME
ASSIGNEE AND INVENTORS SEARCH	04/10/2023	ME
IP.COM	06/23/2023	ME
IP.COM	08/10/2023	ME
GOOGLE SEARCH	04/16/2023	ME

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/942,347	Howell et al.
	Examiner	Art Unit
	MD S ELAHEE	2653

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**
PE2E INTERFERENCE SEARCH		08/10/2023	ME

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/942,347	Howell et al.
	Examiner	**Art Unit**
	MD S ELAHEE	2653

CPC						
Symbol					**Type**	**Version**
G02C	/	11	/	10	F	2013-01-01
G06F	/	1	/	163	I	2013-01-01
H04M	/	1	/	05	I	2013-01-01
G10L	/	15	/	26	I	2013-01-01
H04M	/	1	/	6066	I	2013-01-01
H04M	/	2250	/	02	A	2013-01-01

CPC Combination Sets							
Symbol					**Type**	**Set**	**Ranking**	**Version**
	/		/					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	32	
/MD S ELAHEE/ Primary Examiner, Art Unit 2653	10 August 2023	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

U.S. Patent and Trademark Office — Part of Paper No.: 20230810

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/942,347	Howell et al.
	Examiner	**Art Unit**
	MD S ELAHEE	2653

INTERNATIONAL CLASSIFICATION					
CLAIMED					
H04R	/	25	/	00	
NON-CLAIMED					
	/		/		

US ORIGINAL CLASSIFICATION	
CLASS	**SUBCLASS**
381	327

CROSS REFERENCES(S)						
CLASS	**SUBCLASS (ONE SUBCLASS PER BLOCK)**					

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	32	
/MD S ELAHEE/ Primary Examiner, Art Unit 2653	10 August 2023	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

U.S. Patent and Trademark Office — Part of Paper No.: 20230810

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/942,347	Howell et al.
	Examiner	**Art Unit**
	MD S ELAHEE	2653

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIMS

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1	9	10	18	19	27	28								
2	2	10	11	19	20	28	29								
3	3	11	12	20	21	29	30								
4	4	12	13	21	22	30	31								
5	5	13	14	22	23	31	32								
	6	14	15	23	24	32	33								
6	7	15	16	24	25										
7	8	16	17	25	26										
8	9	17	18	26	27										

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	32	
/MD S ELAHEE/ Primary Examiner, Art Unit 2653	10 August 2023	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

U.S. Patent and Trademark Office — Part of Paper No.: 20230810

Main Concept Text
==========
A wireless wearable device configured to secure to the head of a user, with the device proximate to at least one ear of the user to at least help the user hear, the wireless wearable device comprising: a printed circuit board provided in the wireless wearable device, the printed circuit board having at least one electrical component attached thereon, the at least one electrical component being electrically connected to a plurality of other electrical components, each of the plurality of other electrical components being provided at least partially in the wireless wearable device; a speaker in the wireless wearable device; a microphone in the wireless wearable device; and wireless communication circuitry, wherein the at least one electrical component or the plurality of other electrical components include at least a controller, wherein the at least a controller is configured to facilitate modifying power within a range of frequencies, to help the user hear outputs presented to the user via at least the speaker, wherein the wireless communication circuitry is configured to wirelessly receive a message from a mobile phone via at least a Bluetooth network, wherein if the message is a text message, the at least a controller is configured to have at least a notification of the text message presented to the user, wherein if the message is an audio message, the at least a controller is configured to have at least a notification of the audio message presented to the user, wherein the wireless wearable device comprises another microphone, wherein the microphone is configured to be located closer to mouth of the user than the another microphone when the wireless wearable device is worn by the user, wherein at least the another microphone is configured to capture at least ambient noise, and wherein at least a portion of signals from the microphone is configured to be reduced based on signals from the another microphone at least for reducing at least a portion of the ambient noise in signals from the microphone.

(No Concept Modifiers)
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(No Filters)
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Options
=======
De-dup: None
Relevance Cut-off: None
Sort: Relevance

Content: Patents + NPL (192)
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US Patents
US Designs
US Applications

EPO Patents
EPO Applications
China Patents
China Applications
Japan Patents
Japan Applications
Korea Patents
Korea Applications
WIPO Applications
Argentina Patents
Argentina Applications
Brazil Patents
Brazil Applications
Canada Patents
Canada Applications
Chile Patents
Chile Applications
Colombia Applications
Costa Rica Applications
Cuba Patents
Cuba Applications
Dominican Republic Applications
Ecuador Patents
Ecuador Applications
El Salvador Applications
Guatemala Applications
Honduras Applications
Mexico Patents
Mexico Applications
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Peru Applications
Trinidad & Tobago Patents
Uruguay Applications
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Czechoslovakia Patents
Czechoslovakia Applications
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Denmark Applications
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OnePetro.org: Conferences at OnePetro.org
Other Literature: IBM Redbooks
Other Literature: PubMed Central
Other Literature: arXiv.org

PE2E SEARCH - Search History (Prior Art)

There are no Prior Art searches to show.

PE2E SEARCH - Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
N11	505	(chang$4 OR modif$5 OR updat$4 OR alter$4 OR adjust$5 OR switch$4 OR transform$4 OR variation OR varie$2 OR vary$3 OR variance OR turn$4) near4 (power OR strength OR voltage) WITH frequenc$3 WITH (hear$5 OR listen$4)	(US-PGPUB)	OR	ON	ON	2023/08/10 01:06 PM
N12	37	N11 AND (@ad<"20030415" OR @rlad<"20020415" OR @ptad<"20030415")	(US-PGPUB)	OR	ON	ON	2023/08/10 01:07 PM
N13	541	(chang$4 OR modif$5 OR updat$4 OR alter$4 OR adjust$5 OR switch$4 OR transform$4 OR variation OR varie$2 OR vary$3 OR variance OR turn$4) near4 (power OR strength OR voltage OR force$4) WITH frequenc$3 WITH (hear$5 OR listen$4)	(US-PGPUB)	OR	ON	ON	2023/08/10 01:11 PM
N14	43	N13 AND (@ad<"20030415" OR @rlad<"20020415" OR @ptad<"20030415")	(US-PGPUB)	OR	ON	ON	2023/08/10 01:11 PM

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L68	6976	(chang$4 OR modif$5 OR updat$4 OR alter$4 OR adjust$5 OR switch$4 OR transform$4 OR variation OR varie$2 OR vary$3 OR variance OR turn$4) near4 (power OR strength OR voltage) WITH frequenc$3 WITH (hear$5 OR listen$4)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/10 10:21 AM
L69	440337	((head near3 wear$4) OR headset OR headband OR headphone OR ((ear OR head) ADJ (set OR band OR phone)) OR earset OR earband OR earbud OR (ear ADJ (bud OR cup)) OR earcup OR earphone) WITH (speaker OR transducer)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/10 10:22 AM
L70	467	68 AND 69	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/10 10:23 AM
L71	61	70 AND (@ad<"20030415" OR @rlad<"20020415" OR @ptad<"20030415")	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU,	OR	ON	ON	2023/08/10 10:24 AM

			CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L72	43424	(H04R25/70 OR G08B21/06 OR G02C11/10).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/10 12:48 PM
L73	23	70 AND 72	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/10 12:49 PM

PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

Form 1449 (Modified)	Atty. Docket No.	IPVCP006X1C8
	Application No.:	17/942,347
Information Disclosure Statement By Applicant	Applicant	HOWELL et al.
	Filing Date	September 12, 2022
	Group	2653
(Use Several Sheets if Necessary)		Page 1 of 1

U.S. Patent Documents

Examiner Initial	No.	Patent No.	Date	Patentee	Class	Sub-class	Filing Date
	1.	2022/0415338 A1	Dec-22	Howell et al.			
	2.	2023/0017635 A1	Jan-23	Howell et al.			
	3.	2023/0236444 A1	Jul-23	Howell et al.			
	4.	11,721,183 B2	Aug-23	Howell et al.			
	5.	11,733,549 B2	Aug-23	Howell et al.			
	6.						
	7.						
	8.						
	9.						
	10.						

Foreign Documents

							Translation	
Init.		Document No.	Date	Country	Class	Subclass	Yes	No

Other Documents (Including Author, Title, Date, Pertinent Pages, etc.)

	A	
	B	
	C	
	D	
	E	
	F	
	G	

Examiner	Date Considered
/MD S ELAHEE/	08/10/2023

Examiner: Initial citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /M.S.E/

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: HOWELL et al.	Attorney Docket No.: IPVCP006X1C8
Application No.: 17/942,347	Examiner: ELAHEE, MD S
Filed: September 12, 2022	Group: 2653

Title: WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT

CERTIFICATE OF ELECTRONIC FILING

I hereby certify that this correspondence is being transmitted electronically to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on August 21, 2023.

Signed: /Angela D. Nijim/ Printed Name: Angela D. Nijim

Statement of the Substance of the Interview

Mail Stop _____
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Applicants appreciate the Examiner for the courtesies extended to Applicants' representative at the August 3, 2023, interview. At the interview, certain claim languages were discussed, with no specific agreements reached.

Respectfully submitted,

/Peter P. Tong/

Peter P. Tong
Reg. No. 35,757

(650) 903-9200, x102

Electronic Acknowledgement Receipt

EFS ID:	48466386
Application Number:	17942347
International Application Number:	
Confirmation Number:	1038
Title of Invention:	WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT
First Named Inventor/Applicant Name:	Thomas A. Howell
Customer Number:	34071
Filer:	Peter P. Tong/Angela Nijim
Filer Authorized By:	Peter P. Tong
Attorney Docket Number:	IPVCP006X1C8
Receipt Date:	21-AUG-2023
Filing Date:	12-SEP-2022
Time Stamp:	12:52:00
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Applicant summary of interview with examiner	IPVCP006X1C8_StatementOfSubstance_AsFiled_8-23.pdf	18281 47473f4527c6a7caa9f04cd784712c6df2c1a872	no	1

Warnings:

Information:	
Total Files Size (in bytes):	18281

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Electronic Patent Application Fee Transmittal

Application Number:	17942347
Filing Date:	12-Sep-2022
Title of Invention:	WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT
First Named Inventor/Applicant Name:	Thomas A. Howell
Filer:	Peter P. Tong/Angela Nijim
Attorney Docket Number:	IPVCP006X1C8

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
SUBMISSION- INFORMATION DISCLOSURE STMT	1806	1	260	260
		Total in USD ($)		**260**

Electronic Acknowledgement Receipt	
EFS ID:	48606160
Application Number:	17942347
International Application Number:	
Confirmation Number:	1038
Title of Invention:	WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT
First Named Inventor/Applicant Name:	Thomas A. Howell
Customer Number:	34071
Filer:	Peter P. Tong/Angela Nijim
Filer Authorized By:	Peter P. Tong
Attorney Docket Number:	IPVCP006X1C8
Receipt Date:	20-SEP-2023
Filing Date:	12-SEP-2022
Time Stamp:	09:54:51
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$260
RAM confirmation Number	E20239J055555905
Deposit Account	503874
Authorized User	Angela Nijim
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.21 (Miscellaneous fees and charges)	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	IPVCP006X1C8_IDSAfterNoA_9-23.pdf	21357 64e8517f0689c05b1019fe1a9bfcaefca6e1964a	no	2
Warnings:					
Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	IPVCP006X1C8_1449_9-23.pdf	21923 6b1b8a49eceee0bbe10d62fcd2d06bc64611e948	no	1
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	Amendment after Notice of Allowance (Rule 312)	IPVCP006X1C8_312Amd_9-23.pdf	27647 341fdaa67a7fb242fc0c5f519d2e7fbaba59bcc5	no	3
Warnings:					
Information:					
4	Fee Worksheet (SB06)	fee-info.pdf	38350 0b1889d3ab7fd5877a00ce096df42fa083cf833b	no	2
Warnings:					
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		Total Files Size (in bytes):	109277		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: HOWELL et al.	Attorney Docket No.: IPVCP006X1C8
Application No.: 17/942,347	Examiner: ELAHEE, MD S
Filed: September 12, 2022	Group: 2653
Title: WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT	

INFORMATION DISCLOSURE STATEMENT AFTER FINAL ACTION OR NOTICE OF ALLOWANCE (37 CFR §§ 1.56 AND 1.97(d))

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

The references listed in the attached PTO Form 1449, a copy of which is attached, may be material to examination of the above-identified patent application. Applicants submit this reference in compliance with their duty of disclosure pursuant to 37 CFR §§1.56 and 1.97. The Examiner is requested to make this citation of official record in this application.

This Information Disclosure Statement is not to be construed as a representation that a search has been made, that additional information material to the examination of this application does not exist, or that this reference indeed constitutes prior art.

This Information Disclosure Statement is being filed after the mailing date of final action under §1.113 or a notice of allowance under §1.311, but before payment of the issue fee.

Accompanying this Information Disclosure Statement is the fee set forth in 37 CFR 1.17(p).

The undersigned hereby states:

☐ that each item of information contained in the Information Disclosure Statement was first cited in a communication from a foreign patent office in a counterpart foreign application no more than three months prior to the filing of the Information Disclosure Statement, or

☒ that no item of information contained in the Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign application, and to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the Information Disclosure Statement was known to any individual designated in § 1.56(c) more than three months prior to the filing of the Information Disclosure Statement.

Electronic Fee in payment of the Information Disclosure Statement Fee is provided herewith. If it is determined that any additional fees are due, the Commissioner is hereby authorized to charge such fees to Deposit Account 50-3874 (Order No. IPVCP006X1C8).

Respectfully submitted,

/Peter P. Tong/

Peter P. Tong
Registration No. 35,757

4010 Moorpark Avenue
Suite 211
San Jose, CA 95117

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: HOWELL et al.

Attorney Docket No.: IPVCP006X1C8

Application No.: 17/942,347

Examiner: ELAHEE, MD S.

Filed: September 12, 2022

Group: 2653

Title: WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT

CERTIFICATE OF ELECTRONIC FILING

I hereby certify that this correspondence is being transmitted electronically to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on September 20, 2023.

Signed: /Angela D. Nijim/ Printed Name: Angela D. Nijim

312 AMENDMENT

Mail Stop _____
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

In response to the Notice of Allowance dated August 14, 2023, please amend the above-identified patent application as follows:

Amendments to the Specification are reflected to begin on page 2 of this paper.

Remarks/Arguments are reflected on page 3 of this paper.

Amendments to the Specification:

On page 4, after paragraph 7 of the specification, please ADD paragraphs 0007.1-0007.3 as follows:

- -

[0007.1] Also, typically, to participate in wireless communications, a user holds a mobile phone (e.g., wireless or a cellular phone) against his ear to hear an audio communication received in a wireless manner. The user usually also speaks towards a microphone embedded in the mobile phone to participate in the audio communication, again in a wireless manner. More recently, to facilitate hands-free operation of mobile phones, head-sets have been produced and utilized. Typically, a headset clips over or into an ear of the user to provide a speaker and a microphone in proximity to the ear and the mouth, respectively, of the user. Traditionally, the head-set was connected to the mobile phone by a cord (i.e., wire). In recent times, head-sets have been developed to operate in a wireless manner, without the need of a cord connected to the mobile phone. For example, one popular type of wireless head-set uses Bluetooth wireless transmissions to communicate between the head-set and the corresponding mobile phone.

[0007.2] Mobile phones often support both voice calls and text messaging. When the user does not make use of a head-set, the user often holds the mobile phone against their ear when participating in a voice call. One problem this presents is that the user is not able to see the screen of the mobile phone. As a result, the user has difficultly interacting with the keypad or screen of the mobile phone when the mobile phone is held against the user's head. Alternatively, when the user of a mobile phone makes use of a head-set, the user can receive and participate in voice calls in a hands-free manner. Unfortunately, however, the user would need to view a screen of the mobile phone to participate in text messaging.

[0007.3] Accordingly, there is a need for improved wireless communication techniques for users of mobile communication devices.

- -

REMARKS

The Examiner has allowed all the claims, which Applicants acknowledge with gratitude. By this amendment, Applicants have added paragraphs 7.1 to 7.3 with support found, for example, in the background of the invention in U.S. Patent No. 7,116,976, entitled "ADAPTABLE COMMUNICATION TECHNIQUES FOR ELECTRONIC DEVICES," which was incorporated by reference in paragraph 0005 of the current application.

If there are any issues remaining which the Examiner believes could be resolved through either a Supplemental Response or an Examiner's Amendment, the Examiner is respectfully requested to contact the undersigned representative at the telephone number listed below.

Respectfully submitted,

/Peter P. Tong/

Peter P. Tong
Reg. No. 35,757

Form 1449 (Modified)	Atty. Docket No.	IPVCP006X1C8
	Application No.:	17/942,347
Information Disclosure Statement By Applicant	Applicant	HOWELL et al.
	Filing Date	September 12, 2022
	Group	2653
(Use Several Sheets if Necessary)		Page 1 of 1

U.S. Patent Documents

Examiner Initial	No.	Patent No.	Date	Patentee	Class	Sub-class	Filing Date
	1.	2019/0117121 A1	Apr-19	Kutina et al.			
	2.	2021/0399691 A1	Dec-21	SAMINATHAN et al.			
	3.	2023/0273464 A1	Aug-23	Howell et al.			
	4.	11,762,224 B2	Sep-23	Howell et al.			
	5.						
	6.						
	7.						
	8.						
	9.						
	10.						

Foreign Documents

Init.		Document No.	Date	Country	Class	Subclass	Translation Yes	Translation No

Other Documents (Including Author, Title, Date, Pertinent Pages, etc.)

	A	Office Action for U.S. Patent Application No. 17/964,853, dated September 15, 2023.
	B	Notice of Allowance for U.S. Patent Application No. 18/129,660, dated August 24, 2023.
	C	Office Action for U.S. Patent Application No. 18/224,793, dated September 7, 2023.
	D	
	E	
	F	
	G	

Examiner	Date Considered

Examiner: Initial citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/942,347	09/12/2022	Thomas A. Howell	IPVCP006X1C8	1038

34071 7590 10/13/2023

IPVENTURE, INC.
4010 Moorpark Avenue
Suite 211
San Jose, CA 95117

EXAMINER	
ELAHEE, MD S	

ART UNIT	PAPER NUMBER
2694	

MAIL DATE	DELIVERY MODE
10/13/2023	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Response to Rule 312 Communication	Application No.	Applicant(s)	
	17/942,347	Howell et al.	
	Examiner	Art Unit	AIA (FITF) Status
	MD S ELAHEE	2694	No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

1. ☑ The amendment filed on 20 September 2023 under 37 CFR 1.312 has been considered, and has been:
   a) ☑ entered.
   b) ☐ entered as directed to matters of form not affecting the scope of the invention.
   c) ☐ disapproved because the amendment was filed after the payment of the issue fee.
      Any amendment filed after the date the issue fee is paid must be accompanied by a petition under 37 CFR 1.313(c)(1) and the required fee to withdraw the application from issue.
   d) ☐ disapproved. See explanation below.
   e) ☐ entered in part. See explanation below.
   f) ☐ not entered because the supplemental or corrected Application Data sheet (ADS)
      ☐ was not accompanied by a petition to accept an unintentionally delayed claim under 37 CFR 1.55 or 27 CFR 1.78;
      ☐ did not identify the information being changed in accordance with 37 CFR 1.76(c)(2);
      ☐ was not properly signed in accordance with 37 CFR 1.76(e) (or 37 CFR 1.33(b) for applications filed prior to September 16, 2012).

/MD S ELAHEE/
Primary Examiner, Art Unit 2694

Applicant-Initiated Interview Summary	**Application No.** 17/942,347	**Applicant(s)** Howell et al.		
	Examiner MD S ELAHEE	**Art Unit** 2694	**AIA (First Inventor to File) Status** No	**Page** 1 of 1

All Participants (applicant, applicants representative, PTO personnel)	**Title**	**Type**
MD S ELAHEE	Primary Examiner	Telephonic
Peter Tong	Applicant's rep.	

Date of Interview: 27 August 2023

Issues Discussed:

Proposed Amendment(s)

The applicant's representative would like to amend claim 11 after allowance. In an inquiry whether the changes in attached document is minor or not, Examiner informed the applicant's representative that the amendment is not minor (see the attachment).

☑ Attachment

/MD S ELAHEE/ Primary Examiner, Art Unit 2694	

Applicant is reminded that a complete written statement as to the substance of the interview must be made of record in the application file. It is the applicants responsibility to provide the written statement, unless the interview was initiated by the Examiner and the Examiner has indicated that a written summary will be provided. See MPEP 713.04
Please further see:
MPEP 713.04
Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews, paragraph (b)
37 CFR § 1.2 Business to be transacted in writing

Applicant recordation instructions: The formal written reply to the last Office action must include the substance of the interview. (See MPEP section 713.04). If a reply to the last Office action has already been filed, applicant is given a non-extendable period of the longer of one month or thirty days from this interview date, or the mailing date of this interview summary form, whichever is later, to file a statement of the substance of the interview.

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

Form 1449 (Modified)	Atty. Docket No.	IPVCP006X1C8
	Application No.:	17/942,347
Information Disclosure Statement By Applicant	Applicant	HOWELL et al.
	Filing Date	September 12, 2022
	Group	2653
(Use Several Sheets if Necessary)		Page 1 of 1

U.S. Patent Documents

Examiner Initial	No.	Patent No.	Date	Patentee	Class	Sub-class	Filing Date
	1.	2019/0117121 A1	Apr-19	Kutina et al.			
	2.	2021/0399691 A1	Dec-21	SAMINATHAN et al.			
	3.	2023/0273464 A1	Aug-23	Howell et al.			
	4.	11,762,224 B2	Sep-23	Howell et al.			
	5.						
	6.						
	7.						
	8.						
	9.						
	10.						

Foreign Documents

Init.		Document No.	Date	Country	Class	Subclass	Translation Yes	Translation No

Other Documents (Including Author, Title, Date, Pertinent Pages, etc.)

	A	Office Action for U.S. Patent Application No. 17/964,853, dated September 15, 2023.
	B	Notice of Allowance for U.S. Patent Application No. 18/129,660, dated August 24, 2023.
	C	Office Action for U.S. Patent Application No. 18/224,793, dated September 7, 2023.
	D	
	E	
	F	
	G	

Examiner	Date Considered
/MD S ELAHEE/	10/07/2023

Examiner: Initial citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /M.S.E/

From: Peter Tong
To: Elahee, Shafiul Alam
Subject: RE: Serial Number 17/942,347
Date: Tuesday, August 29, 2023 9:51:51 PM

CAUTION: This email has originated from a source outside of USPTO. **PLEASE CONSIDER THE SOURCE** before responding, clicking on links, or opening attachments.

Dear Examiner Elahee,

Do you mind if we file a 312 by changing one word as follows?

Thanks,

Best,

Peter

11. A wireless wearable device configured to secure to the head of a user, with the device proximate to at least one ear of the user to at least help the user hear, the wireless wearable device comprising:

a printed circuit board provided in the wireless wearable device, the printed circuit board having at least one electrical component attached thereon, the at least one electrical component being electrically connected to a plurality of other electrical components, each of the plurality of other electrical components being provided at least partially in the wireless wearable device;

a speaker in the wireless wearable device;

a microphone in the wireless wearable device; and

wireless communication circuitry,

wherein the at least one electrical component or the plurality of other electrical components include at least a controller,

wherein the at least a controller is configured to facilitate modifying power within a range of frequencies, to help the user hear outputs presented to the user via at least the speaker,

wherein the wireless communication circuitry is configured to wirelessly receive a message from a mobile phone via at least a Bluetooth network,

wherein if the message is a text message, the at least a controller is configured to have at least a notification of the text message presented to the user,

wherein if the message is an audio message, the at least a controller is configured to have at least a notification of the audio message presented to the user,

wherein the wireless wearable device comprises another microphone,

wherein the microphone is configured to be located closer to mouth of the user than the another microphone when the wireless wearable device is worn by the user,

wherein at least the another microphone is configured to capture at least ambient noise, and

wherein at least a portion of signals from the microphone is configured to be ~~reduced~~ changed based on signals from the another microphone at least for reducing at least a portion of the ambient noise in signals from the microphone.

From: Peter Tong
Sent: Sunday, August 27, 2023 8:58 PM
To: 'shafiulalam.elahee@uspto.gov' <shafiulalam.elahee@uspto.gov>
Subject: Serial Number 17/942,347

Dear Examiner Elahee,

Would like to file a 312 to amend claim 11 slightly (and similarly for claim 1), as follows. Sorry to increase your workload. Hope it's fine with you.

Would at once pay issue fee after that. Would that be ok?

Best,

Peter

11. A wireless wearable device configured to secure to the head of a user, with the device proximate to at least one ear of the user to at least help the user hear, the wireless wearable device comprising:

a printed circuit board provided in the wireless wearable device, the printed circuit board having at least a controller attached thereon ~~one electrical component attached thereon, the at least one electrical component being electrically connected to a plurality of other electrical components, each of the plurality of other electrical components being provided at least partially in the wireless wearable device~~;

a speaker in the wireless wearable device;

a microphone in the wireless wearable device; and

wireless communication circuitry,

~~wherein the at least one electrical component or the plurality of other electrical components include at least a controller,~~

wherein the at least a controller is configured to facilitate modifying power within a range of frequencies, to help the user hear outputs presented to the user via at least the speaker,

wherein the wireless communication circuitry is configured to wirelessly receive

a message from a mobile phone via at least a Bluetooth network,

wherein if the message is a text message, the at least a controller is configured to have at least a notification of the text message presented to the user,

wherein if the message is an audio message, the at least a controller is configured to have at least a notification of the audio message presented to the user,

wherein the wireless wearable device comprises another microphone,

wherein the microphone is configured to be located closer to mouth of the user than the another microphone when the wireless wearable device is worn by the user,

wherein at least the another microphone is configured to capture at least ambient noise, and

wherein at least a portion of signals from the microphone is configured to be ~~reduced~~ changed based on signals from the another microphone at least for reducing at least a portion of the ambient noise in signals from the microphone.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: HOWELL et al.

Attorney Docket No.: IPVCP006X1C8

Application No.: 17/942,347

Examiner: ELAHEE, MD S.

Filed: September 12, 2022

Group: 2653

Title: WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT

CERTIFICATE OF ELECTRONIC FILING

I hereby certify that this correspondence is being transmitted electronically to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on September 20, 2023.

Signed: /Angela D. Nijim/ Printed Name: Angela D. Nijim

OK TO ENTER: /M.S.E/

312 AMENDMENT

Mail Stop _____
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

In response to the Notice of Allowance dated August 14, 2023, please amend the above-identified patent application as follows:

Amendments to the Specification are reflected to begin on page 2 of this paper.

Remarks/Arguments are reflected on page 3 of this paper.

Form 1449 (Modified)	Atty. Docket No.	IPVCP006X1C8
	Application No.:	17/942,347
Information Disclosure Statement By Applicant	Applicant	HOWELL et al.
	Filing Date	September 12, 2022
	Group	2694
(Use Several Sheets if Necessary)		Page 1 of 1

U.S. Patent Documents

Examiner Initial	No.	Patent No.	Date	Patentee	Class	Sub-class	Filing Date
	1.	2002/0146097 A1	Oct-02	Vuori			
	2.	5,790,311	Aug-98	Togino			
	3.						
	4.						
	5.						
	6.						
	7.						
	8.						
	9.						
	10.						

Foreign Documents

						Translation	
Init.		Document No.	Date	Country	Class	Subclass	Yes	No

Other Documents (Including Author, Title, Date, Pertinent Pages, etc.)

	A	
	B	
	C	
	D	
	E	
	F	
	G	

Examiner	Date Considered

Examiner: Initial citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: HOWELL et al.

Attorney Docket No.: IPVCP006X1C8

Application No.: 17/942,347

Examiner: ELAHEE, MD S

Filed: September 12, 2022

Group: 2694

Title: WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT

CERTIFICATE OF ELECTRONIC FILING

I hereby certify that this correspondence is being transmitted electronically to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on October 24, 2023.

Signed: /Angela D. Nijim/ Printed Name: Angela D. Nijim

Statement of the Substance of the Interview

Mail Stop _____
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Applicants appreciate the Examiner for the courtesies extended to Applicant's representative at the August 27th, 2023 interview, offering guidance regarding a 312 amendment.

Respectfully submitted,

/Peter P. Tong/

Peter P. Tong
Reg. No. 35,757

(650) 903-9200, x102

Electronic Patent Application Fee Transmittal

Application Number:	17942347
Filing Date:	12-Sep-2022
Title of Invention:	WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT
First Named Inventor/Applicant Name:	Thomas A. Howell
Filer:	Peter P. Tong/Angela Nijim
Attorney Docket Number:	IPVCP006X1C8

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
SUBMISSION- INFORMATION DISCLOSURE STMT	1806	1	260	260
		Total in USD ($)		**260**

Electronic Acknowledgement Receipt	
EFS ID:	48750217
Application Number:	17942347
International Application Number:	
Confirmation Number:	1038
Title of Invention:	WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT
First Named Inventor/Applicant Name:	Thomas A. Howell
Customer Number:	34071
Filer:	Peter P. Tong/Angela Nijim
Filer Authorized By:	Peter P. Tong
Attorney Docket Number:	IPVCP006X1C8
Receipt Date:	24-OCT-2023
Filing Date:	12-SEP-2022
Time Stamp:	11:37:44
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$260
RAM confirmation Number	E20230NB38465434
Deposit Account	503874
Authorized User	Angela Nijim
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.21 (Miscellaneous fees and charges)	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	IPVCP006X1C8_IDSAfterNoA_10-23.pdf	21365 c3094a66910c256feb8c9213050203d39a05107e	no	2
Warnings:					
Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	IPVCP006X1C8_1449_10-23.pdf	21135 8f909ed402f12aca0fa04c0c94c6c58fc7861383	no	1
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	Applicant summary of interview with examiner	IPVCP006X1C8_StatementOfSubstance_AsFiled_10-23.pdf	18144 13735b2f64a743ac621da7cf226b201aec7c1a5d	no	1
Warnings:					
Information:					
4	Fee Worksheet (SB06)	fee-info.pdf	38350 4f5c52f08d784254b3c58863280020b797f4c374	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	98994		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: HOWELL et al.	Attorney Docket No.: IPVCP006X1C8
Application No.: 17/942,347	Examiner: ELAHEE, MD S
Filed: September 12, 2022	Group: 2694
Title: WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT	

INFORMATION DISCLOSURE STATEMENT AFTER FINAL ACTION OR NOTICE OF ALLOWANCE (37 CFR §§ 1.56 AND 1.97(d))

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

The references listed in the attached PTO Form 1449, a copy of which is attached, may be material to examination of the above-identified patent application. Applicants submit this reference in compliance with their duty of disclosure pursuant to 37 CFR §§1.56 and 1.97. The Examiner is requested to make this citation of official record in this application.

This Information Disclosure Statement is not to be construed as a representation that a search has been made, that additional information material to the examination of this application does not exist, or that this reference indeed constitutes prior art.

This Information Disclosure Statement is being filed after the mailing date of final action under §1.113 or a notice of allowance under §1.311, but before payment of the issue fee.

Accompanying this Information Disclosure Statement is the fee set forth in 37 CFR 1.17(p).

The undersigned hereby states:

☐ that each item of information contained in the Information Disclosure Statement was first cited in a communication from a foreign patent office in a counterpart foreign application no more than three months prior to the filing of the Information Disclosure Statement, or

☒ that no item of information contained in the Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign application, and to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the Information Disclosure Statement was known to any individual designated in § 1.56(c) more than three months prior to the filing of the Information Disclosure Statement.

Electronic Fee in payment of the Information Disclosure Statement Fee is provided herewith. If it is determined that any additional fees are due, the Commissioner is hereby authorized to charge such fees to Deposit Account 50-3874 (Order No. IPVCP006X1C8).

Respectfully submitted,

/Peter P. Tong/

Peter P. Tong
Registration No. 35,757

4010 Moorpark Avenue
Suite 211
San Jose, CA 95117

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/942,347	09/12/2022	Thomas A. Howell	IPVCP006X1C8	1038

34071 7590 10/27/2023

IPVENTURE, INC.
4010 Moorpark Avenue
Suite 211
San Jose, CA 95117

EXAMINER	
ELAHEE, MD S	

ART UNIT	PAPER NUMBER
2694	

MAIL DATE	DELIVERY MODE
10/27/2023	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Corrected ***Notice of Allowability***	**Application No.** 17/942,347	**Applicant(s)** Howell et al.	
	Examiner MD S ELAHEE	**Art Unit** 2694	**AIA (FITF) Status** No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☑ This communication is responsive to 10/24/2023.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☑ The allowed claim(s) is/are 1-5 and 7-32 . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information , please see **http://www.uspto.gov/patents/init_events/pph/index.jsp** or send an inquiry to **PPHfeedback@uspto.gov.**

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some* c) ☐ None of the:

   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☑ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.
5. ☐ Examiner's Amendment/Comment
6. ☐ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/MD S ELAHEE/
Primary Examiner, Art Unit 2694

Form 1449 (Modified)	Atty. Docket No.	IPVCP006X1C8
	Application No.:	17/942,347
Information Disclosure Statement By Applicant	Applicant	HOWELL et al.
	Filing Date	September 12, 2022
	Group	2694
(Use Several Sheets if Necessary)		Page 1 of 1

U.S. Patent Documents

Examiner Initial	No.	Patent No.	Date	Patentee	Class	Sub-class	Filing Date
	1.	2002/0146097 A1	Oct-02	Vuori			
	2.	5,790,311	Aug-98	Togino			
	3.						
	4.						
	5.						
	6.						
	7.						
	8.						
	9.						
	10.						

Foreign Documents

							Translation	
Init.		Document No.	Date	Country	Class	Subclass	Yes	No

Other Documents (Including Author, Title, Date, Pertinent Pages, etc.)

	A	
	B	
	C	
	D	
	E	
	F	
	G	

Examiner	Date Considered
/MD S ELAHEE/	10/26/2023

Examiner: Initial citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /M.S.E/

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/942,347	09/12/2022	Thomas A. Howell	IPVCP006X1C8	1038

34071 7590 10/31/2023

IPVENTURE, INC.
4010 Moorpark Avenue
Suite 211
San Jose, CA 95117

EXAMINER	
ELAHEE, MD S	

ART UNIT	PAPER NUMBER
2694	

MAIL DATE	DELIVERY MODE
10/31/2023	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Applicant-Initiated Interview Summary	**Application No.** 17/942,347	**Applicant(s)** Howell et al.		
	Examiner MD S ELAHEE	**Art Unit** 2694	**AIA (First Inventor to File) Status** No	**Page** 1 of 1

All Participants (applicant, applicants representative, PTO personnel)	**Title**	**Type**
MD S ELAHEE	Primary Examiner	Telephonic
Peter Tong	Attorney	

Date of Interview: 30 October 2023

Issues Discussed:

Other

Examiner informed the applicant's representative that the corrected notice of allowance should be showing the allowed claims 1-5 and 7-33. (See the attachment)

/MD S ELAHEE/ Primary Examiner, Art Unit 2694	

Applicant is reminded that a complete written statement as to the substance of the interview must be made of record in the application file. It is the applicants responsibility to provide the written statement, unless the interview was initiated by the Examiner and the Examiner has indicated that a written summary will be provided. See MPEP 713.04
Please further see:
MPEP 713.04
Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews, paragraph (b)
37 CFR § 1.2 Business to be transacted in writing

Applicant recordation instructions: The formal written reply to the last Office action must include the substance of the interview. (See MPEP section 713.04). If a reply to the last Office action has already been filed, applicant is given a non-extendable period of the longer of one month or thirty days from this interview date, or the mailing date of this interview summary form, whichever is later, to file a statement of the substance of the interview.

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

corrected ***Notice of Allowability***	**Application No.** 17/942,347	**Applicant(s)** Howell et al.	
	Examiner MD S ELAHEE	**Art Unit** 2694	**AIA (FITF) Status** No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☑ This communication is responsive to 10/24/2023.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☑ The allowed claim(s) is/are 1-5 and 7-33 . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information , please see **http://www.uspto.gov/patents/init_events/pph/index.jsp** or send an inquiry to **PPHfeedback@uspto.gov.**

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some* c) ☐ None of the:

   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.
4. ☑ Interview Summary (PTO-413), Paper No./Mail Date. _____.
5. ☐ Examiner's Amendment/Comment
6. ☐ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/MD S ELAHEE/
Primary Examiner, Art Unit 2694

Doc Code: IFEE PTOL/85B-EFS

Document Description: Issue Fee Payment (PTO-85B)

Issue Fee Transmittal Form

Application Number	Filing Date	First Named Inventor	Atty. Docket No.	Confirmation No.
17942347	12-Sep-2022	Thomas A. Howell	IPVCP006X1C8	1038

TITLE OF INVENTION :

WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT

Entity Status	Application Type	Art Unit	Class - Subclass	EXAMINER
Regular Undiscounted	Utility under 35 USC 111(a)	2694	327000	MD ELAHEE

Issue Fee Due	Publication Due	Total Fee(s) Due	Date Due	Prev. Paid Fee
$1200	$0	$1200	14-Nov-2023	$0

1.Change of Correspondence Address and/or Indication Of Fee Address (37 CFR 1.33 & 1.363)

Current Correspondence Address:	Current Indicated Fee Address :
34071 IPVENTURE, INC. 4010 Moorpark Avenue Suite 211 San Jose CA 95117 UNITED STATES 650-903-9200	
☐ Change of correspondence address requested, system generated AIA/122-EFS form attached	☐ Fee Address indication requested, system generated SB/47-EFS form attached

2.Entity Status

Change in Entity Status

○ Applicant certifying micro entity status; system generated Micro Entity certification form attached. See 37 CFR 1.29.
Note: Absent a valid certification of micro entity status, issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment. If this box is checked, you will be prompted to choose a micro entity status on the gross income basis (37 CFR 1.29(a)) or the institution of higher education basis (37 CFR 1.29(d)), and make the applicable certification online.

○ Applicant asserting small entity status. See 37 CFR 1.27.
Note: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

◉ Applicant changing to regular undiscounted fee status.
Note: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

3.The Following Fee(s) Are Submitted:

☒ Issue Fee	☐ I authorize USPTO to apply my previously paid issue fee to the current fees due
☐ Publication Fee	☐ The Director is hereby authorized to apply my previously paid issue fee to the current fee due and to charge deficient fees to Deposit Account Number _____
	☒ If **in addition to** the payment of the issue fee amount submitted with this form, there are any discrepancies in any amount(s) due, the Director is authorized to charge any deficiency or credit any overpayment, to Deposit Account Number 503874 . The **issue fee must be submitted** with this form. **If payment of the issue fee does not accompany this form, checking this box and providing a deposit account number will NOT be effective to satisfy full payment of the fee(s) due.**

4.Firm and/or Attorney Names To Be Printed

NOTE: If no name is listed, no name will be printed
For printing on the patent front page, list to be displayed as entered

1.

2.

3.

5.Assignee Name(s) and Residence Data To Be Printed

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

Name	City	State	Country	Category
IngenioSpec, LLC	San Jose	CALIFORNIA	UNITED STATES	corporation

6.Signature

I certify, in accordance with 37 CFR 1.4(d)(4) that I am an attorney or agent registered to practice before the Patent and Trademark Office who has filed and has been granted power of attorney in this application. I also certify that this Fee(s) Transmittal form is being transmitted to the USPTO via EFS-WEB on the date indicated below.

Signature	/Peter P. Tong/	**Date**	10-31-2023
Name	Peter P. Tong	**Registration Number**	35757

Electronic Patent Application Fee Transmittal

Application Number:	17942347
Filing Date:	12-Sep-2022
Title of Invention:	WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT
First Named Inventor/Applicant Name:	Thomas A. Howell
Filer:	Peter P. Tong/Angela Nijim
Attorney Docket Number:	IPVCP006X1C8

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
UTILITY APPL ISSUE FEE	1501	1	1200	1200
PUBL. FEE- EARLY, VOLUNTARY, OR NORMAL	1504	1	0	0
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**1200**

Electronic Acknowledgement Receipt	
EFS ID:	48776430
Application Number:	17942347
International Application Number:	
Confirmation Number:	1038
Title of Invention:	WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT
First Named Inventor/Applicant Name:	Thomas A. Howell
Customer Number:	34071
Filer:	Peter P. Tong/Angela Nijim
Filer Authorized By:	Peter P. Tong
Attorney Docket Number:	IPVCP006X1C8
Receipt Date:	31-OCT-2023
Filing Date:	12-SEP-2022
Time Stamp:	15:37:58
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$1200
RAM confirmation Number	E20230UF37567454
Deposit Account	503874
Authorized User	Angela Nijim
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.20 (Post Issuance fees) 37 CFR 1.21 (Miscellaneous fees and charges)	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	Web85b.pdf	60344 20f3277c142add6d34d4d5aca3e1116fbcfd78ea	no	2
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	40580 4884558a2e53838cfe7e6d2192a116af6771176b	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	100924		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: HOWELL et al.	Attorney Docket No.: IPVCP006X1C8
Application No.: 17/942,347	Examiner: ELAHEE, MD S
Filed: September 12, 2022	Group: 2694

Title: WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT

CERTIFICATE OF ELECTRONIC FILING

I hereby certify that this correspondence is being transmitted electronically to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on November 2, 2023.

Signed: /Angela D. Nijim/ Printed Name: Angela D. Nijim

Statement of the Substance of the Interview

Mail Stop _____
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Applicants appreciate the Examiner for the courtesies extended to Applicants' representative at the October 30, 2023 interview, informing Applicants regarding the corrected notice of allowance.

Respectfully submitted,

/Peter P. Tong/

Peter P. Tong
Reg. No. 35,757

(650) 903-9200, x102

Electronic Acknowledgement Receipt

EFS ID:	48791398
Application Number:	17942347
International Application Number:	
Confirmation Number:	1038
Title of Invention:	WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT
First Named Inventor/Applicant Name:	Thomas A. Howell
Customer Number:	34071
Filer:	Peter P. Tong/Angela Nijim
Filer Authorized By:	Peter P. Tong
Attorney Docket Number:	IPVCP006X1C8
Receipt Date:	02-NOV-2023
Filing Date:	12-SEP-2022
Time Stamp:	15:11:59
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Applicant summary of interview with examiner	IPVCP006X1C8_StatementOfSubstance2_AsFiled-11-23.pdf	18227 b6c8cbc0c549db661666c3b8c737253777fd1a79	no	1
Warnings:					

Information:	
Total Files Size (in bytes):	18227

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/942,347	12/26/2023	11852901	IPVCP006X1C8	1038

34071 7590 12/06/2023

IPVENTURE, INC.
4010 Moorpark Avenue
Suite 211
San Jose, CA 95117

ISSUE NOTIFICATION

The projected patent number and issue date are specified above. The patent will issue electronically. The electronically issued patent is the official patent grant pursuant to 35 U.S.C. § 153. The patent may be accessed on or after the issue date through Patent Center at https://patentcenter.uspto.gov/. The patent will be available in both the public and the private sides of Patent Center. Further assistance in electronically accessing the patent, or about Patent Center, is available by calling the Patent Electronic Business Center at 1-888-217-9197.

The USPTO is implementing electronic patent issuance with a transition period, during which period the USPTO will mail a ceremonial paper copy of the electronic patent grant to the correspondence address of record. Additional copies of the patent (i.e., certified and presentation copies) may be ordered for a fee from the USPTO's Certified Copy Center at https://certifiedcopycenter.uspto.gov/index.html. The Certified Copy Center may be reached at (800)972-6382.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 0 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Center (https://patentcenter.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Patents Stakeholder Experience (OPSE), Stakeholder Support Division (SSD) at (571)-272-4200.

INVENTOR(s) (Please see PATENT CENTER site https://patentcenter.uspto.gov for additional inventors):

Thomas A. Howell, San Jose, CA;
David Chao, Saratoga, CA;
C. Douglass Thomas, Saratoga, CA;
Peter P. Tong, Mountain View, CA;

APPLICANT(s) (Please see PATENT CENTER site https://patentcenter.uspto.gov for additional applicants):

IngenioSpec, LLC, San Jose, CA;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/942,347	09/12/2022	Thomas A. Howell	IPVCP006X1C8	1038

34071 7590 12/27/2023

IPVENTURE, INC.
4010 Moorpark Avenue
Suite 211
San Jose, CA 95117

EXAMINER	
ELAHEE, MD S	

ART UNIT	PAPER NUMBER
2694	

MAIL DATE	DELIVERY MODE
12/27/2023	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	ISSUE DATE	PATENT NO.
17/942,347	26-Dec-2023	11852901

IPVENTURE, INC.
4010 Moorpark Avenue
San Jose, CA 95117

EGRANT NOTIFICATION

Your electronic patent grant (eGrant) is now available, which can be accessed via Patent Center at https://patentcenter.uspto.gov

The electronic patent grant is the official patent grant under 35 U.S.C. 153. For more information, please visit https://www.uspto.gov/electronicgrants

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: HOWELL et al.	Attorney Docket No.: IPVCP006X1C8
Patent: 11,852,901	Issued: December 26, 2023
Title: WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT	

REQUEST FOR CERTIFICATE OF CORRECTION OF OFFICE MISTAKE (35 U.S.C. §254, 37 CFR §1.322)

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450
Attn: Certificate of Correction

Dear Sir:

Attached is Form PTO-1050 (Certificate of Correction) at least one copy of which is suitable for printing.

Mistakes of a clerical or typographical nature, or minor in character appears in the above-referenced patent. The correction introduces no new matter nor requires reexamination. The mistakes occurred because of either USPTO printing errors or Applicants' errors in presenting claims.

The error(s) together with the exact page and line number where the error(s) appear (if Applicants' mistake) / appear correctly (if USPTO mistake) in the application file are as follows:

CLAIMS:

1. In line 2 of claim 1 (column 74, line 13) change "the first" to --the --.

[PTO error] This appears correctly on page 2, line 6 of Amendment A, filed on May 19, 2023.

2. In line 25 of claim 1 (column 74, line 36) change “wherein at least if” to --wherein if--.

[PTO error] This appears correctly on page 2, line 22 of Amendment A, filed on May 19, 2023.

3. In line 4 of claim 5 (column 74, line 58) change “via the at least” to --via at least--.

[PTO error] This appears correctly on page 3, line 16 of the Preliminary Amendment, filed on April 7, 2023.

It is noted that the above-identified errors were printing errors that apparently occurred during the printing process. Accordingly, it is believed that no fees are due in connection with the filing of this Request for Certificate of Correction. However, if it is determined that any fees are due, the Commissioner is hereby authorized to charge such fees to Deposit Account 50-3874 (Order No. IPVCP006X1C8).

Respectfully submitted,

/Peter P. Tong/

Peter P. Tong
Registration No. 35,757

IpVenture, Inc.
4010 Moorpark Avenue
Suite 211
San Jose, CA 95117

PTO/SB/44 (09-07)
Approved for use through 08/31/2010. OMB 0651-0033
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.
(Also Form PTO-1050)

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 11,852,901

APPLICATION NO.: 17/942,347

ISSUE DATE : December 26, 2023

INVENTOR(S) : HOWELL et al.

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In the claims:

Column 74, line 13 (claim 1, line 2) "the first" should be --the--

Column 74, line 36 (claim 1, line 25) "wherein at least if" should be --wherein if--

Column 74, line 58 (claim 5, line 4) "via the at least" should be --via at least--

MAILING ADDRESS OF SENDER (Please do not use customer number below):

IngenioSpec, LLC
4010 Moorpark Ave, Ste 211
San Jose, CA 95117

This collection of information is required by 37 CFR 1.322, 1.323, and 1.324. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1.0 hour to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Attention Certificate of Corrections Branch, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450**.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, VA 22313 - 1450
www.uspto.gov

ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
17/942,347	**07/23/2024 11:50:51 AM Z ET**	**IPVCP006X1C8**

Title of Invention

WIRELESS HEADSET SUPPORTING MESSAGES AND HEARING ENHANCEMENT

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	11852901
CONFIRMATION #	1038	FILED BY	Angela Nijim
PATENT CENTER #	66470214	FILING DATE	09/12/2022
CUSTOMER #	34071	FIRST NAMED INVENTOR	Thomas A. Howell
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	Peter Tong

Documents

TOTAL DOCUMENTS: 1

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
IPVCP006X1C8_Req_and_CerCorr_AsFiled_7-24.pdf	3	Request for Certificate of Correction	105 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
IPVCP006X1C8_Req_and_CerCorr_AsFiled_7-24.pdf	56CCE3C646557A6996D3C24ABDED66C896D38A32962CACA4CB4AD5C20A839DE040ED9F7AC2C357960E7F1AF08789EDA86C956F86375C4DDCB87A236588A7D6C2

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized

by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 11,852,901 B2
APPLICATION NO. : 17/942347
DATED : December 26, 2023
INVENTOR(S) : Howell et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In the Claims

Column 74, Line 13 (Claim 1, Line 2) "the first" should be --the--

Column 74, Line 36 (Claim 1, Line 25) "wherein at least if" should be --wherein if--

Column 74, Line 58 (Claim 5, Line 4) "via the at least" should be --via at least--

Signed and Sealed this
Twentieth Day of August, 2024

Katherine Kelly Vidal

Katherine Kelly Vidal
Director of the United States Patent and Trademark Office

UNITED STATES PATENT AND TRADEMARK OFFICE

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United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/942,347	09/12/2022	Thomas A. Howell	IPVCP006X1C8	1038

34071 7590 08/20/2024

IPVENTURE, INC.
4010 Moorpark Avenue
Suite 211
San Jose, CA 95117

EXAMINER	
ELAHEE, MD S	

ART UNIT	PAPER NUMBER
2694	

MAIL DATE	DELIVERY MODE
08/20/2024	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

APPLICATION NO.	ISSUE DATE	PATENT NO.
17/942,347	20-Aug-2024	11852901

IPVENTURE, INC.
4010 Moorpark Avenue
San Jose, CA 95117

ELECTRONIC CERTIFICATE OF CORRECTION NOTIFICATION

Your electronic certificate of correction is now available, and can be accessed via Patent Center at https://patentcenter.uspto.gov.

The electronic certificate of correction is the official certificate of correction under 35 U.S.C. 254 or 255. For more information, please visit https://www.uspto.gov/electronicgrants.