UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

BOSE CORPORATION,
Petitioner,

v.

INGENIOSPEC, LLC,
Patent Owner.

Case No. IPR2025-01548
Patent No. 11,829,518

DECLARATION OF ANDREW P. DEJACO

Bose Exhibit 1003
Bose v. IngenioSpec

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I, Andrew P. DeJaco, declare:

1. I have been retained by Wolf, Greenfield & Sacks, P.C., counsel for Petitioner Bose Corporation, to assess claims 1-20 (the "challenged claims") of U.S. Patent No. 11,829,518 ("the '518 patent"). I am being compensated for my time at my standard rate of $350.00 per hour, plus actual expenses. My compensation is not dependent in any way upon the outcome of the *inter partes* review of the '518 patent.

I. PERSONAL AND PROFESSIONAL BACKGROUND

2. I received a Bachelor of Science in Electrical Engineering from the University of Dayton in 1986. I received a Master of Science in Electrical Engineering from the University of Michigan in 1989. During my time at the University of Michigan, I completed all the required coursework for a Ph.D. in Digital Signal Processing and Communication.

3. From 1991 to 1997 I worked as an Electrical Engineer for Qualcomm focusing on the research, development, and implementation of digital signal processing algorithms. From 1997 to 2003 I worked as a Vice President of Engineering for Qualcomm, directing the functional group covering voice processing, digital media and digital signal processing needs in a cell phone, including speech coding, in addition to the electro-acoustic systems required in the handset and carkit products that included microphones, speakers, and dual mic noise suppression designs.

4. I am currently self-employed as a business broker and advisor having a franchise with WebsiteClosers LLC. From 2013 to January 2021, I was a co-owner of Judee's Gluten Free Ingredient brand where we doubled Amazon sales each year from 2013-2020 and sold the brand in 2021. From 2003 to June 2012, I taught High School Advanced Placement Calculus/Statistics and Computer Science at St. Charles Preparatory School in Bexley, Ohio.

5. I have over 15 years of experience working in the field of digital signal processing. This includes algorithmic development, product implementation and testing, as well as system wide testing and optimization. I have designed and built speech coders ranging in bit rates from 600 bits per second for military use up to 13000 bits per second for high quality CDMA cellular applications. I have improved coding techniques using Multi-pulse, LPC, RELP, and CELP coding structures and have many patents in the area of variable rate speech coding techniques for CDMA cellular use. These patents include handling severe background noise using speech enhancement techniques, detecting voice activity (VAD) in noisy cellular environments, protecting against channel errors, and optimizing speech quality at the lowest average encoding rate possible. I have participated in speech coding standardization processes and have authored coding standards for CDMA for the IS-96-A, IS-733 speech codecs, and the IS-125 speech coding performance specification.

6. Patents and Publications: I am a named inventor on the following patents:

- 7,590,096 (2009) Method and Apparatus for Improved Detection of Rate Errors in Variable Rate Receivers
- 7,577,563 (2009) Enhanced Conversion of Wideband Signals to Narrowband Signals
- 7,483,520 (2009) Method and Apparatus for Prompting a Cellular Telephone User with Instructions
- 7,426,466 (2008) Method and Apparatus for Quantizing Pitch, Amplitude, Phase and Linear Spectrum of Voiced Speech
- 7,289,461 (2007) Communications Using Wideband Terminals
- 7,184,954 (2007) Method and Apparatus for Detecting Bad Data Packets Received by a Mobile Telephone Using Decoded Speech Parameters
- 7,146,174 (2006) Method and Apparatus for Determining the Transmission Data Rate in a Multi-User Communication System
- 7,113,522 (2006) Enhanced Conversion of Wideband Signals to Narrowband Signals
- 7,061,934 (2006) Method and Apparatus for Interoperability Between Voice Transmission Systems During Speech Inactivity

- 6,950,799 (2005) Speech Converter Utilizing Preprogrammed Voice Profiles
- 6,941,265 (2005) Voice Recognition System, Method and Apparatus
- 6,836,758 (2004) System and Method for Hybrid Voice Recognition
- 6,804,218 (2004) Method and Apparatus for Improved Detection of Rate Errors in Variable Rate Receivers
- 6,789,059 (2004) Reducing Memory Requirements of a Codebook Vector Search
- 6,766,289 (2004) Fast Code-Vector Searching
- 6,766,176 (2004) Method and Apparatus for Automatically Adjusting Speaker and Microphone Gains Within a Mobile Telephone
- 6,754,624 (2004) Codebook Re-Ordering to Reduce Undesired Packet Generation
- 6,745,024 (2004) System and Method for Preparing and Sending an Electronic Mail Communication Using a Wireless Communications Device
- 6,744,882 (2004) Method and Apparatus for Automatically Adjusting Speaker and Microphone Gains Within a Mobile Telephone
- 6,631,139 (2003) Method and Apparatus for Interoperability Between Voice Transmission Systems During Speech Inactivity

- 6,574,596 (2003) Voice Recognition Rejection Scheme
- 6,519,479 (2003) Spoken User Interface for Speech-Enabled Devices
- 6,484,138 (2002) Method and Apparatus for Performing Speech Frame Encoding Mode Selection in a Variable Rate Encoding System
- 6,477,502 (2002) Method and Apparatus for Using Non-Symmetric Speech Coders to Produce Non-Symmetric Links in a Wireless Communication System
- 6,449,496 (2002) Voice Recognition User Interface for Telephone Handsets
- 6,438,518 (2002) Method and Apparatus for Using Coding Scheme Selection Patterns in a Predictive Speech Coder to Reduce Sensitivity to Frame Error Conditions
- 6,434,519 (2002) Method and Apparatus for Identifying Frequency Bands to Compute Linear Phase Shifts Between Frame Prototypes in a Speech Coder
- 6,330,532 (2001) Method and Apparatus for Maintaining a Target Bit Rate in a Speech Coder
- 6,324,509 (2001) Method and Apparatus for Accurate Endpointing of Speech in the Presence of Noise

- 6,324,503 (2001) Method and Apparatus for Providing Feedback from Decoder to Encoder to Improve Performance in a Predictive Speech Coder Under Frame Erasure Conditions
- 6,260,009 (2001) CELP-Based to CELP-Based Vocoder Packet Translation
- 6,240,387 (2001) Method and Apparatus for Performing Speech Frame Encoding Mode Selection in a Variable Rate Encoding System
- 6,205,339 (2001) Method and Apparatus for Establishing TDD/TTY Service Over Vocoded Channels
- 6,205,130 (2001) Method and Apparatus for Detecting Bad Data Packets Received by a Mobile Telephone Using Decoded Speech Parameters
- 6,169,763 (2001) Characterizing a Communication System Using Frame Aligned Test Signals
- 5,915,235 (1999) Adaptive Equalizer Preprocessor for Mobile Telephone Speech Coder to Modify Nonideal Frequency Response of Acoustic Transducer
- 5,911,128 (1999) Method and Apparatus for Performing Speech Frame Encoding Mode Selection in a Variable Rate Encoding System

- 5,903,862 (1999) Method and Apparatus for Detection of Tandem Vocoding to Modify Vocoder Filtering
- 5,857,147 (1999) Method and Apparatus for Determining the Transmission Data Rate in a Multi-User Communication System
- 5,790,632 (1998) Method and Apparatus for Echo Canceling Accounting for Companding Induced Quantization Error
- 5,784,406 (1998) Method and Apparatus for Objectively Characterizing Communications Link Quality
- 5,751,901 (1998) Method for Searching an Excitation Codebook in a Code Excited Linear Prediction (CELP) Coder
- 5,742,734 (1998) Encoding Rate Selection in a Variable Rate Vocoder
- 5,528,593 (1996) Method and Apparatus for Controlling Power in a Variable Rate Communication System
- 5,341,456 (1994) Method for Determining Speech Encoding Rate in a Variable Rate Vocoder

7. I also have authored a number of publications including the following:

- SC Greer, A DeJaco, "Standardization of the selectable mode vocoder", 2001 IEEE International Conference on Acoustics, Speech, and Signal Processing. Proceedings.

- A. Das; A. DeJaco; S. Manjunath; A. Ananthapadmanabhan; J. Huang; E. Choy, "Multimode variable bit rate speech coding: an efficient paradigm for high-quality low-rate representation of speech signal", 1999 IEEE International Conference on Acoustics, Speech, and Signal Processing. Proceedings.
- Ning Bi; Harinath Garudadri; Chienchung Chang; Andrew DeJaco; Yingyong Qi; Naren Malayath; William Huang, "A robust speech recognition system embedded in CDMA cellular phone chipsets," 2002 IEEE International Conference on Acoustics, Speech, and Signal Processing.
- A. DeJaco; W. Gardner; P. Jacobs; Chong Lee, "Qcelp: The North American Cdma Digital Cellular Variable Rate Speech Coding Standard", Proceedings., IEEE Workshop on Speech Coding for Telecommunications.
- A.P. DeJaco, "Method for determining speech encoding rate in a variable rate vocoder", The Journal of the Acoustical Society of America 97, 3927 (1995).
- A.P. DeJaco; N. Bi, "Method for searching an excitation codebook in a code excited linear prediction (CELP) coder", The

Journal of the Acoustical Society of America, Volume 104, Issue 6, December 1998, p. 3158.

8. My curriculum vitae is provided as Exhibit 1004.

II. MATERIALS REVIEWED AND CONSIDERED

9. In forming my opinions, I have reviewed the following documents, and any other document cited in this declaration:

Exhibit	Description
1001	U.S. Patent No. 11,829,518 ("the '518 patent")
1002	Prosecution History of U.S. Patent No. 11,829,518
1005	W.O. Pub. No. 2003/056790 A1 ("Goh")
1007	U.S. Patent Application Publication No. 2004/0137967 A1 ("Bodley")
1008	WIPO Patent Application Publication No. WO 02/39600 A2 ("Griffin")
1009	U.S. Patent No. 6,445,799 ("Taenzer")
1010	U.S. Statutory Invention Registration H417 ("Miles")
1011	WIPO Patent Application Publication No. WO 01/063888 A2 ("Irvin")
1012	U.S. Patent Application Publication No. 2004/0132509 A1 ("Glezerman")
1013	U.S. Patent No. 6,978,163 ("Dyer")
1014	U.S. Patent No. 7,925,029 ("Hollemans")
1015	U.S. Patent Application Publication No. 2002/0191029 A1 ("Gillespie")
1016	U.S. Patent No. 5,559,301 ("Bryan")
1017	U.S. Patent No. 5,825,897 ("Andrea")
1018	U.S. Patent No. 7,072,686 ("Schrager")
1019	U.S. Patent Application Publication No. 2002/0068610
1020	U.S. Patent No. 5,113,428 ("Fitzgerald")

Exhibit	Description
1021	U.S. Patent No. 4,882,745 ("Silver")
1022	U.S. Patent No. 5,590,417 ("Rybeck")
1023	U.S. Patent No. 5,429,889
1024	U.S. Patent Application Publication No. 2003/0222622
1025	U.S. Patent Application Publication No. 2003/0214268
1026	U.S. Patent No. 6,549,586

10. I have also relied on my education, experience, research, training, and knowledge in the relevant art, and my understanding of any applicable legal principles described in this declaration.

III. MY UNDERSTANDING OF PATENT LAW

11. In developing my opinions, I discussed various relevant legal principles with Petitioner's attorneys. Though I do not purport to have prior knowledge of such principles, I understood them when they were explained to me and have relied upon such legal principles, as explained to me, in the course of forming the opinions set forth in this declaration. My understanding in this respect is as follows:

12. I understand that "*inter partes* review" (IPR) is a proceeding before the United States Patent & Trademark Office for evaluating the patentability of an issued patent's claims based on prior-art patents and printed publications.

13. I understand that, in this proceeding, Petitioner has the burden of proving that the challenged claims of the '518 patent are unpatentable by a

preponderance of the evidence. I understand that "preponderance of the evidence" means that a fact or conclusion is more likely true than not true.

14. I understand that, in IPR proceedings, claim terms in a patent are given their ordinary and customary meaning as understood by a person of ordinary skill in the art ("POSA") in the context of the entire patent and the prosecution history pertaining to the patent. If the specification provides a special definition for a claim term that differs from the meaning the term would otherwise possess, the specification's special definition controls. If a claim element is expressed as a "means" for performing a specified function, I understand that it covers the corresponding structure described in the specification and equivalents of the described structure. I have applied these standards in preparing the opinions in this declaration.

15. I understand that determining whether a particular patent or printed publication constitutes prior art to a challenged patent claim can require determining the effective filing date (also known as the priority date) to which the challenged claim is entitled. I understand that for a patent claim to be entitled to the benefit of the filing date of an earlier application to which the patent claims priority, the earlier application must have described the claimed invention in sufficient detail to convey with reasonable clarity to the POSA that the inventor had possession of the claimed invention as of the earlier application's filing date. I understand that a disclosure

that merely renders the claimed invention obvious is not sufficient written description for the claim to be entitled to the benefit of the filing date of the application containing that disclosure.

16. I understand that for an invention claimed in a patent to be patentable, it must be, among other things, new (novel—*i.e.*, not anticipated) and not obvious from the prior art. My understanding of these two legal standards is set forth below.

A. Anticipation

17. I understand that, for a patent claim to be "anticipated" by the prior art (and therefore not novel), each and every limitation of the claim must be found, expressly or inherently, in a single prior-art reference. I understand that a claim limitation is disclosed for the purpose of anticipation if a POSA would have understood the reference to disclose the limitation based on inferences that a POSA would reasonably be expected to draw from the explicit teachings in the reference when read in light of the POSA's knowledge and experience.

18. I understand that a claim limitation is inherent in a prior art reference if that limitation is necessarily present when practicing the teachings of the reference, regardless of whether a person of ordinary skill recognized the presence of that limitation in the prior art.

B. Obviousness

19. I understand that a patent claim may be unpatentable if it would have been obvious in view of a single prior-art reference or a combination of prior-art references.

20. I understand that a patent claim is obvious if the differences between the subject matter of the claim and the prior art are such that the subject matter as a whole would have been obvious to a person of ordinary skill in the relevant field at the time the invention was made. Specifically, I understand that the obviousness question involves a consideration of:

- the scope and content of the prior art;
- the differences between the prior art and the claims at issue;
- the knowledge of a person of ordinary skill in the pertinent art; and
- if present, objective factors indicative of non-obviousness, sometimes referred to as "secondary considerations." To my knowledge, the Patent Owner has not asserted any such secondary considerations with respect to the '518 patent.

21. I understand that in order for a claimed invention to be considered obvious, a POSA must have had a reason for combining teachings from multiple prior-art references (or for altering a single prior-art reference, in the case of obviousness in view of a single reference) in the fashion proposed.

22. I further understand that in determining whether a prior-art reference would have been combined with other prior art or with other information within the knowledge of a POSA, the following are examples of approaches and rationales that may be considered:

- combining prior-art elements according to known methods to yield predictable results;
- simple substitution of one known element for another to obtain predictable results;
- use of a known technique to improve similar devices in the same way;
- applying a known technique to a known device ready for improvement to yield predictable results;
- applying a technique or approach that would have been "obvious to try," *i.e.*, choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success.
- known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations would have been predictable to one of ordinary skill in the art;
- some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior-art reference or to

combine prior-art reference teachings to arrive at the claimed invention. I understand that this teaching, suggestion or motivation may come from a prior-art reference or from the knowledge or common sense of one of ordinary skill in the art.

23. I understand that for a single reference or a combination of references to render the claimed invention obvious, a POSA must have been able to arrive at the claimed invention by altering or combining the applied references.

IV. PERSON OF ORDINARY SKILL IN THE ART ("POSA")

24. In rendering the opinions set forth in this declaration, I have been asked to consider the claims of the '518 patent and the prior art through the eyes of a POSA. I have considered factors such as the educational level and years of experience of those working in the pertinent art, the types of problems encountered in the art, the teachings of the prior art, patents and publications of other persons or companies, and the sophistication of the technology

25. As I discuss in more detail below in Section V, the '518 patent generally relates techniques for integrating electrical components (such as those commonly found in conventional cellular phones) into consumer wearable products like eyeglasses or headphones.

26. I have been instructed to assume a person of ordinary skill in the art is not a specific real individual, but rather a hypothetical individual having the qualities reflected by the factors discussed above.

27. I have been asked to provide my opinions as to the state of the art in this field prior to July 28, 2004. In my opinion, a person of ordinary skill in the art in 2004 ("POSA") would have had a Bachelor's or graduate degree in electrical engineering, mechanical engineering, signal processing, or a related field, and at least two years of experience with designing personal wireless communication devices. More education could substitute for experience, and vice versa. This hypothetical person would have been capable of understanding and applying the teachings of the '518 patent and the prior-art references discussed in this declaration.

28. By 2004, I held a Bachelor of Science degree in Electrical Engineering from the University of Dayton and a Master of Science degree in Electrical Engineering from the University of Michigan, and I had over 15 years of experience with developing and implementing wireless communications in personal communication devices such as hand-held cellphones. Therefore, I was a person of more than ordinary skill in the art during the relevant timeframe. However, I worked with many people who fit the characteristics of the POSA, and I am familiar with their level of skill. When developing the opinions set forth in this declaration, I

assumed the perspective of a person having ordinary skill in the art, as set forth above.

V. THE '518 PATENT

29. The '518 patent is titled "[w]ireless headset supporting messages and hearing enhancement." In introducing its alleged invention, the '518 patent says that although conventional mobile phones "support both voice calls and text messages," using both functionalities simultaneously can allegedly be difficult. EX1001, 3:44-55. For example, when making a call with a mobile phone, "the user often holds the mobile phone against their ear," preventing the user from reading a text message on the phone. *Id*., 3:45-51. And even if a conventional wireless headset is used with the phone so that a user can conduct calls in a "hands-free manner" (which the patent acknowledges was known), "the user would need to view a screen of the mobile phone to participate in text messaging." *Id*., 3:51-55.

30. As I explain below in Section VI, the components and capabilities recited in the claims were conventional in the prior art for use in headsets and other wearable devices before the '518 patent's earliest claimed priority date.

A. Prosecution History of the '518 Patent

31. The originally filed claims were rejected for non-statutory double patenting over U.S. Patent Appl. No 18/129,660 (which issued as U.S. Patent No. 11,803,069) and several third-party prior-art references. EX1002, 204-214. The

Examiner said the claims would be allowed if a terminal disclaimer was filed because the closest prior art allegedly did not disclose the "*conductive pads*," "*rechargeable battery*," "*microphone,*" and "*touch-sensitive input surface*" limitations of the then-pending (and now-issued) claims. *Id.*, 214-215; *infra* Section V.B.

32. The applicant filed a terminal disclaimer (EX1002, 257-258), and the claims were allowed (*id.*, 282-284).

B. The Challenged Claims

33. Claims 1-20 are reproduced in the Claim Listing (*infra* §X), and independent claim 1 is reproduced below with labels added:

1[PRE] A head-worn wireless electronic apparatus at least configured for producing audio outputs for a user comprising:

[1A] a speaker in the head-worn wireless electronic apparatus;

[1B] an electrical connector at the head-worn wireless electronic apparatus, wherein the electrical connector includes at least two conductive pads, with the at least two conductive pads both on at least a surface of the head-worn wireless electronic apparatus, and wherein the at least two conductive pads are configured to removably couple to corresponding conductive contacts of a counterpart connector external to and separate from the head-worn wireless electronic apparatus, at least via spring-force, to at least enable each of the at least two conductive pads electrically connected to its corresponding conductive contact;

[1C] a rechargeable battery in the head-worn wireless electronic apparatus;

[1D] a microphone in the head-worn wireless electronic apparatus; and

[1E] a touch-sensitive input surface on the head-worn wireless electronic apparatus, wherein the touch-sensitive input surface is configured to generate at least an electrical signal for an operation of the head-worn wireless electronic apparatus based on receiving at least a touch input.

34. At a high-level, claim 1 recites a "*head-worn electronic apparatus*"—*e.g.*, a headset—with electronic components like a speaker, microphone, and re-chargeable battery, all of which were routinely used in wireless headsets ***long*** before 2004. Examples include:

- U.S. Patent 5,113,428 (issued 1992), which discloses a "headset includes its own push button key pad and related control buttons, a rechargeable battery and an RF transceiver" and "[i]n addition, the preferred embodiment of the portable unit has two earphones and a volume control for enhanced and realistic binaural sound and for reducing background noise interference, a microphone." EX1020, Abstract, 2:13-21. Further, "[w]hen the portable unit is not in use, it can be replaced into the base station in the manner shown in FIG. 4. The left side piece fits into a pocket in the base station so that the external

battery pack contacts 121 and 122 contact the recharging terminals 123 and 124, thereby recharging the batteries." EX1020, 4:25-30, FIG. 4.

- U.S. Patent 4,882,745 (issued 1989), which discloses "one or more headsets having at least one earpiece and a microphone attached thereto" and a base with "a pair of charging contacts for providing electrical connection between the headset and the base…." EX1021, 1:29-41.

- U.S. Patent 5,590,417 (issued 1996), which discloses "[t]he headset may contain power saving circuitry to minimize power drain from an internal battery. The battery may be recharged whenever the headset is fixed to the radiotelephone." EX1022, Abstract. Further, "when the headset 110 is attached to the radiotelephone body 120, a speaker 140 and a microphone 150 serve their respective functions for the radiotelephone 100. The speaker 140 and microphone 150 also serve those functions when the headset is detached from the body 120." EX1022, 3:3-8.

35. The claimed apparatus also includes "*conductive pads*," *e.g.*, for charging of its battery, and a "*touch-sensitive input surface*" for controlling an operation of the headset. As this Petition demonstrates, these latter aspects of the

claimed apparatus were also known and used in prior-art headsets. Claim 1 recites nothing novel or non-obvious.

36. The dependent claims likewise recite conventional features that were well-known and already used in headsets, such as requiring "*wireless communication circuitry"* (claim 2), or limiting where the microphone is "*positioned*" on the apparatus (claim 3).

C. CLAIM INTERPRETATION

37. I am informed by counsel that claim terms are construed according to their ordinary meaning in light of the specification and prosecution history.

VI. UNPATENTABILITY GROUNDS: THE BODLEY-BASED GROUNDS

38. I have been asked to provide my opinion concerning whether claims 1-20 of the '518 patent are anticipated or would have been obvious to a POSA in light of the prior-art references identified in the Petition. For the reasons explained below, it is my opinion that each of claims 1-20 is anticipated and/or would have been obvious to a POSA.

39. As I explained above in Section V, the '518 Patent relates generally to techniques for incorporating electrical components into small consumer devices such as eyeglasses. EX1001, Abstract. Although the patent focuses primarily on an eyeglass-frame embodiment, a person of ordinary skill in the art would have understood that headsets and other small consumer devices such as cellphones fall

within the same general field of the patent—indeed, the patent repeatedly describes its eyeglasses as functioning as a headset, generally, and/or functioning as a cellphone, specifically. *See, e.g.*, EX1001, Abstract ("Another embodiment includes a headset with a touch-sensitive input surface…"), 17:13-15 ("the glasses also have a microphone and can serve as a cellular phone or a wireless headset of a cellular phone."), 18:51-52 ("If the glasses are used for cell phone headset application…"), 27:58-59 ("In yet in another embodiment, a pair of glasses functioning as a headset with a speaker and a microphone…"), 32:14-15 ("In one embodiment, with a microphone, the eyeglasses 2400 serve as a headset for a phone."), 43:45-46 ("As an example of wireless coupling for a pair of glasses functioning as a headset…"), 43:66-44:4 ("Different embodiments of glasses functioning as a headset have been described in patent application, entitled, "EYEGLASSES WITH HEARING ENHANCED AND OTHER AUDIO SIGNAL-GENERATING CAPABILITIES", which was incorporated by reference above, and can be used with the various embodiments described herein…"). I also understand from counsel that the Patent Owner previously alleged that certain Bose headphones infringed at least claim 1 of the '518 Patent, which further confirms that headphone-related prior art is relevant to the patent's field of endeavor.

40. In my opinion, each of the Relevant Prior Art references falls within the same field of endeavor as the '518 Patent, namely small consumer electronics such

as eyeglasses, headphones, and/or cellphones. Indeed, all of the Relevant Prior Art relates specifically to headsets/headphones or mobile phones, except Gillespie and Bryan, and both relate to touchscreens that are small in size, which are ideal for headset use. *See infra,* Sections VI-VIII For these reasons, the Relevant Prior Art references are also reasonably pertinent to the problem addressed by the '518 patent—*i.e.*, how to improve conventional headsets and other wearable devices as well as mobile phones.

A. Ground 1A: Bodley in view of Griffin Renders Claims 1, 3, and 15-16 Obvious

41. I have been instructed by counsel for Bose to assume that Bodley and Griffin qualify as prior art to the Challenged Claims.

1. Bodley (EX1007)

42. Bodley discloses a "wireless headset" that communicates with, for example, a cellular telephone or personal digital assistant via Bluetooth. Bodley, Abstract, [0015], [0021]. Bodley's headset includes conventional headset components like a speaker, microphone, and battery. *Id.*, Abstract, [0016], [0019]-[0020]. The headset also includes an "integral display" that can be "touch sensitive" for "data input" like "dialing using a virtual numeric keypad." *Id.*, [0019].

43. Figures 1 and 2 (below) depict the front and back of a "generic headset 100 that includes the display means 103 of the present invention." *Id.*, [0015]. In

the figures below, element 111 is a microphone and element 109 is a speaker (*id.*, [0016]):

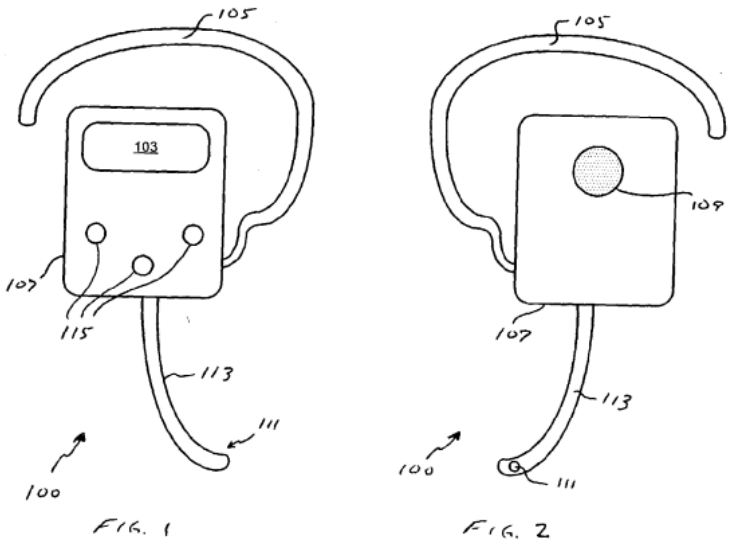


FIG. 1 FIG. 2

44. Bodley explains that its headset can be "coupled to a charger port" (*id.*, [0024]), but Bodley provides no specific details regarding its port or how its headset is coupled to it. As discussed below, such implementation details were known.

2. Griffin (EX1008)

45. Griffin discloses a communication device with two components: a first communication module and a second communication module that is sized to fit inside the first module. Griffin, 4:13-5:5; FIGS. 1-2. Figure 1 of Griffin, which I have reproduced below, depicts the "first communication module 12 and a second detachable communication module 14 for insertion into the communication device user's ear." Griffin, 4:13-15. As shown below, the second communication module

takes the form of a headset whereas the first communication module is effectively a docking station for that headset.

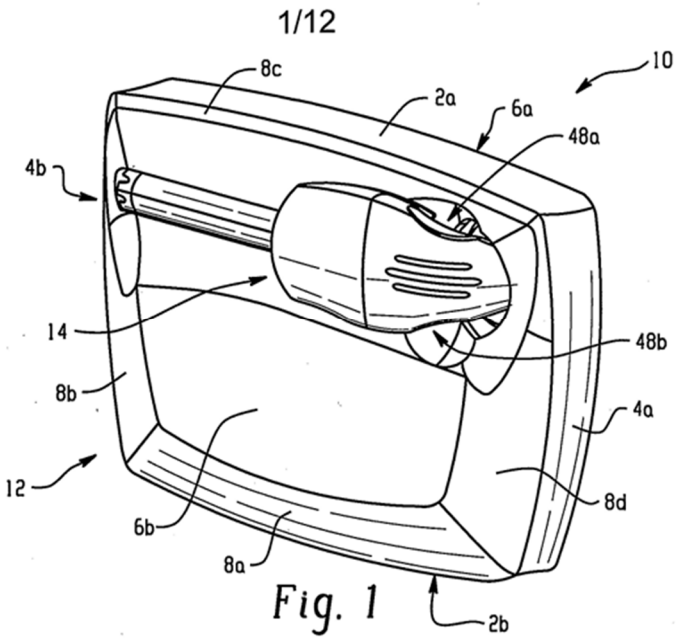


Fig. 1

46. Griffin teaches that the first communication module can receive long-range "RF signals from a wireless network" and thus function as a cellular phone. Griffin, Abstract, 2:6-7; 15:8-12. Indeed, in an alternate embodiment, Griffin teaches that the first communication module can take the physical form of a "cellular phone" as depicted in Figure 14a (reproduced below). Griffin, 13:19-23, 17:3-13. Griffin further teaches that the first module sends the received RF signals to the second module via a "short-range wireless network or link" and "convert[s] the RF signals into an audible signal." *Id.*, Abstract, 2:7-11, 15:8-12, 15:25-16:4. That is, the first communication module (*i.e.*, the phone) receives cellular transmissions (*e.g.*, a phone call) and then re-transmits those transmissions to the second

communication module (*i.e.*, the headset) over a short-range wireless link such as Bluetooth, which also allows for "hands-free operation" of the first communication module such as through voice commands. *Id.*, 14:18-20, 19:6-13.

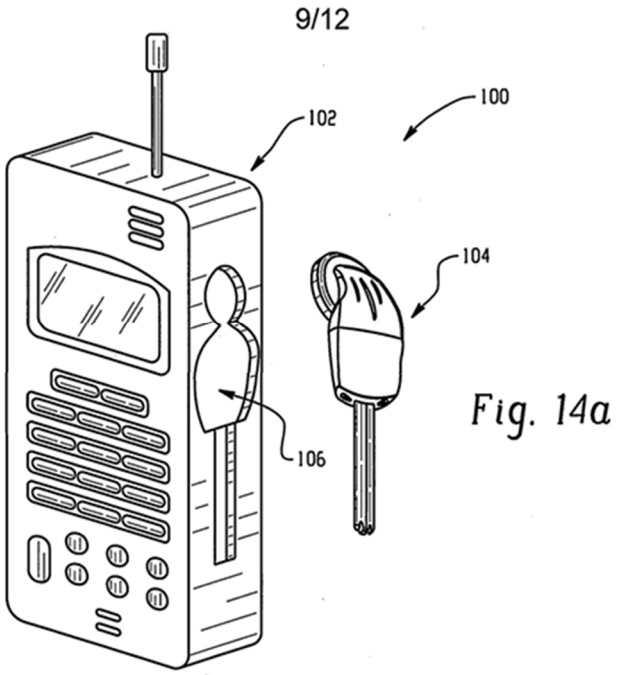


Fig. 14a

47. Griffin depicts the second communication module as a headset that includes both a "speaker 14a" that is "placed in the ear" of the user as well as a "microphone 14d." Griffin, 6:14-18.

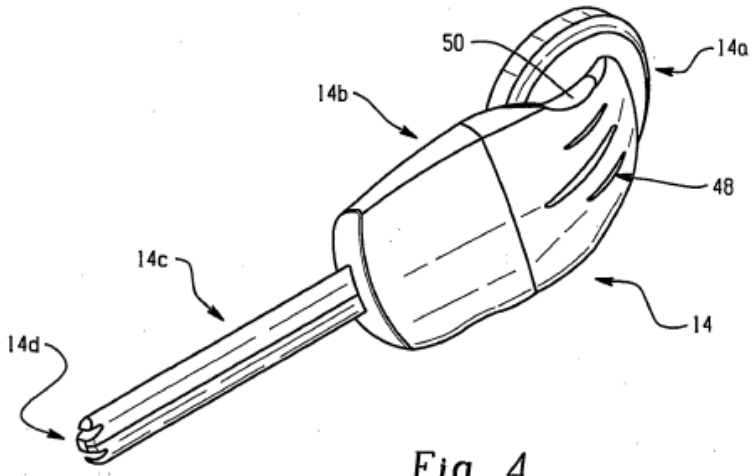


Fig. 4

48. Among other things, the first communication module charges the second communication module. Griffin, 8:3-12, FIGS. 3-5. The first communication module is shown below in Figure 3. It includes a cavity 16 into which the second module is designed to "be detachably mounted" as shown in Figures 3 and 6 (also shown below). Griffin 5:1-5; *see also* Fig. 2.

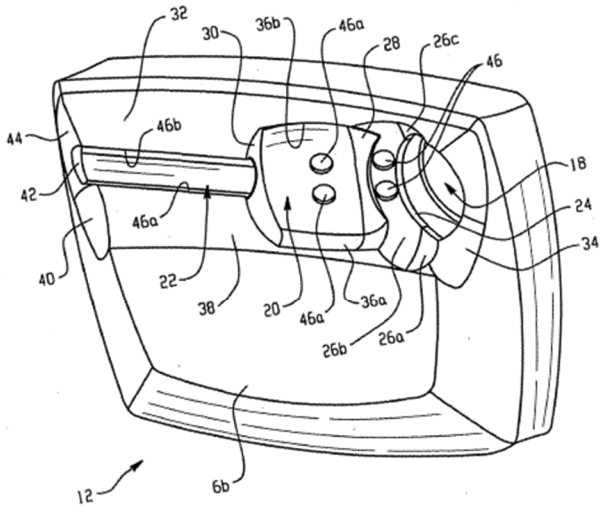


Fig. 3

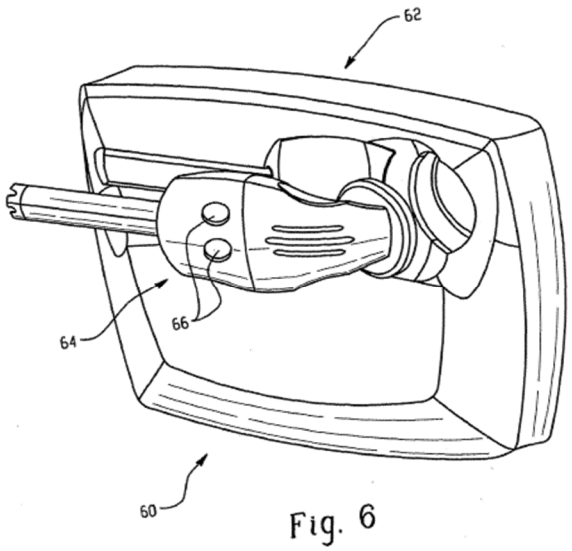


Fig. 6

49. Griffin identifies various ways that the headset can be retained in the first communication module, including the use of "springs." Giffin, 5:24-6:2; *see also id.*, 11:11-12:6. POSAs would have been familiar with the use of springs as a means for retaining and pressing electrical contacts together. One common example that most individual have encountered in their life is the small spring used to press a battery against electrical contacts in a TV remote control or similar electronic device. The spring both retains the battery within the remote control and also presses the battery's electrical contacts into contact with corresponding electrical contacts in the remote control.

50. Griffin further explains that when the headset is put into the first communication module the "charging terminals 56" on the headset (*see* Figure 5 below) "mate with corresponding charging terminals 46 on the first communication module 12 shown in Fig. 3." Griffin, 8:3-12. The charging terminals allow a "rechargeable power source," *e.g.*, battery, within the headset to be recharged. Griffin, 8:6-12; *see also id.*, 16:9 ("rechargeable battery"); claim 2.

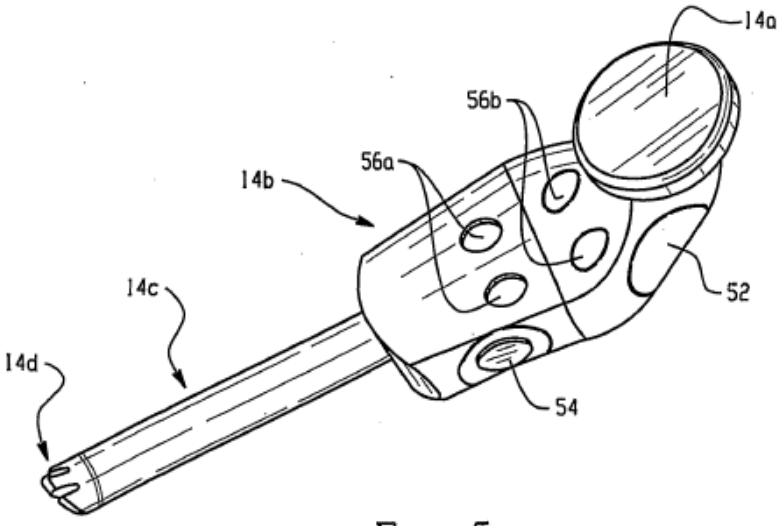


Fig. 5

51. Figure 16 of Griffin, which I have reproduced below, depicts the "rechargeable battery 188" within the second communication module (*i.e.*, the headset 162). Griffin, 15:3-4, 16:7-9.

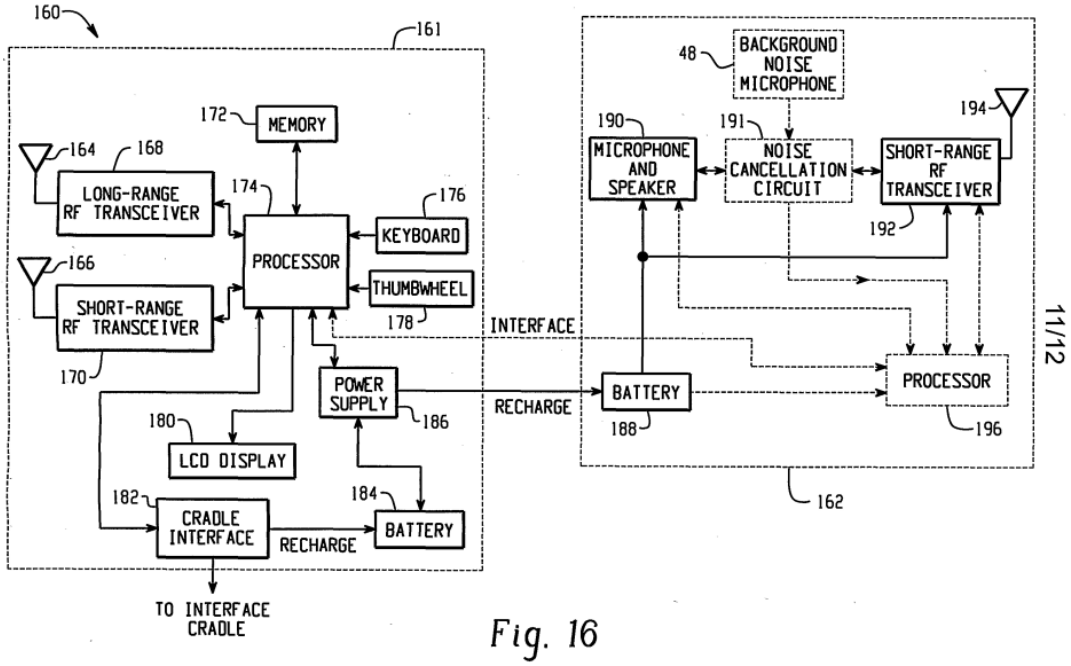


Fig. 16

52. Apart from its charging-station teachings, Griffin teaches that its headset can provide noise cancellation functionality to reduce "undesired noise signals from a multitude of sources" other than the user's speech. Griffin, 7:6-8. Specifically, Griffin notes that the headset:

> includes a noise cancellation circuit with a background noise microphone 48 as shown in Fig. 4. The background noise microphone 48 preferably detects background noise signals which are then subtracted from the corrupted speech received by the microphone 14d in the noise cancellation circuit. In this manner, a higher quality speech signal is provided.

Id., 7:8-13.

53. As seen in Figure 4, the headset's microphone 14d is positioned closer to where the user's mouth would be during use than background noise microphone 48:

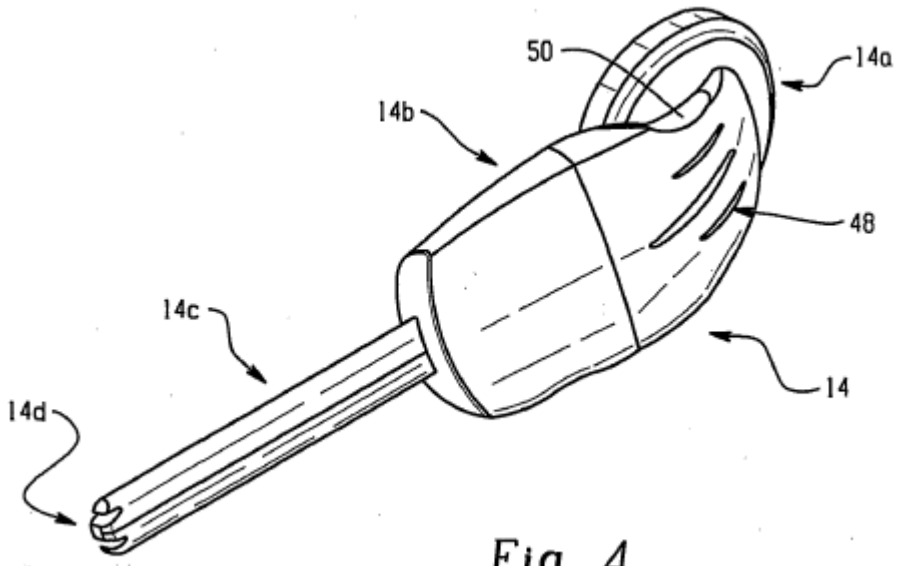


Fig. 4

See also Griffin, 7:1-3.

3. The Combination

54. Bodley and Griffin each disclose headsets that include conventional functionality with which a person of ordinary skill in the art would have been familiar and which the ordinary artisan would have had reason to include in an obvious combination to form the combined Bodley-Griffin headset.

55. Bodley's headset can be "coupled to a charger port" that charges a "power sub-system" which, in turn, "provid[es] power for the headset electronics." Bodley, [0025]. Bodley also discloses the use of a rechargeable battery (*see infra* limitation [1C]), and POSAs would have understood that the headset's power sub-system would be a rechargeable battery that is recharged via coupling to the charger port. Bodley, however, provides no details on its "charger port" and imposes no

restrictions on how its wireless headset is "coupled" to that port, leaving those implementation details to a POSA's routine skill about such details, which a POSA would have.

56. As discussed above (*supra* Section VI.A.2), Griffin teaches a technique for charging a wireless headset, and in my opinion POSAs would have looked to Griffin for implementation details on how to couple a power source to Bodley's headset to recharge its battery. By leaving the details of recharging its headset to POSAs' knowledge, Bodley itself motivates POSAs to utilize known recharging techniques like Griffin's technique.

57. Separately, Griffin motivates POSAs to incorporate a "background noise microphone" into Bodley's headset so as to provide "a higher quality speech signal." Griffin, 7:8-10. It is my opinion that POSAs would have readily appreciated the synergy between Griffin's teaching and Bodley's headset as Bodley's headset (like Griffin's headset) positions a microphone at the end of a boom thereby positioning the microphone close to a user's mouth and allowing room for a second microphone to be located elsewhere on the headset apart from the user's mouth. *Compare* Bodley, FIGS. 1-2 (microphone 111) *with* Griffin FIG. 4 (microphone 14d). These two pre-existing elements in combination do no more than they would in separate, sequential operation.

58. For example, in one obvious implementation, the second microphone would be located on either the earhook of Bodley's headset or near the top of the headset's body so as to isolate it from the user's mouth. Known advantages to locating noise-canceling microphone apart from the user's mouth include improvement of the additional microphone's ability to distinguish between speech from the user and background noise, to ensure that the sound that is canceled is noise and not the user's voice, and to improve the clarity of transmitted speech.

59. In the Bodley-Griffin combination, Bodley's headset would have been designed to fit inside a charging station like Griffin's first module so that the charging station could recharge Bodley's battery, which would have been well within the skill of a POSA in my opinion. In the combination, Bodley's headset would be modified to include multiple charging terminals that mate with charging terminals in the charging station, and the charging station would include springs to retain the headset within the charging station during the charging process thereby pressing the charging terminals into contact.

60. As mentioned above, the headset in the Bodley-Griffin combination would also be designed to include a background noise microphone positioned apart from Bodley's microphone 111 as well as a noise cancellation circuit subtracts background noise from the speech received by Bodley's microphone 111. Griffin, 7:1-10. In the annotated version of Figure 1 of Bodley below, I've depicted in red

two possible locations a POSITA would consider placing this background noise microphone in the Bodley-Griffin combination.

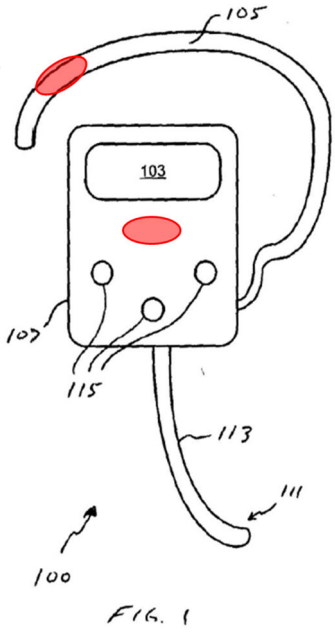


FIG. 1

61. POSAs would have had a reasonable expectation of success in implementing the Bodley-Griffin combination in my opinion as it requires mere routine engineering skill to modify Bodley's headset such that it includes the conventional design features and electrical components described in Griffin.

4. Claim 1

a. [1PRE]: "A head-worn wireless electronic apparatus at least configured for producing audio outputs for a user comprising:"

62. The Bodley-Griffin combination uses Bodley's "wireless headset" which is used for telephone, *i.e.*, audio, communication. Bodley, Abstract ; FIGS. 1-7; claims 24-25.

b. [1A]: "a speaker…;"

63. Bodley's headset includes a "speaker." Abstract ("The wireless headset of the invention includes…an output transducer (e.g., a speaker)…"); [0004]; [0016]; claim 4; FIGS. 1-2

c. [1B1]: "an electrical connector at the head-worn wireless electronic apparatus, wherein the electrical connector includes at least two conductive pads, with the at least two conductive pads both on at least a surface of the head-worn wireless electronic apparatus, and"

64. As discussed above, Bodley's headset in the Bodley-Griffin combination includes charging terminals like those seen below in Figure 5 from Griffin, *i.e.*, elements 56a and 56b (Griffin, 8:15-21):

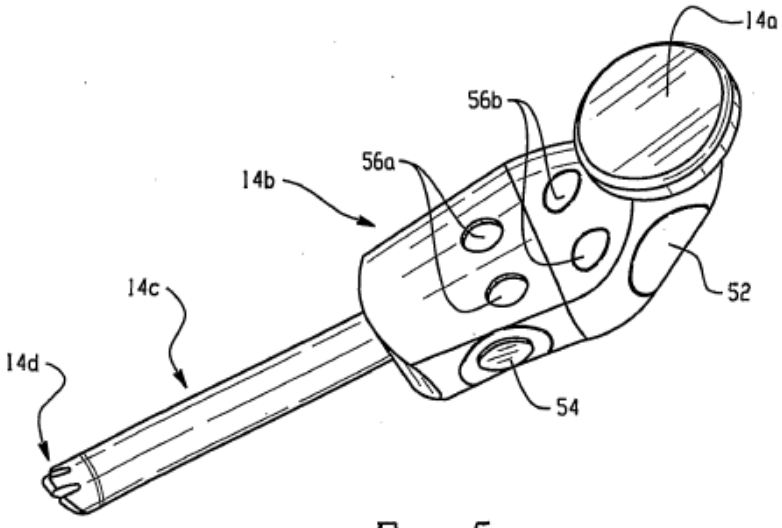
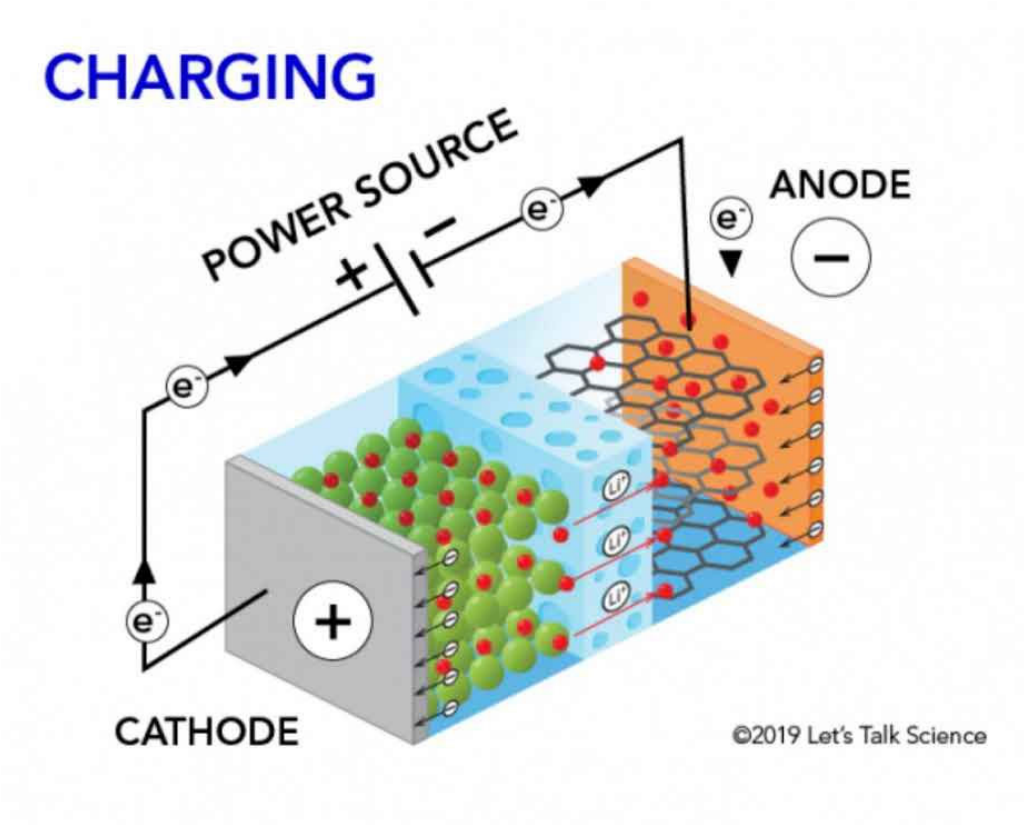


Fig. 5

65. It is my opinion that POSAs would have understood these charging terminals to be "*conductive pads*" that act as "*an electrical connector*" because

POSAs would have known that in order to carry an electrical current, the charging terminals 56a and 56b (depicted as "*pads*") would be "*conductive*" as the flow of electrons required from a power source to recharge a battery requires a fully conductive circuit in which these electrons flow into and out of these charging terminals as shown in the diagram below.



Taken from: https://letstalkscience.ca/educational-resources/stem-explained/how-does-a-lithium-ion-battery-work

66. As seen in Figure 5, Griffin's headset uses four "*conductive pads*" that are on "*a surface*" of Griffin's headset, and thus Griffin gives POSAs reason to use at least four pads on the surface of Bodley's headset too.

d. [1B2]: "wherein the at least two conductive pads are configured to removably couple to corresponding conductive contacts of a counterpart connector external to and separate from the head-worn wireless electronic apparatus, at least via spring-force, to at least enable each of the at least two conductive pads electrically connected to its corresponding conductive contact"

67. As discussed above, Bodley's headset in the Bodley-Griffin combination includes charging terminals that electrically connect with corresponding charging terminals in a separate device like charging terminals 46 on Griffin's first module shown below in Figure 3:

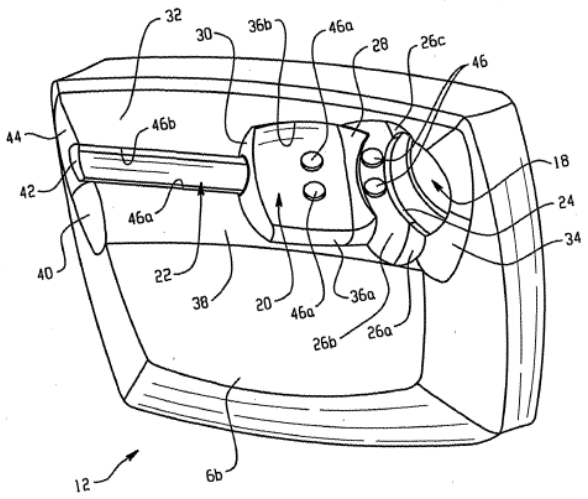


Fig. 3

68. In the Bodley-Griffin combination, "*the at least two conductive pads*" on the headset "*are configured to removably couple to corresponding conductive contacts*" on the separate device because they coupled to those corresponding

contacts via one or more springs, *i.e.*, "*via spring force*," that retain the headset in the separate device. Griffin, 5:24-6:2.

69. Separately, Griffin also discloses the use of a "door" on the first module that is biased toward a closed position via a ***spring***. Griffin, 11:11-12:6. The spring-biased door would have also retained (and protected) the headset when it was placed in the first module for charging, and thus would also "*removably couple*" the two modules' "*conductive contacts…via spring force*." Using such a spring-biased door would have been obvious to a person of ordinary skill in the art given Griffin's express disclosure and the benefits the door would provide, *i.e.*, a means to ensure charging contacts are urged together and to physically shield the charging headset from damage.

e. [1C]: "a rechargeable battery…"

70. Bodley discloses that its headset's display provides information regarding the headset including its "battery level" as well as its "charge level." Bodley, [0004]; [0019] ("headset battery level"); [0020] ("battery…strength"); [0024] ("battery status, charge level"). Bodley likewise discloses that its headset is "typically coupled to a charger port." Bodley, [0025]. In view of these disclosures, it is my opinion that POSAs would have understood that Bodley's headset includes a battery, and that the battery is rechargeable, *e.g.*, via the "charger port."

71. If Patent Owner argues that Bodley does not teach or suggest the use of a "rechargeable battery," then the use of such a power source in Bodley's wireless headset would have been obvious in view of Griffin which teaches the use of a "rechargeable battery" for a wireless headset (like Bodley's headset) that can be recharged using Griffin's first communication module. Griffin, 8:6-12; 16:9 ("rechargeable battery"); claim 2. Using Griffin's rechargeable battery in Bodley's headset would have been a routine design choice for POSAs in my opinion.

f. [1D]: "a microphone…"

72. Bodley's headset in the Bodley-Griffin combination maintains its microphone that is positioned at the end of a boom. Bodley, Abstract ("The wireless headset…includes an input transducer (e.g., a microphone)…"); [0004]; [0016]; claim 2; FIG. 1 (element 111).

g. [1E]: "a touch-sensitive input surface…, wherein the touch-sensitive input surface is configured to generate at least an electrical signal for an operation of the head-worn wireless electronic apparatus based on receiving at least a touch input."

73. As explained above, Bodley's headset includes a display 103 that is seen in Figure 1 (below) (Bodley, [0015]):

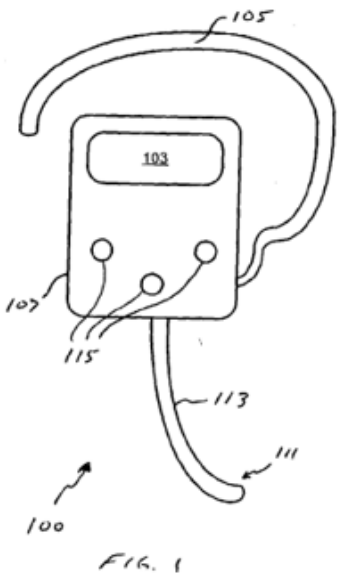


FIG. 1

74. Bodley's display 103 is a "*touch-sensitive input surface*" as claimed because a user can touch icons on the screen to input data such as a phone number that the headset would use to initiate a call. Bodley, [0019] ("display 103 can be **touch sensitive**, thus providing a touch screen for data input (e.g., phone numbers into a phone list, dialing using a virtual numeric keypad)."); claim 19 ("said display means is **a touch sensitive display**").

5. Claim 3

a. [3PRE]

75. *See* [1PRE] in Ground 1A.

b. [3A]: "at least another microphone…"

76. As I discussed above in Section VI.A.3, when describing one potential implementation of the Bodley-Griffin combination, Bodley's headset in the

combination includes a second background-noise microphone per Griffin's teachings. Griffin, 7:1-13, claim 7, FIG. 4 (element 48).

c. [3B]: "wherein the microphone is configured to be positioned closer to mouth of the user and the another microphone is configured to be positioned further from the mouth of the user, when the head-worn wireless electronic apparatus is worn by the user, and"

77. In an obvious implementation of the Bodley-Griffin combination, Bodley's original microphone ("input transducer 111 (e.g., a microphone)"), *i.e.*, "*the microphone*," would remain at the end of a boom where it is positioned close to the user's mouth "at the end of a boom member 113." Bodley, [0016], FIGS. 1-2.

78. In the Bodley-Griffin combination, Bodley's headset would be modified to include a background-noise microphone, *i.e.*, "*the another microphone*." Griffin, 7:1-13, FIG. 4, claim 7.

79. As I explained above in Section VI.A.3, the background-noise microphone in the combination would be "*positioned further from the mouth of the user*" than the original microphone, *e.g.*, on earhook 105 or body 107 of Bodley's headset. *See* Bodley, FIG. 1 (with these exemplary locations on Bodley's headset for the background-noise microphone annotated in red below). Griffin motivates such positioning as it positions its background-noise microphone 48 at a location further from the user's mouth than the voice microphone 14d. *See* Griffin, 7:1-14, FIG. 4. Moreover, a person of ordinary skill in the art would have known that

positioning a background-noise microphone apart from the user's mouth is advantageous because that location better ensures that the audio the microphone captures consists primarily of background noise, and not the user's voice, which improves noise-cancellation.

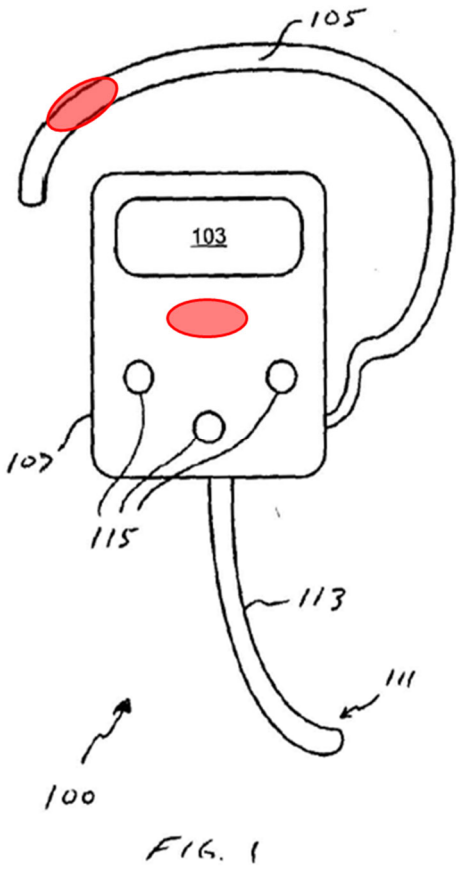


FIG. 1

d. [3C]: "wherein at least the microphone and the another microphone are configured to receive audio inputs, with at least some noise in the audio inputs configured to be cancelled based on using at least the microphone and the another microphone."

80. As discussed above in Section VI.A.3, Bodley's headset in the Bodley-Griffin combination includes a "noise cancellation circuit" that "subtract[s]," *i.e.*,

"*cancel[s]*," background noise signals from the speech received by Bodley's original microphone at the end of the boom. Griffin, 7:1-10.

6. Claim 15: "…configured to be worn in an ear of the user."

81. Bodley describes its headset as "generic" and provides no details as to how the speaker for its headset is designed. Bodley, [0006]-[0007], [0015]. Bodley thus imposes no restrictions on the particular design that its headset or speaker takes so long as the headset otherwise has room for Bodley's touchscreen display.

82. In view of Griffin, it is my opinion that POSAs would have known that one design for a speaker, like Bodley's speaker 109, was an in-the-ear earbud design in which the speaker is worn in a user's ear. Griffin, 6:17-18 (describing FIG. 4 and explaining that "[o]perationally, the speaker 14a is placed in the ear of a communication device user…"); *see also* Abstract ("the [headset] is physically dimensioned so that it may be fitted into or onto an ear of a communication device user"), claim 16. It would thus have been a routine design choice, in view of Griffin, to implement the headset in Bodley-Griffin such that it was "*configured to be worn in an ear of the user*," like Griffin's headset designs.

7. Claim 16

a. [16PRE]

83. *See* claim 15.

b. [16A]

84. *See* limitation [3A].

c. [16B]

85. *See* limitation [3B].

d. [16C]

86. *See* limitation [3C].

B. Ground 1B: The Bodley-Griffin Combination in View of Taenzer Renders Claims 2 and 18 Obvious.

87. I have been instructed by counsel for Bose to assume that Taenzer qualifies as prior art to the Challenged Claims.

1. Taenzer (EX1009)

88. Taenzer discloses an earphone(s) with a microphone(s) and a personal communications node wirelessly connected to the earphone that "processes signals received via the [earphone's] microphone(s)" including "voice commands to control [a] cellular telephone." Taenzer, 7:13-16, Abstract.

89. To provide its voice-control functionality, Taenzer teaches the use of a "voice recognition command manager 138" that can be software and which "interprets voice commands from the user." *Id.*, 7:19-65. "The voice recognition command manager 138 matches a voice command to a particular control function in a library or lookup table" that is stored in memory, and "[a]fter matching the voice command to a particular control function and a particular remote device, the voice recognition command manager 138 can issue an appropriate control code" to the

device being controlled, *e.g.*, a phone. *Id.*, 7:66-8:6, 5:41-59 ("external device" can be "a cellular phone").

2. The Combination

90. Taenzer's earphones include conventional functionality with which a person of ordinary skill in the art would have been familiar and which the ordinary artisan would have had reason to include in an obvious variation of the Bodley-Griffin headset. One such function is voice-control processing, e.g., for voice-dialing functionality, aided by memory for storing the relevant software needed for such processing.

91. The headset in the Bodley-Griffin combination includes Bodley's "voice dialing" functionality (Bodley, Abstract, [0004], claim 16), but Bodley does not provide details on how its voice-dialing functionality is implemented. Taenzer provides such details, and teaches that such functionality can be provided by a processor executing voice-recognition software and a lookup table stored in memory that compares spoken commands with control functions. Taenzer, 7:52-8:7.

92. Given that Bodley leaves the implementation details for its "voice dialing" functionality to POSAs' routine skills, POSAs would have had reason to look for references explaining how voice-dialing can be provided in electronic devices similar to Bodley's wireless headset – and would have easily been able to find them – and Taenzer is one such reference. Although Taenzer uses a device

separate from its wireless earpiece to perform its voice-command functionality (*i.e.*, a "personal communication node" or PCN (Taenzer, 6:52-54, 7:12-28)), in my opinion POSAs would have recognized that the same functionality is suitable in Bodley's headset alone because it already includes both a controller (in the form of a processor) for executing Taenzer's voice-control software and memory for storing the relevant software. Bodley, [0023] ("at least one controller (e.g., processor, microcontroller, …or ASIC, etc.)"); [0028] ("memory resident within the headset").[1]

[1] Alternatively, if Patent Owner argues that Bodley relies solely on the connected peripheral device for voice dialing, then POSAs would nonetheless still have had reasons to incorporate that functionality into Bodley's headset too. As I noted above, Bodley's headset already has the processing capabilities and memory needed to implement Taenzer's voice-dialing functionality and POSAs would have recognized that having such functionality built into Bodley's headset would beneficially allow it perform voice-dialing with peripheral devices that lacked such functionality themselves. Bodley, [0015] (explaining the headset can be used "with any peripheral electronic device in which hands-free operation is desired"). This implementation would also reduce the headset's reliance on external device software and enable the headset to deliver consistent voice dialing performance to the user.

93. In the combination, Bodley's voice-dialing functionality is implemented using a lookup table of pre-stored commands and voice-recognition software (as taught by Taenzer), both of which are stored in "memory resident within the headset." Bodley, [0028]; Taenzer, 7:66-8:6.

94. It is my opinion that POSAs would have had a reasonable expectation of success in implementing the Bodley-Griffin-Taenzer combination because Taenzer's voice-control technique works with voice signals that a microphone on an earpiece/headset captures and requires only routine engineering skills to implement, which a POSA would have possessed. The combination involves the use of only conventional components for their typical and intended purposes.

3. Claim 2

a. [2PRE]

95. *See* [1PRE] (Ground 1A).

b. [2A]: "wireless communication circuitry…for coupling to at least a Bluetooth network; and"

96. Bodley's headset includes "a Bluetooth enabled wireless networking module" for transmitting and receiving signals from "a Bluetooth enabled cellular telephone." Bodley, claim 25; see also Abstract ("a wireless networking subsystem"); [0021] (citing and incorporating by reference the Bluetooth standard).

c. [2B]: "a storage medium configured to store at least computer program codes for facilitating voice recognition to facilitate recognizing at least a word

received by at least the microphone for an operation of the head-worn wireless electronic apparatus."

97. Bodley's headset, which is used in Bodley-Griffin-Taenzer, includes "memory" (Bodley, [0028]), *i.e.*, "*a storage medium*." In the Bodley-Griffin-Taenzer combination, Bodley's memory would include Taenzer's voice-recognition software and lookup table, i.e., "*computer program codes for facilitating voice recognition*," to perform voice-dialing, e.g., to initiate a call. Taenzer, 7:49-8:6. The Bodley-Griffin-Taenzer combination therefore meets limitation [2B].

C. Ground 1C: The Bodley-Griffin Combination in View of Gillespie Renders Claim 4 Obvious.

98. I have been instructed by counsel for Bose to assume that Gillespie qualifies as prior art to the Challenged Claims.

1. Gillespie (EX1015)

99. Gillespie discloses a touchscreen that is the size of a laptop's touchpad. Gillespie, [0036], FIG. 1 (element 106). Similar to Bodley's integral display, the display for Gillespie's touchscreen "can be a liquid crystal display." Gillespie, [0038]; Bodley, [0029].

100. Gillespie discloses several usage modes for its touchscreen, including an "iconic" mode that is depicted below in Figure 4 (Gillespie, [0048]-[0049]):

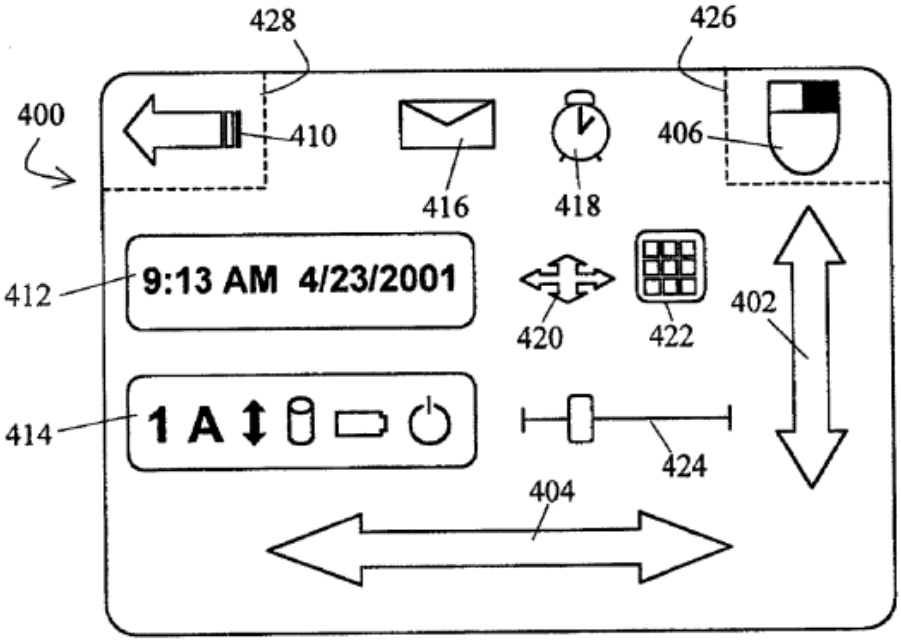


Figure 4

101. The graphical icon 424 shown above "represents the volume control for the sound system and speakers of [a] computer. Icon 424 includes a visual slider and 'thumb.'" *Id.*, [0057]; *see also id.*, [0060]. "When the touch screen is in the activated state, finger motions within the volume control region can move the thumb to a different location on the slider to adjust the volume level." *Id.* That is, using his or her finger, a user can slide the visual thumb on the virtual slider left or right to decrease or increase volume. *See, e.g.*, Gillespie, [0044] (explaining that "finger motions," when used on a conventional touchpad, "cause corresponding motions of a cursor on the main display"); [0049] (distinguishing finger motions and finger taps). Furthermore, display scrolling region icons 402 and 404 in Figure 4 illustrates two directional arrows, which indicates to a POSA that touching the display and

moving to the left or to the right will create different functional outcomes (402) or touching the display and moving up or down will create different functional outcomes (404).

2. The Combination

102. In view of Gillespie, in my opinion POSAs would have been motivated to design Bodley's headset in the Bodley-Griffin combination such that the headset included Gillespie's visual slider (e.g., icon 424). This design would provide an easier way to adjust setting (e.g., volume) over Bodley's conventional keys/buttons.

103. Bodley teaches that, among other uses, its integral display can be used to "to adjust or set…headset volume." Bodley, [0019]; *see also id.*, [0004]. Bodley's exemplary embodiments use physical "volume keys" as "input means" to adjust volume. *Id.*, [0020]; FIG. 1 (elements 115); *see also id.*, [0019] ("display 103 can be used during headset configuration (e.g., to adjust or set the ring mode, ring loudness, headset volume…)"). In view of Gillespie, however, in my opinion POSAs would have known that other forms of input means existed, including graphical icons presented on a touchscreen. Gillespie explicitly motivates the combination because its touchscreen has a small size (the size of a laptop's touchpad) and pertains to similar control types (e.g., volume).

104. Implementing Bodley's headset in the Bodley-Griffin combination such that the headset's touch-sensitive display presented users with a visual slider

like Gillespie's icon 424 (or a directional arrow like Gillespie's scrolling region 402/404) to adjust the headset's volume (or another setting) would have been the simple substitution of one conventional input means (Bodley's volume keys) for another conventional input means (Gillespie's visual slider) to obtain predictable results (a headset with inputs means for adjusting its volume).

105. It is my opinion that POSAs would have had a reasonable expectation of success in implementing the combination as Bodley's display is already touch sensitive and is thus a touchscreen similar to the one Gillespie discloses. Bodley, [0019], claim 19; Gillespie, [0038]. Modifying Bodley's display to include Gillespie's icon 424 (or scrolling region 402/404) would have required only routine software programming, well within POSAs' capabilities.

106. In the Bodley-Griffin-Gillespie combination, users can adjust the volume of Bodley's headset by touching the thumb on Gillespie's visual slider and sliding the thumb left or right by sliding their finger left or right on the integral display to decrease or increase volume. Alternatively, the user can perform the same basic function using scrolling region 402/404.

3. Claim 4

107. As discussed above, the headset in Bodley-Griffin-Gillespie headset is Bodley's headset which includes an "on-board processor (also referred to as a controller or an interface controller)." Bodley, [0018]; *see also id.*, [0004], [0023],

claim 21. Bodley's controller is configured to "program and/or modify the functionality of the headset." *Id.*, [0023].

108. In the Bodley-Griffin-Gillespie, Bodley's controller would be "*configured to identify a sliding action across at least a portion of the touch-sensitive input surface*," *i.e.*, a left or right slide of the user's finger on the screen to move the thumb on a visual slider left or right (or to move left/down or right/up along a directional arrow). The controller would also "*facilitate a first or a second operation of the [headset]*," *i.e.*, a volume increase operation or a volume decrease operation, *"based on identifying whether the sliding action is in a first direction*," *i.e.*, to the right (or up), *"or a direction opposite from the first direction*," *i.e.*, to the left (or down) *"across the at least a portion of the touch-sensitive input surface*."

D. Ground 1D: The Bodley-Griffin Combination in View of Irvin Renders Claims 5-6, 9, and 11 Obvious.

109. I have been instructed by counsel for Bose to assume that Irvin qualifies as prior art to the Challenged Claims.

1. Irvin (EX1011)

110. Irvin discloses a wireless headset that includes a sensor for detecting whether the headset is being worn by a user so the headset can automatically be placed into an active (or inactive) state to conserve battery power. Irvin, Abstract, 2:29-31. Irvin's wireless headset is suitable for use with a "cellular telephone," and

"draws essentially no power" when in an inactive state. Irvin, 2:32-3:2; *see also* Abstract.

111. Irvin teaches that its sensor for detecting whether the headset is being used "may be based on a variety of technologies" so long as it "provide[s] a signal responsive to a natural stimulus associated with use of the headset by a user." Irvin, 7:10-14. One such sensor Irvin identifies is an "accelerometer" that can detect movement of the headset. Irvin, 7:14-17. An alternative sensor is a "contact sensor," *e.g.*, a force or pressure sensor, that detects when the headset contacts the user's head. Irvin, Abstract, 8:28-9:8, claim 11.

2. The Combination

112. In view of Irvin, in my opinion POSAs would have had reason to add a sensor to the headset in the Bodley-Griffin combination that outputs data indicating when the headset is in use so as to conserve the life of the headset's rechargeable battery. *Supra* Ground 1A (discussing limitation [1C]). As Irvin explains, "battery life is a key component of operator convenience," and therefore "it is important that wireless headset design incorporates provisions maximizing battery life." Irvin, 2:17-21. Irvin's teachings explicitly motivate the combination since its sensors are already used to determine whether a headset is in use. Moreover, Irvin's use is consistent with Bodley's teaching that "battery level" is important information to display for users. Bodley, [0004], [0019].

113. In an obvious implementation, the sensor would be either an accelerometer that detects movement of the headset or a contact sensor like a force sensor that detects when the user's head is in contact with the headset. Irvin, 7:14-17, Abstract, 8:28-9:8, claim 11. The choice between the two would have been a simple and routine design choice for POSAs in my opinion, and either implementation would have been obvious to pursue. Data from either sensor would be used by the controller/processor in Bodley's headset to control whether the headset should transition from an inactive to an active state. Bodley, [0018] ("headset on-board processor (also referred to as a controller…)"), [0019] ("headset processor"); [0023]; claim 25 ("a controller"); Irvin, Abstract, 2:29-3:10, 10:13-27.

114. Irvin's wireless headset includes conventional functionality with which a person of ordinary skill in the art would have been familiar and which the ordinary artisan would have had reason to include in an obvious variation of the Bodley-Griffin headset to include a sensor for detecting whether the headset is being worn by a user, e.g., by use of an accelerometer. Irvin, Abstract, 2:29-31, 7:15-17.

3. Claim 5: "…a controller configured to determine whether the…apparatus is being used based on outputs from a sensor…."

115. As discussed above, the headset in Bodley-Griffin-Irvin headset is Bodley's headset which includes an "on-board processor (also referred to as a controller or an interface controller)," *i.e.*, "*a controller*." Bodley, [0018]; *see also*

id., [0004], [0023], claim 21. Bodley's controller is configured to "program and/or modify the functionality of the headset." *Id.*, [0023].

116. As discussed above, the Bodley-Griffin-Irvin combination includes Irvin's sensor for detecting whether Bodley's headset is being worn by a usern and in the combination Bodley's controller would have been configured to determine, "*based on outputs from a sensor*", *i.e.*, Irvin's sensor, whether the headset is being worn, *i.e.*, "*used*."

4. Claim 6: "…an accelerometer."

117. As discussed above in Section VI.D.2, an obvious implementation of the Bodley-Griffin-Irvin combination uses an "accelerometer" as the sensor for detecting whether headset is being used. Irvin, 7:15-17.

5. Claim 9: "…a force sensor."

118. As discussed above in Section VI.D.2, an obvious implementation of the Bodley-Griffin-Irvin combination uses a "contact sensor" as the sensor for detecting whether headset is being used. Irvin, Abstract, 8:28-9:8, claim 11. It is my opinion that POSAs would have considered Irvin's "contact sensor" to be a "*force sensor*" as claimed. To start, the specification of the '518 patent does not use the term "*force sensor*," but it does identify numerous "forces" that can activate a switch and these forces range from mechanical forces to electrical forces to magnetic forces and so forth. EX1001, 38:61-65, 5:54-55, FIG. 28. The patent thus broadly

describes a "*force sensor*" as a sensor capable of detecting at least one of many different types of forces. Irvin's "contact sensor" is such a sensor because a person of ordinary skill would have known that Irvin's contact sensor senses the force that is applied by physical contact with the sensor (*i.e.*, a contact force) and/or the absence of such force. Irvin, 8:28-9:8, claim 32 ("wherein said predetermined condition is contact between said wireless headset and a user's body and said sensor is a contact sensor"). Irvin's contact sensor thus detects a force—a contact force—and is a "*force sensor*" as claimed.

6. Claim 11: "…an accelerometer."[2]

119. *Supra* claim 6; *see also* claim 3 (Ground 1A).

E. Ground 1E: The Bodley-Griffin Combination in View of Glezerman Renders Claim 7-8, 10, and 17 Obvious.

120. I have been instructed by counsel for Bose to assume that Glezerman qualifies as prior art to the Challenged Claims.

[2] Claim 11 lacks an antecedent basis for "*claim*," but the immediately preceding claim 10 depends from claim 3 and thus Petitioner treats claim 11 as depending from claim 3. For the reasons set forth in Ground 1D, however, claim 11 would have been obvious regardless of what claim it depends from.

1. Glezerman (EX1012)

121. Glezerman discloses a wireless headset that provides users with the ability to utilize different attachments for securing the headset to their head. Glezerman, [0027]. "Through these different modes of attachment, the headset can be directly and easily secured around a user's ear or attached to the frame of a pair of eyeglass or sunglasses." *Id.* A first attachment 110 for attaching the headset to the user's glasses is depicted in FIG. 1, and a second attachment 160 for attaching the headset to the user's ears is depicted in FIG. 2. *Id.*, [0013]-[0014].

FIG. 1

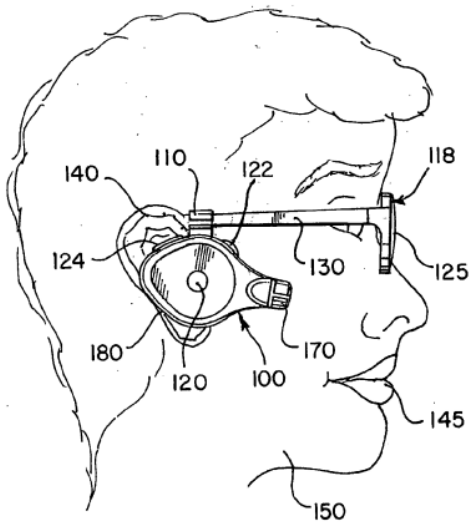
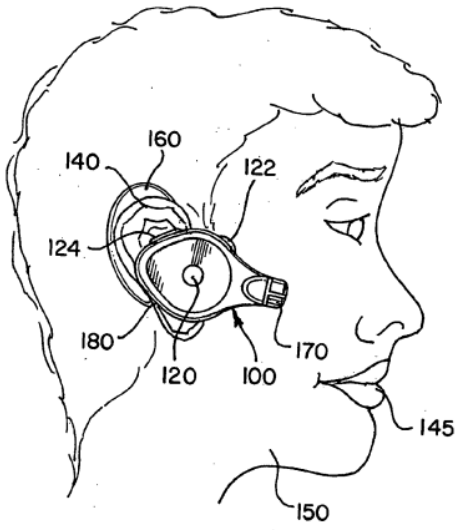


FIG. 2



122. In Figure 8 (below), Glezerman depicts an embodiment in which its attachments are connected to the headset via a magnet 800 on the headset that

magnetically attaches to metal portions 810 and 830 on the attachments (Glezerman, [0045]-[0046]):

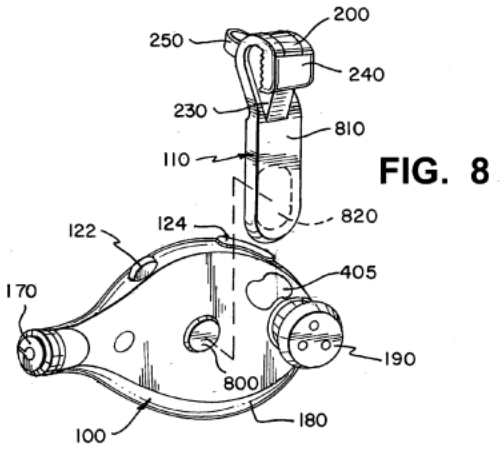


FIG. 8

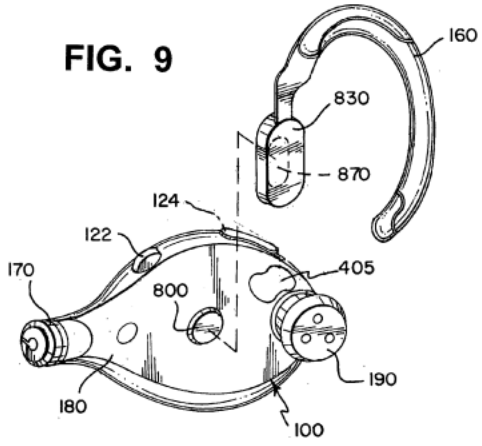


FIG. 9

2. The Combination

123. In view of Glezerman, in my opinion POSAs would have been motivated to design Bodley's headset in the Bodley-Griffin combination such that the headset's body included a magnet to which different attachments (*e.g.*, an earhook, a loop for glasses) could attach. This design would make the earhook for Bodley's headset removable such that that it could be replaced with an attachment more suitable for use with eyeglasses such as Glezerman's attachment 110.

Glezerman, [0033]-[0034]; *see also* FIGS. 8, 11, claim 1. Making the earhook removable would also beneficially allow Bodley's headset to be used more effectively as an earbud (*i.e.*, without any attachment), a design that Griffin motivates as discussed above in Ground 1A regarding claim 15.

124. Glezerman explicitly motivates the combination as it touts its design as "offer[ing] versatility to a user" by allowing changes in different modes of attachment "quickly and easily." Glezerman, [0006]. For example, with Glezerman's design, a user could switch from using Bodley's earhook to using Glezerman's attachment 110 for glasses when the user puts on a pair of "sunglasses." Glezerman, [0033]. Likewise, a user could elect to use no attachment, consistent with the earbud-design shown in Griffin. *See* Griffin, FIGS. 4-5, 15a, 15b.

125. It is my opinion that POSAs would have had a reasonable expectation of success in implementing the Bodley-Griffin-Glezerman combination as it requires mere routine engineering skill to modify Bodley's headset such that it includes the design features described in Glezerman. For example, the design would merely require adding a magnet to the body of Bodley's headset and including magnetic material (*e.g.*, metal) on Bodley's earhook 105 or Glezerman's attachment 110 so that they can attach to the magnet.

3. Claim 7: "…an area configured for attachment via magnetic force."

126. As explained above, the headset in the Bodley-Griffin-Glezerman combination includes a magnet that is configured for attachment with, *e.g.*, Bodley's earhook 105 or Glezerman's attachment 110 "*via magnetic force*." Glezerman, [0045]-[0046].

4. Claim 8: "…a magnet in the area."

127. *Supra* claim 7.

5. Claim 10: "…an area configured for attachment via magnetic force."

128. *Supra* claim 7; *see also* claim 3 (Ground 1A).

6. Claim 17

129. *Supra* claim 7; *see also* claim 16 (Ground 1A).

F. Ground 1F: The Bodley-Griffin-Glezerman Combination in Further View of Taenzer Renders Claims 12 and 18 Obvious.

1. Claim 12

130. Claims 12 and 18, respectively, limit claims 10 and 17 in the same manner that claim 2 limits claim 1. As established immediately above in Ground 1E, the Bodley-Griffin-Glezerman combination renders claims 10 and 17 obvious.

131. For the same reasons as discussed above in Ground 1B, Taenzer would have given POSAs reason to include voice-control functionality in Bodley's Bluetooth headset in the Bodley-Griffin-Glezerman combination. The resulting

Bodley-Griffin-Glezerman-Taenzer combination renders claims 12 and 18 obvious as seen below.

1. [12PRE]

132. *See* claim 10 (Ground 1E).

2. [12A]: "wireless communication circuitry…for coupling to at least a Bluetooth network; and"

133. *See* limitation [2A] (Ground 1B).

3. [12B]: "a storage medium configured to store at least computer program codes for facilitating voice recognition to facilitate recognizing at least a word received at least by the microphone for an operation of the head-worn wireless electronic apparatus."

134. *See* limitation [2B] (Ground 1B).

4. Claim 18

a. [18PRE]

135. *See* claim 17 (Ground 1E).

b. [18A]

136. *See* limitation [2A] (Ground 1B).

c. [18B]

137. *See* limitation [2B] (Ground 1B).

G. Ground 1G: The Bodley-Griffin-Glezerman-Taenzer Combination in Further View of Irvin Renders Claim 13 and 19-20 Obvious.

138. Claim 13 limits claim 12 in the same manner that claim 5 limits claim 1. Likewise, claims 19 and 20 limit claim 18 in the same manner that claims 5-6

limit claim 1. As established immediately above in Ground 1F, the Bodley-Griffin-Glezerman-Taenzer combination renders claims 12 and 18 obvious.

139. For the same reasons as discussed above in Ground 1D, Irvin would have given POSAs reason to include reason to include an accelerometer in Bodley's headset in the Bodley-Griffin-Glezerman-Taenzer combination to detect when the headset is in use so as to conserve battery power. The resulting Bodley-Griffin-Glezerman-Taenzer-Irvin combination renders claim 13 and 19-20 obvious.

H. Ground 1H: The Bodley-Griffin-Glezerman Combination in Further View of Gillespie Renders Claim 14 Obvious.

140. Claim 14 limits claim 12 in the same manner that claim 4 limits claim 1. As established above in Ground 1F, the Bodley-Griffin-Glezerman-Taenzer combination renders claim 12 obvious.

141. For the reasons discussed above in Ground 1C, Gillespie would have given POSAs reason to include a visual slider in the Bodley-Griffin-Glezerman combination that a user would slide left or right with their finger to adjust the volume on the combination's headset. The resulting Bodley-Griffin-Glezerman-Gillespie combination renders claim 14 obvious.

VII. UNPATENTABILITY GROUNDS: THE GOH-BASED GROUNDS

A. Ground 2A: Goh in View of Dyer and Hollemans Renders Claims 1-5, 9, and 12-16 Obvious

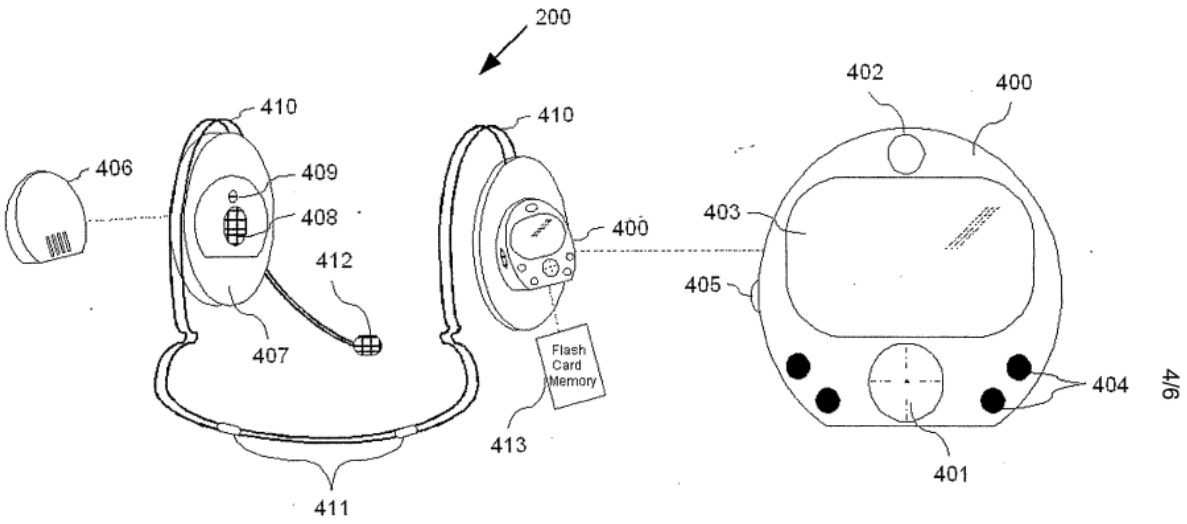
142. I have been instructed by counsel for Bose to assume that Goh, Dyer, and Hollemans qualify as prior art to the Challenged Claims.

1. Goh (EX1005)

143. Goh discloses a multifunctional wireless headset. Goh, Title, 5:11-12 ("One main aspect of the invention is to provide a digital wireless headset for multifunctional usage, which offers the user a wide range of functionality."). The headset includes conventional electronic components like a speaker and a microphone, and it also includes a short-range wireless network interface, *e.g.*, Bluetooth, that allows the headset to communicate wirelessly with nearby devices. *See* Goh, 3:28-29; 9:18-20 ("The headset circuit 100 comprises above all a digital processing device 101, which comprises a central processing unit 102 for processing binary data and an audio processing unit 103 for processing audio signals."); 11:21-27 (describing use of Bluetooth); 17:26-18:2; 19:20-22; claim 1.

144. The headset also has a display. *Id*., 13:4-11 ("Finally, the central processing unit 102 is connected to an optional display controller and driver 122 for controlling and driving an optional display like a liquid crystal display (LCD). Such a LCD can be used to display a setting control menu to the user, wherein the setting control menu is provided from the operating system running in the central processing unit 102 to control the headset circuit 100.");

145. One embodiment of Goh's headset is depicted below in Figure 4:



146. Goh's headset includes "an integrated power source like a battery or an accumulator." *Id.*, 6:18-20. POSAs would have known that an accumulator is another term for a rechargeable battery. My opinion that POSAs would have known that an accumulator is another term for a rechargeable battery is corroborated by, *e.g.*, EX1023 (granted in 1995), 1:7-11 (background section, explaining that "[d]ue to their convenience of use, and also due to the increasing use of portable electrical and electronic apparatus, so-called rechargeable batteries or accumulators have become an established part of everyday domestic life"); EX1024, [0004] (background section, describing "an accumulator" as "i.e., a rechargeable battery"); EX1025, [0004] (using the two terms "rechargeable batteries" and "accumulator[s]" interchangeably, *e.g.*, "it is recommendable to use rechargeable batteries (hereinafter called accumulator)").

147. Goh further discloses the use of a "docking station" for "re-charging" the headset's power source "via a re-charging interface, if the power source [] is re-chargeable." *Id.*, 7:3-8; 12:24-13:3.

2. Dyer (EX1013)

148. Dyer discloses devices "for conveniently…recharging wireless headsets." Dyer, Abstract. One device is "wireless headset holder 705," which is depicted in Figure 9 (below) alongside a wireless headset 310 and an electrical adapter 905. *Id.*, 4:49-56 ("FIG. 7 illustrates wireless headset holder 705 with an integral dongle (not shown), a battery recharger (not shown) and an embodiment of wireless headset 310"); 5:16-21.

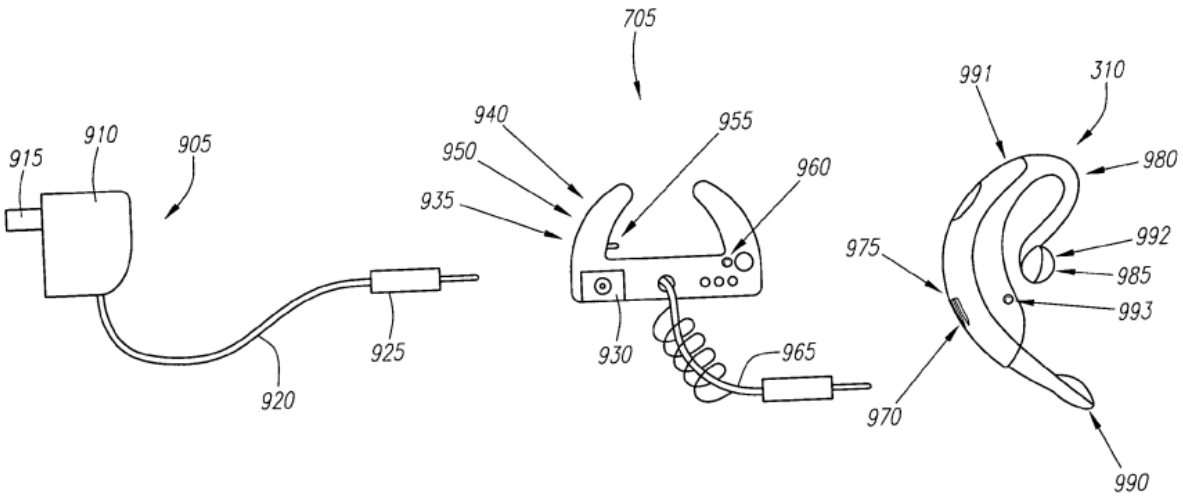


FIG. 9

149. The electrical adapter 905 plugs into a standard electrical outlet and supplies power to the headset holder 705 via connector plug 925 and jack 930. *Id.*,

5:14-21 ("FIG. 9 illustrates some of the components of wireless headset holder 705 and wireless headset 310 which are not visible in FIGS. 7 and 8. Adapter 905 includes prongs 915 for insertion into an electrical outlet, transformer 910 for converting alternating current to direct current and cord 920 for conducting the direct current to wireless headset holder 705: connector plug 925 fits into jack 930 to supply power to wireless headset holder 705.").

150. As seen in Figure 9, the headset holder includes "spring loaded pins 955," and the headset includes corresponding "contacts 970." *Id.*¸5:21-25. When contacts 970 of the wireless headset "are engaged with spring loaded pins 955," the headset holder "recharge[s] battery 975 of wireless headset 310." *Id.*; *see also* Abstract.

3. Hollemans (EX1014)

151. Hollemans discloses a remote control device that takes the form of an earbud-type headphone with a touch-sensitive surface. Hollemans, Abstract ("In a personal audio system (100), a remote controller (120) has a touch-sensitive area (122) and is worn in or by a human ear…"), 1:44-49 ("This object is realized in that the controller has an outer surface with a touch-sensitive area, the controller being arranged to be substantially worn in or by a human ear, the controller being further arranged to detect the touch-sensitive area being touched, and to send the control signal in response to detecting the touch-sensitive area being touched."), 1:63-2:4

("Advantageously, the controller is arranged to fit substantially in a human ear concha, such that the area is accessible for touching when the controller is fitted substantially in the concha…."), FIG. 2, claim 10.

152. The earbud detects "temporal patterns" that a user makes on the touch-sensitive surface and controls the functionality of a remote device, e.g., a mobile phone or MP3 player, based on those detected patterns. *Id*., 1:12-19, 2:5-18, 3:9-17. "An example is a single short tap for pause/play, double short tap for next track, triple short tap for next artist/album and a long tap for adjusting the volume." *Id*., 2:15-18. Hollemans also teaches that its earbud can detect "gestures made on the [touch-sensitive] area" in various ways, including with "a small camera." *Id*., 6:14-18.

153. Hollemans touts its touch-sensitive design over prior-art remote control designs that relied on "tiny button[s] to active the desired function" and which "require[] considerable time and attention from the user, which may lead to dangerous situations when the user takes part in traffic." *Id.*, 1:20-40.

4. The Combination

154. Dyer and Hollemans, respectively, disclose conventional functionality with which a person of ordinary skill in the art would have been familiar and which the ordinary artisan would have had reason to include in obvious variations of Goh's headset.

155. Starting with Dyer, it teaches a conventional technique for charging a headset, *i.e.*, the use of a spring-loaded charging contacts on charging dock that are urged into contact with corresponding conductive pads on a headset. Hollemans, in turn, teaches the use of touch-sensitive surfaces on a headset for controlling/adjusting functionality of, for example, a device with which the headset is connected.

156. In view of Dyer and Hollemans, in my opinion POSAs had reason (a) to implement Goh's pre-existing docking station as a spring-loaded recharging station, and (b) to augment Goh's pre-existing controller by adding to the controller a touch-sensitive surface that a user could touch to control the functionality of the headset and/or the electronic device(s) with which the headset is wirelessly connected.

157. Starting with the modification that Dyer would have motivated, Goh discloses a docking station with an interface "for re-charging an integrated power source," *i.e.*, a rechargeable battery, within the headset. Goh, claim 12; *see also* FIG. 1 (element 121). Goh, however, does not provide details regarding how to implement its docking station, leaving that to POSAs' routine skill.

158. And while Goh's Figure 4 depicts "a detachable power source 406 for supplying the headset 200 with power," it does not provide details regarding that

power source. Goh, 17:12-13. In my opinion POSAs would have had reason to look for known designs for recharging the headset like Dyer's spring-loaded design.

159. As for the modification that Hollemans motivates, POSAs would have recognized that Hollemans' touch-sensitive surface would beneficially allow users to adjust the functionality of Goh's headset and/or the electronic device to which it is wirelessly connected in a convenient manner that did not require locating and pressing small physical buttons. My opinion is based on Hollemans explicitly motivating the use of its touch-sensitive surface to increase user safety in scenarios such as driving. Hollemans, 1:28-40 (prior art devices "require[] considerable time and attention from the user, which may lead to dangerous situations when the user takes part in traffic."). The use of Hollemans' touch-sensitive surface on Goh's headset is merely the use of a known technique to improve similar devices in the same way.

160. In the Goh-Dyer-Hollemans combination, Goh's headset would be designed to include Dyer's "contacts 970" and Goh's docking station would be designed to include Dyer's "spring loaded pins 955" for recharging Goh's battery, which is well within the skill of a POSA in my opinion.

161. In addition, in the Goh-Dyer-Hollemans combination, Goh's headset would maintain all the functionality associated with the Goh-Dyer combination, but the headset would also be designed to include, e.g., on the surface of controller 400,

a touch-sensitive surface and the headset would use that surface to detect touch-based commands from a user for adjusting the functionality, e.g., volume. Such a touch-sensitive surface would either replace one or more of the physical buttons on Goh's controller 400 or be added to the controller as another means to control the headset's functionality in situations where the physical buttons are not easily accessed, e.g., when driving.

162. It is my opinion that POSAs would have had a reasonable expectation of success in the combination as it involves the use of conventional components for their conventional and intended purposes such that implementing the combination was within POSAs' routine engineering skills.

5. Claim 1

a. [1PRE]

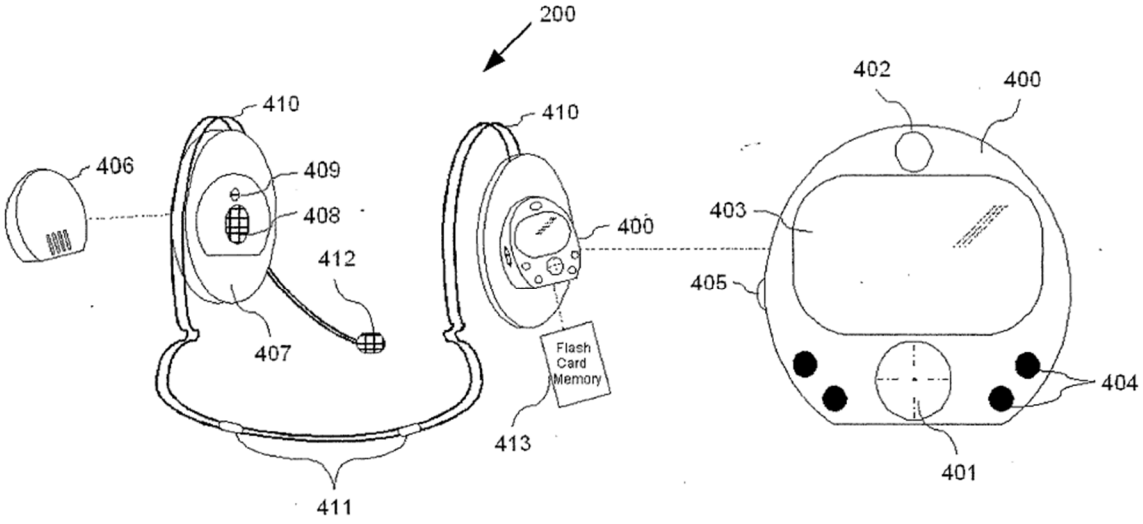
163. Goh discloses a "digital wireless headset" that includes "at least one speaker" for playing an "audio signal," *e.g.*, for "a phone call" or "music." *See* Goh:

- 5:11-25 ("One main aspect of the invention is to provide a digital wireless headset for multifunctional usage, which offers the user a wide range of functionality. … A headset for multifunctional usage comprises at least one speaker, a microphone, a central processing unit for processing binary data, an audio processing unit for processing an audio signal, a memory device, a short-range wireless network interface for enabling a binary data communication of the headset with surrounding communication devices, and an operating system being executable in the central processing unit.…");
- Abstract ("A headset for multifunctional usage comprises at least one speaker (110), a microphone (111, 118), a central processing unit (102) for processing binary data, an audio processing unit (103) for

processing an audio signal, a memory device (105, 106, 107), a short-range wireless network interface (115, 116) for enabling a binary data communication of the headset with surrounding communication devices, and an extensible operating system executable in the central processing unit (102).");

- 7:27-8:10 ("The headset has preferably the functions of a sound card or is arranged to work as an audio player, e.g. a MP3 player, which is able to play music from binary audio data representing an audio signal. The necessary binary audio data are saved in the memory device or transmitted during an audio communication via the short-range wireless network interface or via the wired communication connection….");
- 11:1-10 ("The audio processing unit 103 is necessary to convert audio signals into corresponding binary audio data processable by the central processing unit 102 as well as to convert binary audio data into corresponding audio signals. Audio signals converted from corresponding binary audio data by the audio processing unit 103 are transferred via a digital to analog converter (DAC) 108 and a first amplifier 109 to a speaker 110. ….");

See also 14:4-10 , 18:3-7, FIG. 4 (copied below).

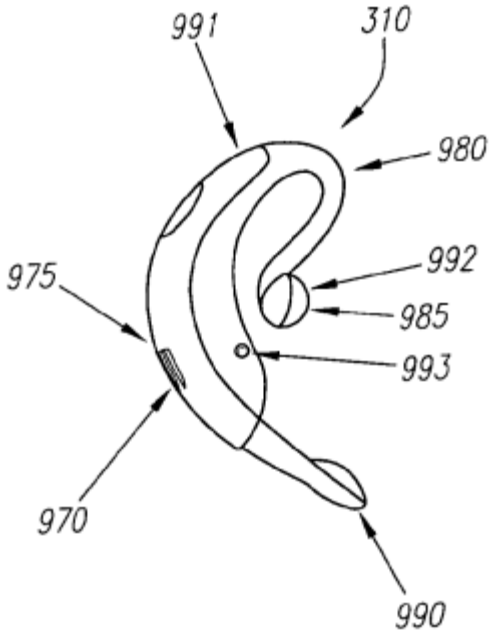


b. [1A]: "a speaker…;"

164. Goh's headset includes a speaker. Abstract ("A headset for multifunctional usage comprises at least one speaker (110)…"), *see also* 5:18-22 ("A headset for multifunctional usage comprises at least one speaker..."), ; 11:3-5; FIG. 1 (element 110); FIG. 4 (elements 408, 409).

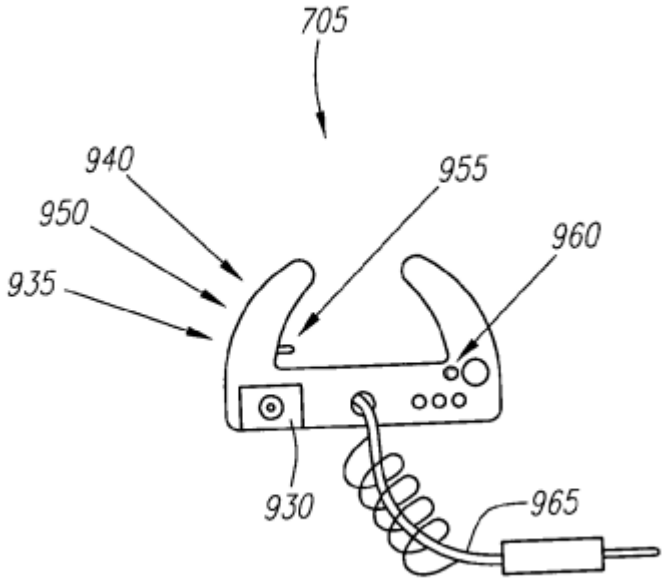
c. [1B1]: "…two conductive pads both on at least a surface of the head-worn wireless electronic apparatus"

165. As discussed above, in the Goh-Dyer-Hollemans combination Goh's headset would include Dyer's "contacts 970" which are depicted in Figure 9 as being on the surface of the headset. In my opinion, POSAs would have known the contacts were "*conductive pads*" as this was the conventional manner by which batteries were recharged, *i.e.*, by applying an electric current to the battery from a power source via conduction, confirmed as well known in the art by EX1020-EX1022, as discussed *supra* in paragraph 34.



d. [1B2]: "…corresponding conductive contacts of a counterpart connector external to and separate from the head-worn wireless electronic apparatus…"

166. As discussed above, in the Goh-Dyer-Hollemans combination Goh's headset would be charged by a docking station designed similar to Dyer's headset holder and the docking station would include Dyer's "spring loaded pins 955" for recharging Goh's battery. POSAs would have known these spring-loaded pins were "*conductive contacts*" in my opinion, as this was the conventional manner by which batteries were recharged as discussed *supra* for [1B1].



e. [1C]: "a rechargeable battery…"

167. Goh's headset includes "a power source 104" in the form of a rechargeable accumulator which POSAs understood to be another term for a rechargeable battery in my opinion. Goh, 9:20-22. For example, Goh explicitly discloses a helmet embodiment with an "accumulator" (i.e., battery) and "accumulator charger contacts 605." Goh, 19:19-22, FIG. 6 (accumulator charger contacts 605); *see also id.*, 6:19-20, 9:20-22 (headset embodiment). These "accumulator charger contacts 605" are the functional equivalent of the contacts shown on the detachable power source in Figure 4. *See also* Goh, 13:2-3, claim 10.

168. My opinion that POSAs would have known that an accumulator is another term for a rechargeable battery is corroborated by background art discussed

supra, e.g., EX1023, 1:7-11 ("Due to their convenience of use, and also due to the increasing use of portable electrical and electronic apparatus, so-called rechargeable batteries or accumulators have become an established part of everyday domestic life."); EX1024, [0004] ("DE4409736 depicts a method and a device for caring for an accumulator (i.e., a rechargeable battery) incorporated in an accumulator-operated device…"); EX1025, [0004] (using the two terms "rechargeable batteries" and "accumulator[s]" interchangeably, e.g., "it is recommendable to use rechargeable batteries (hereinafter called accumulator)").

f. [1D]: "a microphone…"

169. Goh's headset includes a microphone. Abstract ("A headset for multifunctional usage comprises at least … a microphone (111, 118)…"), 5:18, 8:11-13 ("The at least one speaker of the headset and/or the microphone are/is preferably incorporated in an earpiece of the headset..."), 11:3-5, 11:11-14 ("Further, the headset circuit 100 comprises a first microphone 111 which is located in the mouth-piece of the headset adjacent to the mouth of the user of the headset..."), FIG. 1 (element 111), FIG. 4 (element 412), FIGS. 5-6; claim 1.

g. [1E]: "a touch-sensitive input surface…"

170. As discussed above, in the Goh-Dyer-Hollemans combination, Goh's headset would include Hollemans' touch-sensitive surface, *e.g.*, a surface on controller 400, and a user would tap or otherwise touch that surface to control or

adjust "*an operation of the [headset]based on receiving at least a touch input*," *e.g.*, volume of a telephone call, the song being played on a connected MP3 player, and/or a mode of operation for the headset. Hollemans, 2:17-18 ("a long tap for adjusting volume"); claim 15; *see also id.*, 2:15-19 (describing other temporal patterns and functions to be controlled), 4:46-56 (same), 5:55-6:60 (same).

6. Dependent Claims 2-19

a. Claim 2

i. [2PRE]

171. *Supra* claim 1.

ii. [2A]: "wireless communication circuitry…for coupling to…Bluetooth…"

172. Goh's headset includes a "short-range wireless network interface [that] connects the headset via a short- range wireless network communication, e.g. a Bluetooth™ network communication, with the surrounding communication devices." Goh, 7:9-15; *see also id.*, 1:9-2:4 (describing prior-art Bluetooth headsets), 14:27-15:6 ("Third party communication devices will be identified through a short-range wireless communication protocol like Bluetooth™."); 11:21-27 ("…A short-range wireless network interface based on the Bluetooth™ technology as well as on the IEEE 802.11 standard is incorporated into the headset circuit 100 and comprises a transceiver 115, preferably a Bluetooth™ transceiver, which is electrically coupled to an antenna 116....").

iii. [2B]: "a storage medium configured to store at least computer program codes for facilitating voice recognition…."

173. Goh's headset includes a "memory device," *i.e.*, "*a storage medium*," to which the headset's central processing unit (CPU) is connected. Goh, Abstract ("A headset for multifunctional usage comprises… a memory device (105, 106, 107)…"), 5:20, 9:23-10:16, FIG. 1, claim 1. Goh's CPU "can recognize voice commands of a user" and "can control the headset…via recognized voice commands." Goh, claim 2; *see also id.*, 7:22-24 ("Further, the central processing unit of the headset can preferably be arranged in such a manner, that it can recognize voice commands of a user, and that it can control the headset via recognized voice commands."), 11:11-20, 15:8-9 ("the headset 200 can be controlled via function buttons…as well as via user voice commands"), 17:5-6.

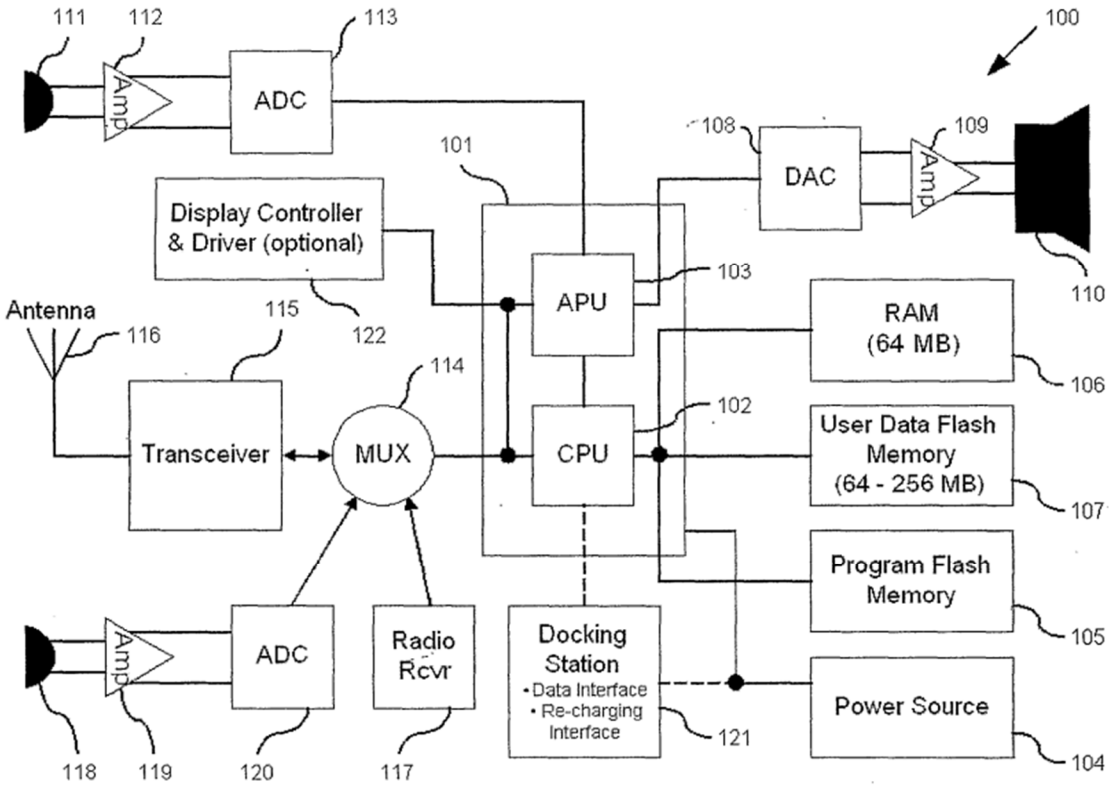


Figure 1

174. Goh explains that "voice commands" are conventionally provided via "a software library or a look-up table" that is stored in memory on the device providing the voice-control functionality. *Id.*, 2:25-3:4. In my opinion, POSAs would have understood that Goh's voice-command functionality is facilitated by similar software, *i.e.*, "*computer program codes*," and that such software is stored in Goh's memory device because the headset is providing the voice-command functionality in Goh's system.

175. POSAs would have understood that the headset's voice-command functionality is implemented using software—specifically, computer program code

stored in the device's memory. My opinion is corroborated by Goh explaining that prior-art systems often offloaded voice-command processing to external devices and criticizes this approach for its limitations. *Id*. Goh presents an improvement in which the headset itself provides voice-control functionality, which a POSA would recognize requires local processing and storage of the relevant software. Thus, POSAs would have understood that Goh's voice-command functionality is facilitated by similar software, i.e., "computer program codes," and that such software is stored in Goh's memory device because the headset is providing the voice-command functionality in Goh's system. *Id.* It is my opinion that POSAs would have seen local storage and execution of the voice-command software not only as consistent with the disclosure, but as the most efficient and expected architecture—requiring no inventive step beyond what Goh already teaches.

176. Alternatively, implementing Goh's headset such that the software for its voice-control functionality is stored in Goh's memory would have been a routine design choice given Goh's teaching that such an implementation was known. Goh, 2:25-3:4. Given this context and Goh's disclosure that such functionality is typically implemented via a "software library or a look-up table," a POSA would understand that Goh's improved system stores and runs this software within the headset, using its own memory and processor. Goh describes that the headset includes memory devices and a CPU capable of executing stored program code to carry out various

audio processing and control tasks. *Id.*, 10:17-29 (describing advanced audio processing that the headset can perform based on programs stored in memory). As such, in my opinion the logical and technically appropriate implementation would involve storing the voice-command software in the headset's memory and executing it locally.

b. Claim 3

i. [3PRE]

177. *See* claim 1.

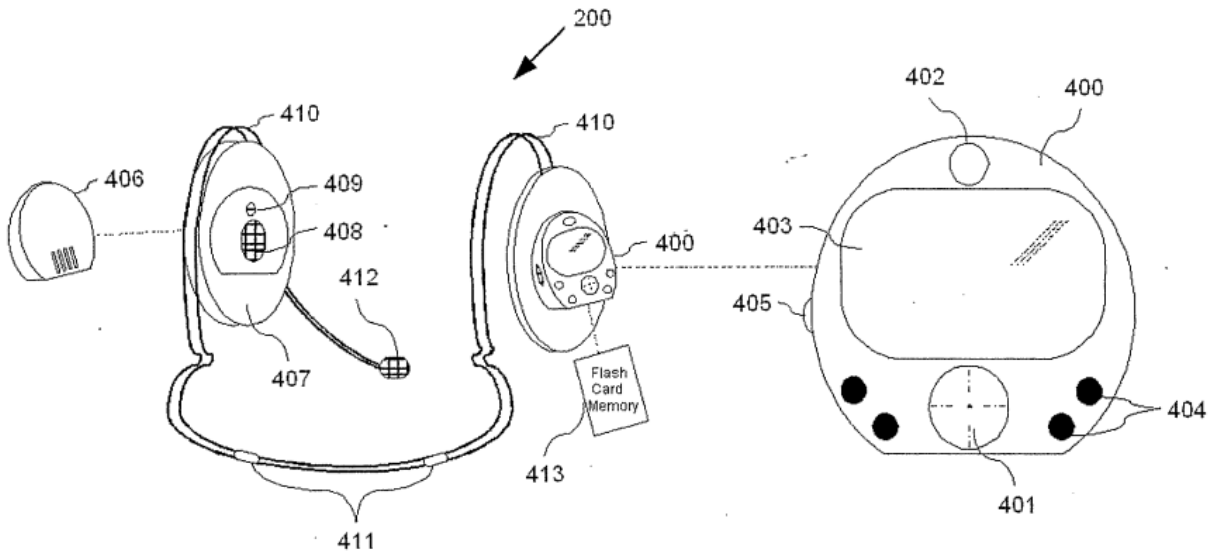
ii. [3A]: "…at least another microphone…"

178. Goh discloses embodiments in which its headset includes a second microphone, *i.e.*, "*at least another microphone*," to "offer more convenience to the user." Goh, 12:11-23; *see also id.*, 17:6-11, FIG. 1 (element 118), FIG. 4 (element 402). Goh's second microphone captures "sounds generated in the adjacent real world," *i.e.*, ambient noise. Goh, 12:11-23.

iii. [3B]: "wherein the microphone is configured to be positioned closer to mouth of the user and the another microphone is configured to be positioned further from the mouth of the user…"

179. In Goh's Figure 4 embodiment, the second microphone is element 402 and it is located on controller 400 apart from the first microphone 412 which is located on a mouthpiece. Goh, 11:11-12, 12:11-23; *see also id*., 17:6-11 ("The microphone 402 in the controller 400 is used to enable an audio connection of the

user to the real world outside of the headset 200. This will offer more convenience to the user since usually a headset shields or lowers a user's hearing of sounds generated in the adjacent real world. Therefore, the microphone 402 adds the sounds of the real 10 world adjacent to the headset 200 to the sounds of the technical world of wireless communication."), 18:9-13, FIG. 4 (elements 402, 412). The first microphone 412, *i.e.*, "*the microphone*" is thus configured to be closer to the user's mouth than the second microphone 402, *i.e.*, "*the another microphone*." Goh's second microphone captures "sounds generated in the adjacent real world," like street noise or users talking in the background or other ambient noises. Goh, 12:11-23.



iv. [3C]: "wherein at least the microphone and the another microphone are configured to receive audio inputs, with at least some noise in the audio inputs configured to be cancelled based on using at

least the microphone and the another microphone."

180. Goh's headset performs "advanced audio processing," including "real-time acoustic noise reduction." Goh, 10:17-29.

181. It is my opinion that POSAs would have understood that Goh's real-time noise reduction uses Goh's second microphone to detect ambient sounds and then subtracts those sounds from speech audio captured by Goh's first microphone positioned closer to the user's mouth thereby reducing (or canceling) ambient noise from the captured speech audio. That is, the second microphone—given its location away from the user's mouth—captures primarily ambient noise and that noise is the subtracted from the audio that the first microphone captures which—given its location close to the user's mouth—is a combination of the user's speech and ambient noise. The end result is that the audio the headset captures for transmission, *e.g.*, for a phone call, is primarily the user's speech with ambient noise having been reduced or canceled.

182. My understanding of Goh is consistent with the fact that Goh's "advanced audio processing" includes audio amplification and filtering. Goh, 10:17-29. Although Goh does not describe a specific noise reduction algorithm, a person of ordinary skill would have recognized that Goh's disclosed processing hardware (*e.g.*, its DSP) is capable of performing noise reduction directly on the signal from the primary microphone as part of standard audio signal conditioning.

183. While one embodiment in Goh suggests that ambient noise may be intentionally played through the speaker to help the user remain aware of their surroundings, a person of ordinary skill would have readily understood that the same second microphone was also used to perform Goh's real-time acoustic noise reduction in contexts like a phone call. My opinion that a person of ordinary skill in the art would have readily understood that Goh's second microphone that is used to capture ambient noise was used to perform noise reduction is corroborated by at least the following references which confirm the use of a second microphone to reduce noise was conventional:

- **EX1010**, which discloses a headset with two microphones including a first microphone called "communication microphone 38" (Fig. 1, 2:36-45) positioned close to the user's mouth to capture the user's voice, and a second microphone 10 (Fig. 1, 2:22-35) positioned on the top of the headphone so as to isolate the microphone from the user's mouth and the headphone's speakers at Abstract, 1:53-57 ("The system includes a directional microphone mounted on a headset/helmet, isolated from both voice and earphone output…."), 2:22-45 (explaining that microphone 10 "picks up the ambient noise" and such ambient noise signal, "is then inverted … to provide destructive interference" by adding it to the "voice input signal" from microphone 38, i.e., the noise signal is subtracted from the voice input signal, which "will effectively cancel noise at the mouthpiece") 2:14-16 ("The figure is generic to account for many variances among headsets, helmets, input levels, etc."), Fig. 1;

- **EX1026**, Figs. 5-6 (disclosing a mobile telephone 582 that includes a far-mouth microphone 586 that primarily captures the background noise and a near-mouth microphone 584 that primarily captures the user's speech, where the near-mouth microphone 584 is closer to the user's mouth than the far-mouth microphone 586), Abstract (same), 12:2-18 (explaining that the signals picked up by the "far-mouth

microphone 586" is used to generate an enhanced "noise estimate" by removing the speech components, which is "[f]inally…used to enhance the near-mouth signal by filtering out the enhanced background noise"; that is, the background noise estimate is subtracted from signal captured from the near-mouth microphone 584 so as to provide a clean speech signal).

184. Alternatively, implementing Goh's headset such that the ambient noise captured by its second microphone was used to perform Goh's real-time noise reduction would have been the use of a known technique to a known device ready for improvement. I recognize that Goh discloses an embodiment in which the ambient noise is added to the audio output by the headset's speaker so that a user can hear the real-world environment (*see* Goh, 12:11-23), and this might provide a safety measure to users who use the headset while riding a bike as they would be able to hear vehicles approaching when they are using the headset while riding a bike (*see* Goh, FIG. 3). However, in my opinion POSAs would have understood that there are other scenarios, *e.g.*, during a stationary phone call (*see* Goh, FIG. 2), when a user would want to use that same captured ambient noise to reduce or cancel out the noise from the speech audio captured by the microphone closer to the user's mouth. *See also infra* Ground 2F.

c. Claim 4: "…identify a sliding action across at least a portion of the touch-sensitive input surface…."

185. As discussed above for claim 1, Goh's headset would include Hollemans' touch-sensitive surface. In an obvious implementation of Goh-Dyer-

Hollemans, Goh's CPU, *i.e.*, "*a controller*," would be "*configured to identify a sliding action across at least a portion of the touch-sensitive input surface*."

186. Hollemans explains that its touch-sensitive surface "is used for picking up a gesture made on the [surface] with e.g., …a finger." Hollemans, 6:14-15. The gestures that the touch-sensitive surface can detect include a "planar gesture," and the gesture can be used to "scroll[] content on a display." Hollemans, 6:21-35. This planar gesture is a "*sliding action*."

187. In addition, "[t]he gesture detected may be a character, like a letter from an alphabet. The character detected may be used for jumping in a list to an entry with a first letter corresponding to the character detected." *Id*., 6:26-29. Such gestures corresponding to letters would include "*sliding action*(s)," such as for example if a user made the gesture of a "T" with two sliding gestures (one vertical and one horizontal).

188. In view of these teachings, in my opinion POSAs would have had reason to implement the Goh-Dyer-Hollemans combination such that a user could scroll content (*e.g.*, a list of phone numbers) shown on either Goh's display 403 (or on a display of a phone being controlled by Goh's headset) by sliding his or her finger up and down on the touch-sensitive surface. Implemented in this manner, the combination's headset changes between "*a first or a second operation*," *i.e.*, scroll up or scroll down, "*based on identifying whether the sliding action is in a first*

direction or a direction opposite from the first direction across the at least a portion of the touch-sensitive input surface."

d. Claim 5: "…determine whether the head-worn wireless electronic apparatus is being used…."

189. As discussed above in Section VII.A.4, Goh's headset would include Hollemans' touch-sensitive surface. In an obvious implementation of Goh-Dyer-Hollemans, Goh's CPU, *i.e.*, "*a controller*," would be "*configured to determine whether the head-worn wireless electronic apparatus is being used based on outputs from a sensor at least partially in the*" headset.

190. Hollemans teaches that its earbud preferably includes a second touch-sensitive surface that is positioned such that it is "touched substantially by the ear when the controller is substantially worn in or by a human ear." Hollemans, 2:19-32. Hollemans explains that "a control signal" from the earbud (*e.g.*, to control a function of a connected device like a phone) is only sent if the second touch-sensitive surface "is touched," which "prevent[s] unwanted activation of the device [being controlled by the earbud] and unnecessary battery exhaustion." *Id.* That is, in my opinion a POSA would understand that the earbud's ability to change or adjust functions of a connected device only occurs when the earbud is being worn as detected by the second touch-sensitive surface.

191. Adding Hollemans' second touch-sensitive surface, *e.g.*, "an ordinary pressure sensor" (Hollemans, 3:38-43, claim 7), to Goh's headset would have

preserved the battery of the mobile device being used with the headset (*e.g.*, a phone or MP3 player) by preventing unwanted activation of its functions when the headset was not being worn. The resulting Goh-Dyer-Hollemans combination would include Goh's CPU for executing the headset's various operations, and the CPU would be "*configured to determine whether the head-worn wireless electronic apparatus is being used based on outputs from a sensor at least partially in the*" headset, *i.e.*, Hollemans' pressure sensor performing as a second touch-sensitive surface in the headset.

e. Claim 9: "…a force sensor."

192. As discussed above in relation to claim 5, the Goh-Dyer-Hollemans combination includes a pressure sensor, and a pressure sensor is a type of "*force sensor*" as claimed by the '518 patent. *Supra* claim 5.

f. Claim 12

i. [12PRE]

193. *See* claim 10.

ii. [12A]

194. *See* limitation [2A].

iii. [12B]

195. *See* limitation [2B].

g. Claim 13

196. *See* claims 5, 12.

h. Claim 14

197. *See* claims 4, 12.

i. Claim 15: "…in an ear of the user."

198. In describing the prior art, Goh teaches that communication headsets include a speaker that "can be placed next to an ear of a user or ***inside of the ear***." Goh, 1:20-22. Goh thus identifies in-the-ear speakers (i.e., earbuds), and near-the-ear speakers as two known designs for communication headsets.

199. Therefore, while Goh's illustrated embodiments use speakers placed next to an ear, Goh explicitly taught that alternative designs were known including designs in which the speaker for the headset is positioned "inside" the user ear. Implementing Goh's headset using an in-the-ear earbud design would have been the simple substitution of one known element (near-the-ear speakers) for another (in-the-ear earbud speakers) to yield a predictable result.

200. The use of headsets with earbud speakers that were configured to be placed in the user's ear was well known and conventional before 2004. *See* Hollemans, Abstract, 1:20-22 (discussing prior art headsets composed of "ear buds that can be inserted into the ears of the user"); 1:44-49, 1:63-2:4, FIG. 2, claim 10 (remote control device that takes the form of an earbud-type headphone with a touch-sensitive surface). Indeed, both Hollemans and Dyer reinforce this teaching as each discloses an earbud-type design in which a speaker is worn inside the user's ear

while other parts of the headset are positioned outside the ear. Hollemans, 4:21-22 ("worn in or by a human ear"), FIG. 2; Dyer, 5:39-42 (explaining "speaker 985" is designed "for comfortable insertion into a user's ear"), FIG. 9.

201. Given the teachings of Goh, Dyer, and Hollemans, in my opinion POSAs would have recognized that an obvious implementation of the Goh-Dyer-Hollemans combination would be one in which the speakers for Goh's headset are placed inside of the user's ear such that the headset is "*configured to be worn in an ear of the user.*" Such an implementation would have been a design choice that POSAs routinely made through the exercise of ordinary skill.

j. Claim 16

(1) [16PRE]

202. *See* claim 15.

(2) [16A]

203. *See* limitation [3A].

(3) [16B]

204. *See* limitation [3B].

(4) [16C]

205. *See* limitation [3C].

B. Ground 2B: The Goh-Dyer-Hollemans Combination In View of Irvin Render Claims 5-6, 11, 13 and 20 Obvious.

1. Irvin

206. Irvin is discussed above in Ground 1D.

2. The Combination

207. As discussed in Ground 2A with respect to claim 5, POSAs would have implemented the Goh-Dyer-Hollemans combination such that it included a sensor, *e.g.*, a pressure sensor, that provided data which the headset's CPU uses to determine whether the headset was being worn so as to conserve power by, for example, preventing an electronic device connected to the headset from mistakenly being operated when the headset is not worn. POSAs would have considered Irvin's accelerometer-based approach to determining whether a headset is being worn to be an obvious substitution for Hollemans' use of a touch-sensitive surface / pressure sensor and/or an obvious augmentation to Hollemans' use of a touch-sensitive surface / pressure sensor.

208. For the reasons discussed in Ground 1D and Ground 2A (claim 5), in my opinion POSAs would have recognized benefits to Goh's headset being able to determine whether it is being worn so that the headset's power and/or the power of the electronic device(s) that the headset communicates with would be preserved. Accelerometers would have been well-known to POSAs, who thus had reason to implement the Goh-Dyer-Hollemans combination using an accelerometer instead of (or in addition to) the pressure sensor as a sensor that provides data to Goh's CPU that the CPU uses to determine whether the headset is being worn to conserve power. Irvin, Abstract, 2:29-31, 7:14-17. Implementing an accelerometer can be more

convenient as it can automatically detect the headset use when the user picks up the headset and places it on the head, without requiring additional user action that a pressure sensor might require, such as identifying and touching the pressure sensor. Moreover, implementing Irvin's accelerometer in the headset can achieve more reliable detection because while an inadvertent light touch could trigger a pressure sensor, it is harder to move the headset and trigger an accelerometer, and Irvin teaches employing a "defined threshold" of acceleration to only detect actual use, which helps "avoiding inadvertent or unintended enabling of the wireless headset." Irvin, 7:19-24. The resulting Goh-Dyer-Hollemans-Irvin combination retains the features of Goh-Dyer-Hollemans discussed in Ground 2A, but uses an accelerometer rather than a pressure sensor.

209. Alternatively, POSAs would have found it obvious to include Irvin's accelerometer in addition to a pressure sensor in the Goh–Dyer–Hollemans headset. Using a combination of sensing techniques in one headset for user interaction detection and automatic headset enabling, such as an accelerometer with a pressure sensor, was well-known to POSAs. Irvin, Abstract ("Techniques for automatic headset enabling include but are not limited to **motion sensors**, attitude or position sensors, proximity sensors, and **contact sensors** [e.g., **pressure sensors**]. These techniques may be used individually or **in any combination**."). POSAs would have recognized that implementing both techniques rather than just one can even more

accurately avoid various false activation instances and thus better preserve power. For example, a headset acceleration caused by the movement of a chair or car-seat holding the headset could cause false detection by the accelerometer but may not cause any detectable touch upon the pressure sensor; and as I just explained in the preceding paragraph, the accelerometer can more reliably prevent false detection of inadvertent touches that could otherwise trigger the pressure sensor. The resulting Goh-Dyer-Hollemans-Irvin combination retains the features of Goh-Dyer-Hollemans discussed in Ground 2A, but uses both Irvin's accelerometer and the pressure sensor in the Goh-Dyer-Hollemans combination to determine when the headset is being worn.

210. It is my opinion that POSAs would have had a reasonable expectation of success in the combination as it involves the use of only conventional components for their conventional and intended purposes such that implementing the combination was well within POSAs' routine engineering skills.

3. Claim 5

211. As discussed above, an obvious implementation of Goh-Dyer-Hollemans-Irvin would include Goh's CPU, i.e., "*a controller*," which would be "*configured to determine whether the head-worn wireless electronic apparatus is being used based on outputs from a sensor at least partially in the*" headset, i.e., Irvin's accelerometer.

4. Claim 6: "…an accelerometer."

212. *Supra* claim 5.

5. Claim 11

213. *Supra* claim 6; *see also* claims 1 or 3 (Ground 2A)[3].

6. Claim 13

214. *Supra* claim 5; *see also* claim 12 (Ground 2A).

C. Ground 2C: The Goh-Dyer-Hollemans Combination in View of Glezerman Renders Claims 7-8, 10, 17, and 18-19 Obvious.

1. Glezerman

215. Glezerman is discussed above in Ground 1E.

2. The Combination

216. Glezerman discloses a wireless headset that provides users with the ability to utilize different attachments, including magnetic attachments, for securing the headset to their head. Glezerman, [0027]. A person of ordinary skill in the art would have been familiar with such attachments and would have had reason to include them in an obvious variation of the Goh-Dyer-Hollemans headset.

217. Goh's headset "is formed in such a way that [it] can be comfortably worn by a user." Goh, 18:3. In the embodiment shown in Goh's Figure 4, "the headset 200 comprises a frame 410, which wraps around the ears and the back of the

[3] *See* fn. 2.

head of the user. This secures the position of the headset 200 even if the user is in active movement." *Id.*, 8:3-6. Goh also discloses other techniques for wearing a headset, including the use of earhooks. *Id.*, 19:11-12 ("an earphone hook 512 to additionally secure the earphone 509 at the ear of the user").

218. In view of Glezerman, in my opinion POSAs would have had reason to implement Goh's headset (which is used in the Goh-Dyer-Hollemans combination) such that the left and right "earpiece housing(s)" of the headset (Goh, 17:4-5, FIG. 4) includes a magnet to which different attachments (*e.g.*, an earhook, a loop for glasses) could attach. This design would eliminate the need for Goh's frame 410 to wrap "around the ears," and would beneficially allow a user to select between a conventional earhook attachment mechanism (like Goh's earhook 512) and an attachment more suitable for use with eyeglasses such as Glezerman's attachment 110. Glezerman, [0033]-[0034]; *see also* FIGS. 8, 11, claim 1.

219. Glezerman explicitly motivates the combination as it touts its design as "offer[ing] versatility to a user" by allowing changes in different modes of attachment "quickly and easily." Glezerman, [0006]. For example, with Glezerman's design, a user could switch from using an earhook for Goh's headset to using Glezerman's attachment 110 for glasses when the user puts on a pair of "sunglasses." Glezerman, [0033].

220. It is my opinion that POSAs would have had a reasonable expectation of success in implementing the Goh-Dyer-Hollemans-Glezerman combination as it requires mere routine engineering skill to modify Goh's headset such that it includes the design features described in Glezerman. For example, the design would merely require adding a magnet to each earpiece housing of Goh's headset and including magnetic material (*e.g.*, metal) on an earhook like Goh's earhook 512 and on Glezerman's eyeglasses-attachment 110 so that they can each attach to the magnet on the earpieces.

3. Claim 7: "…an area configured for attachment via magnetic force."

221. As explained above, the headset in the Goh-Dyer-Hollemans-Glezerman combination includes a magnet that is configured for attachment with, *e.g.*, Goh's earhook 512 or Glezerman's attachment 110 "*via magnetic force*." Glezerman, [0045]-[0046].

4. Claim 8: "…a magnet in the area."

222. *See* claim 7.

5. Claim 10

223. *Supra* claim 7; *see also* claim 3 (Ground 2A).

6. Claim 17

224. *Supra* claim 7; *see also* claim 16 (Ground 2A).

7. Claim 18

225. *Supra* claim 17; *see also* claim 2 (Ground 2A).

8. Claim 19

226. *Supra* claim 18; *see also* claim 5 (Ground 2A).

D. Ground 2D: The Goh-Dyer-Hollemans-Glezerman Combination in View of Irvin Renders Claim 20 Obvious.

227. Claim 20 limits claim 19 in the same manner that claim 6 limits claim 1. As established immediately above in Ground 2C, the Goh-Dyer-Hollemans-Glezerman combination renders claim 19 obvious.

228. For the reasons discussed above in Ground 2B (Section VII.B.2), Irvin would have given POSAs reason to include an accelerometer in Goh's headset in the Goh-Dyer-Hollemans-Glezerman combination to detect when the headset is in use so as to conserve battery power. In my opinion, the resulting Goh-Dyer-Hollemans-Glezerman-Irvin combination renders claim 20 obvious.

E. Ground 2E: The Goh-Dyer Combination in View of Bryan Renders Claims 1-5, 9, and 12-16 Obvious.

229. I have been instructed by counsel for Bose to assume that Bryan qualifies as prior art to the Challenged Claims.

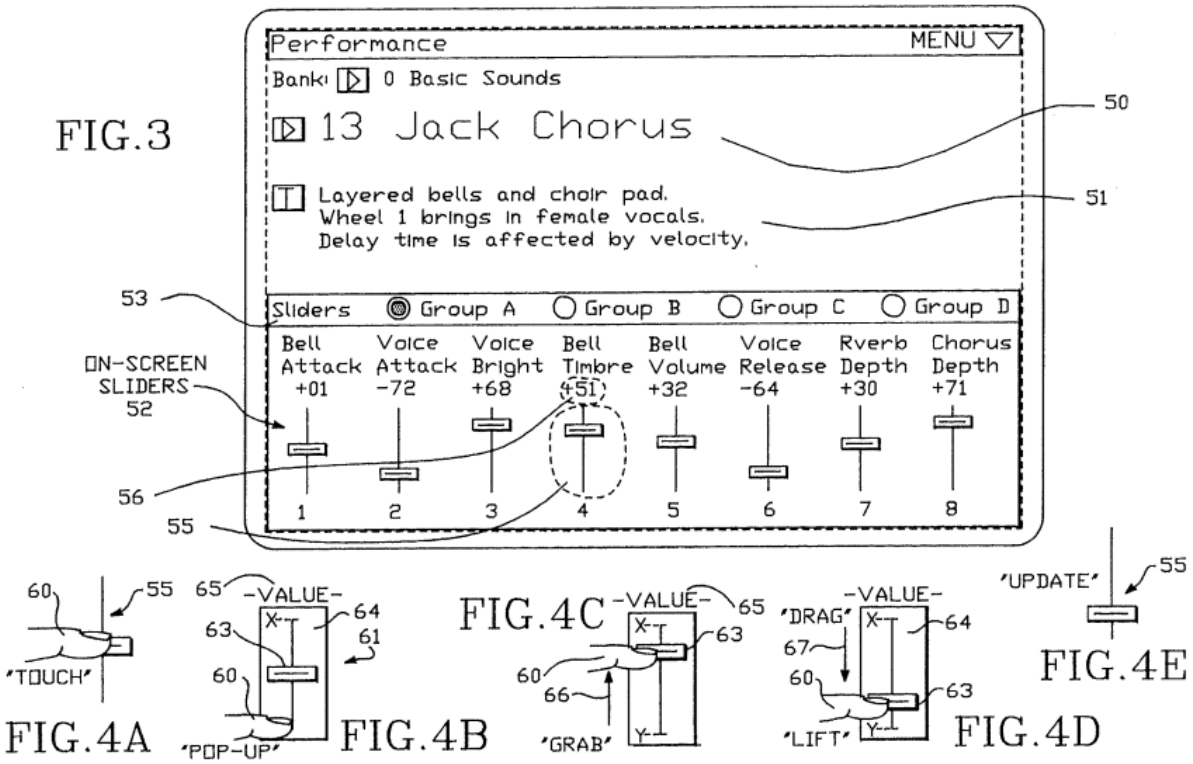
1. Bryan (EX1016)

230. Bryan discloses a touchscreen interface that can be used to adjust various parameters of a sound processing system using a pop-up slider. Bryan, Abstract, 1:9-12, 2:51-54. In introducing its invention, Bryan explains that "the use

of a relatively small, flat panel touchscreen" is desirable for adjusting parameters in sound systems, but that the small size of the screen can "limit[] the number of parameters that might be adjusted based on a single display." *Id.*, 1:36-45.

231. To address this limitation with small touchscreens, Bryan discloses an interface display in which a user selects a sound variable to be adjusted (*e.g.*, volume) by touching a slider icon associated with that variable. *Id.*, 6:21-24. If the user's finger remains on the icon for a short amount of time, then a pop-up slider appears that is larger than the initial icon that was selected. *Id.* The user can then drag, *i.e.*, slide, his finger up or down to adjust the selected variable (*e.g.*, increase or decrease volume), and when the user removes his finger from the touch screen the larger pop-up slider disappears. *Id.*, 6:24-33.

232. An example of Bryan's technique is depicted in FIGS. 3-4 below:



233. As seen above, "FIG. 4A illustrates an icon, such as icon 55 from FIG. 3. A fingertip 60 is shown schematically touching the icon 55." *Id.*, 5:44-45. Once the user's fingertips remain touching the icon, then a pop-up slider as seen in FIG. 4B appears on the touchscreen. *Id.*, 5:46-62. The user can then adjust the parameter corresponding to the pop-up slider (*e.g.*, timbre), by dragging the slider bar 63 up (FIG. 4C) or down (FIG. 4D). *Id.*, 5:65-6:7. "When the user moves the slider bar 63 to a position which corresponds to the value desired, then the user lifts the finger 60" and the pop-up slider disappears. *Id.*, 6:7-20.

2. The Combination

234. Bryan's touchscreen interface can be used to adjust various parameters of a sound processing system (Bryan, Abstract, 1:9-12, 2:51-54), which a person of ordinary skill in the art would have been familiar with and which the ordinary artisan would have had reason to include in an obvious variation of the Goh-Dyer headset.

235. Goh discloses that its headset's volume (or other headset settings) can be changed via either a "volume control button 405" (or "function buttons 404") or "voice commands." Goh, 16:24-17:6. In view of Bryan, however, in my opinion POSAs would have known that an alternative (or supplement) to either form of control is the use of a touchscreen with user adjustable pop-up sliders.

236. POSAs would have considered Bryan's particular touchscreen interface to be well-suited for use with Goh's headset, in my opinion, because (a) Bryan touts its design as suitable for small touchscreens (Bryan, 3:16-21), and the need to comfortably wear Goh's headset on a user's head limits the size of its display, and (b) Bryan's design is intended for "sound processing system[s]" (Bryan, Abstract), and Goh's headset already provides "advanced audio processing" (Goh, 10:19-20).

237. Bryan explicitly motivates the combination as Bryan's exemplary touchscreen is 4-inches by 6-inches (Bryan, 4:25-27), and POSAs would have recognized that the screen could be significantly smaller (if needed). The size of a touchscreen is a routine design choice for POSAs to pursue, and a designer could

merely reduce the number of selectable icons on the screen if the screen was smaller. Doing so would have been well within the skill of a POSA in my opinion. Likewise, POSAs also would have viewed Bryan's touchscreen controls to be more user friendly than requiring buttons to be "rotated or pushed" as was required for changing settings in Goh's unmodified headset, due to ease of use, thus providing a further benefit to its use in conjunction with the Goh-Dyer headset. Goh, 16:24-26.

238. In the combination, Goh's headset would be modified in view of Dyer for the reasons discussed in Ground 2A. In the Goh-Dyer-Bryan combination Goh's headset would maintain all the functionality associated with the Goh-Dyer combination, but the headset would also be further modified in view of Bryan such that its display 403 includes a touch panel that would convert the display to a touchscreen. Bryan, 4:27-28. A user would then adjust the headset's volume (or other setting) by touching the screen to activate Bryan's pop-up slider and then dragging the slider bar up or down. Bryan, 6:22-34.

239. It is my opinion that POSAs would have had a reasonable expectation of success in implementing the combination as converting Goh's display to a touchscreen requires only routine mechanical design skill, and providing Goh's headset with the software to operate (via its CPU) Bryan's touchscreen pop-up slider technique requires software programming skills well within POSA's capabilities. Moreover, the combination involves the use of conventional components for their

conventional and intended purposes such that implementing the combination was within POSAs' routine engineering skills.

3. Claims 1-5, 9, and 12-16

240. The Goh-Dyer-Bryan combination renders claims 1-5, 9, and 12-16 obvious for the same reasons that Goh-Dyer-Hollemans combinations renders those claims obvious with two exceptions: (**a**) the "*touch-sensitive input surface*" of limitation [1E] is met by Goh's integral display implemented in view of Bryan as a touch-screen display (rather than Hollemans' touch-sensitive surface), and (**b**) the "*sliding action*" control mechanism recited in dependent claim 4 is met by a user dragging a volume control pop-up slider on Goh's display up or down to adjust volume (rather than Hollemans' scrolling gesture).

F. Ground 2F: The Ground 2A-2E Combinations in View of Andrea Renders Claims 3, 10, 12-14 and 16-20 Obvious

241. Claims 3, 10, 12-14, and 16-20 all directly (or via dependency) require that the "head-worn wireless electronic apparatus" have two microphones "wherein at least the microphone and the another microphone are configured to receive audio inputs, with at least some noise in the audio inputs configured to be cancelled based on using at least the microphone and the another microphone." As discussed above in Grounds 2A (and thus also in Ground 2B-2E), Goh discloses and/or renders obvious this limitation.

242. If, however, Patent Owner argues that Goh does not disclose and/or render obvious the limitation, then implementing Goh's headset such that the ambient noise captured by its second microphone was used to perform Goh's real-time acoustic noise reduction would have been obvious in view of Andrea for the reasons discussed below.

243. I have been instructed by counsel for Bose to assume that Andrea qualifies as prior art to the Challenged Claims.

1. Andrea (EX1017)

244. Andrea discloses a technique "for reducing ambient noise for use with a headset or a boom headset attached to a boom microphone device or the like." Andrea, Abstract. As Andrea explains, background noise is "undesirable" in numerous situations such as conducting a telephone conversation "in a noisy area" because, *inter alia*, "the person to whom the operator is communicating constantly hears the loud background noise." *Id.*, 1:63-2:17.

245. To address this issue, Andrea's technique uses "a noise cancellation microphone transmitter system having a first and second microphone arranged such that the first microphone receives a desired speech input and the background noise present in the vicinity of the speech, and the second microphone receives substantially only the background noise. The background noise from the second microphone is converted into a corresponding electrical signal and subtracted from

a signal corresponding to the speech and background noise obtained from the first microphone so as to produce a signal representing substantial the speech." *Id.*, Abstract; *see also id.*, 1:32-39, 12:53-66 (describing technique in context of phone), 18:17-25 (describing technique in context of boom microphone for a headset), 19:26-37.

2. The Combination

246. Andrea's disclosure includes conventional functionality with which a person of ordinary skill in the art would have been familiar and which the ordinary artisan would have had reason to include in an obvious variation of the Ground 2A-2E combinations headsets. One such function is a technique for reducing ambient noise for use with a headset. Andrea, Abstract.

247. As explained in Ground 2A, Goh's headset performs "advanced audio processing," including "real-time acoustic noise reduction." Goh, 10:17-29. As also explained in Ground 2A, Goh's headset includes two microphones—a first microphone 412 that is depicted in Figure 4 as being positioned at the end of a boom near the user's mouth, and a second microphone 402 that is positioned away from the user's mouth and which captures "sounds generated in the adjacent real world," *i.e.*, ambient noise. Goh, 12:11-23; FIG. 4.

248. In view of Andrea, in my opinion POSAs would have had reason to implement Goh's "real-time acoustic noise reduction" by using Andrea's noise-

reduction technique which subtracts "background noise" received from one microphone from "a signal corresponding to the speech and background noise obtained" for a different microphone. Andrea, Abstract. As Andrea explains, its technique beneficially results in a "signal representing substantial[ly] the speech" (Andrea, Abstract), which would allow the person to whom the headset user is speaking to better hear the caller's voice. Andrea thus explicitly motivates the combination. Separately, implementing Goh's headset to use Andrea's technique would have been the use of a known technique to a known device ready for improvement and would have been well within the skill of a POSA.

249. Although Goh discloses an embodiment in which the ambient noise is added to the audio output by the headset's speaker so that a user can hear the real-world environment, in my opinion POSAs would have understood that there are scenarios, *e.g.*, during a phone call, when a user would want to use that same captured ambient noise to cancel out the noise from the speech audio captured by the microphone closer to the user's mouth. Indeed, Andrea's technique allows for different modes of operation, including its noise-cancellation mode and a separate "talk-thru mode" in which ambient noise is not canceled but rather provided to the headset's speakers, underscoring the synergy between the two references. Andrea, 33:48-35:16.

250. In the combination, Goh's two microphones perform as they already do in Goh but the ambient noise that microphone 402 captures would be used to cancel out ambient noise from the signal that microphone 412 captures, resulting in an audio signal comprising substantially the user's voice, not ambient noise.

251. It is my opinion that POSAs would have expected success in implementing the combination as Andrea's technique is intended for headsets with a boom microphone (like Goh's headset), and Goh's CPU is already capable of performing advanced audio processing like "real-time acoustic noise reduction." Goh, 10:17-29. The combination involves the use of only conventional components for their conventional and intended purposes such that implementing the combination was within POSAs' routine engineering skills.

3. Claims 3, 10, 12-14, and 16-20

252. The Ground 2F combination renders claims 3, 10, 12-14, and 16-20 obvious for the same reason that Grounds 3A to 3D render those claims obvious with the limited exception that limitation 3C is met in Ground 2F because, in view of Andrea, Goh's headset would implement its real-time acoustic noise reduction functionality by reducing/canceling the ambient noise that Goh's second microphone already captures from the audio input captured by Goh's first microphone at the end of the headset's boom.

VIII. UNPATENTABILITY GROUNDS: THE GRIFFIN-BASED GROUNDS

A. Ground 3A: Griffin in view of Hollemans Renders Claims 1, 3-5, 9, and 15-16 Obvious

1. Griffin

253. Griffin is discussed above in Ground 1A.

254. In addition to its docking-station and voice-cancellation teachings discussed above in Ground 1A, Griffin also provides details regarding its wireless headset (referred to as the second communication module). For example, Griffin explains that its wireless headset—an example of which is shown in FIG. 4 below—includes "includes a speaker 14a, a main body 14b, a boom 14c and a microphone 14d." Griffin, 6:15-16; *see also id.*, 15:3-4, FIG. 16 (block diagram). The headset also preferably includes a rechargeable power source such as a rechargeable battery. *Id.*, 9:3-5, 16:7-17; FIG. 16 (element 188).

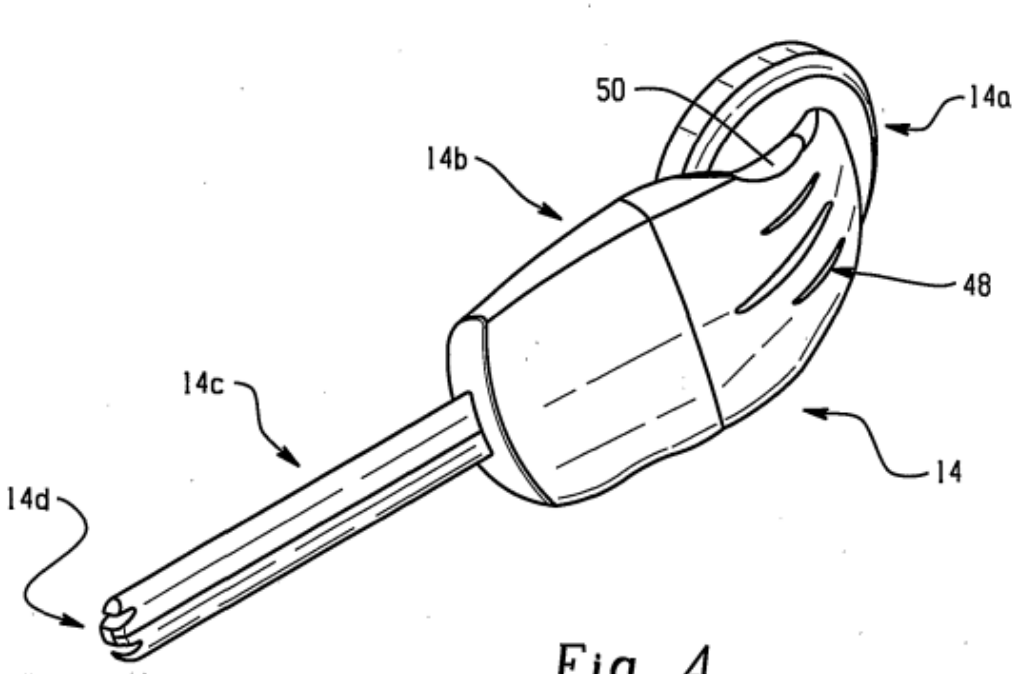


Fig. 4

2. Hollemans

255. Hollemans is discussed above in Ground 2A.

3. The Combination

256. In view of Hollemans, in my opinion POSAs had reason to add a touch-sensitive surface to Griffin's headset so that a user could conveniently adjust the headset's functionality, *e.g.*, volume, via a simple touch command. *See also* my discussion in Section VII.A. regarding why Hollemans would be obvious to combine with the Goh-Dyer headset. Hollemans explicitly motivates the use of its touch-sensitive surface to increase user safety in certain scenarios such as driving. Hollemans, 1:20-40. The use of Hollemans' touch-sensitive surface on Griffin's

headset is also the obvious use of a technique known by POSAs to improve similar devices in the same way.

257. Moreover, Griffin explains that its headset has a physical "power switch 54," and explains that other headset functions—like mute—could be accessed by similar switches. Griffin, 7:21-8:2; *see also* FIG. 5. Because the headset is located in the user's ear, the user would have to locate correctly the right physical switch associated with the functionality the user wishes to switch—that is, the user needs to correctly press the mute switch, not the power switch, if she wishes to mute the microphone. Incorporating Hollemans' touch-sensitive surface in Griffin's headset would therefore have beneficially allowed users to adjust the headset's functionality without needing to locate the right physical buttons on the headset's body and would have been well within the skill of a POSA. Rather than needing to mute the headset's microphone by touching a physical switch uniquely associated with that functionality, the user would simply tap the headset to do so or perform some other gesture that is associated with that function. Hollemans, 1:20-40 (describing problems with the use of prior-art controllers to adjust functionality, including muting).

258. It is my opinion that POSAs would have had a reasonable expectation of success in implementing the proposed combination as Hollemans' technique is designed to work with "mobile phones" (Hollemans, 1:11-19), which is the type of

external device to which Griffin's headset is wirelessly connected (*e.g.*, Griffin, 7:25-8:2, 13:19-22, 17:10-14, 19:7-9, claim 13). Adding Hollemans' touch-sensitive surface and associated control functionality to Griffin's headset would have been required only routine design skill and was well within POSAs' capabilities.

4. Claim 1

a. [1PRE]

259. Griffin's headset, which is used in the Griffin-Hollemans combination, is a "voice communication device" that is used for, *inter alia*, conducting a voice call, *i.e.*, "*producing audio output for a user*," by receiving audio data from a cellular phone via a short-range wireless connection. Griffin, Abstract, 6:15-16; *see also id.*, 7:25-8:2, 13:19-22, 15:22-16:4, 17:10-14, 19:7-9, claim 13.

b. [1A]: "a speaker…;"

260. Griffin's headset includes a speaker. Griffin, 6:16 ("speaker 14a"), 14:7 ("speaker 120a"), 16:8 ("a microphone and speaker 190"); FIGS. 4-5 (depicting speaker 14a), FIG. 15 (depicting speaker 120a), FIG. 16 (block diagram depicting element 190).

c. [1B1]: "…two conductive pads both on at least a surface of the head-worn wireless electronic apparatus, and"

261. Griffin's headset, which is used in the Griffin-Hollemans combination, includes charging terminals 56a and 56b which are seen below in Figure 5 from Griffin:

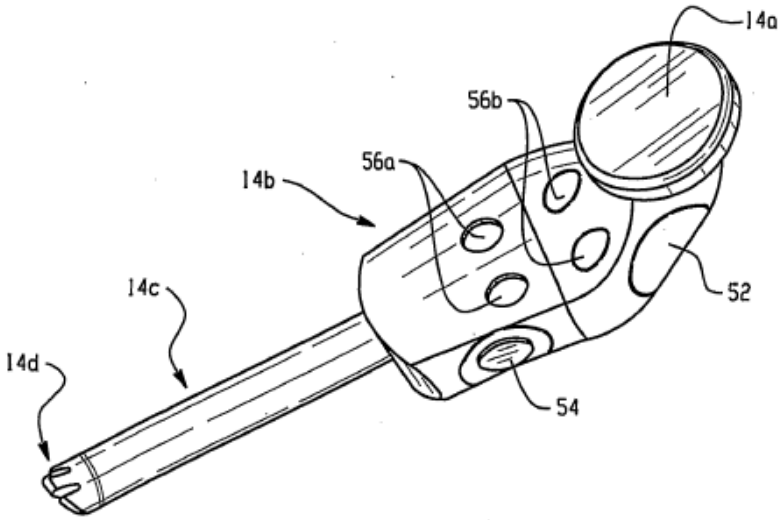
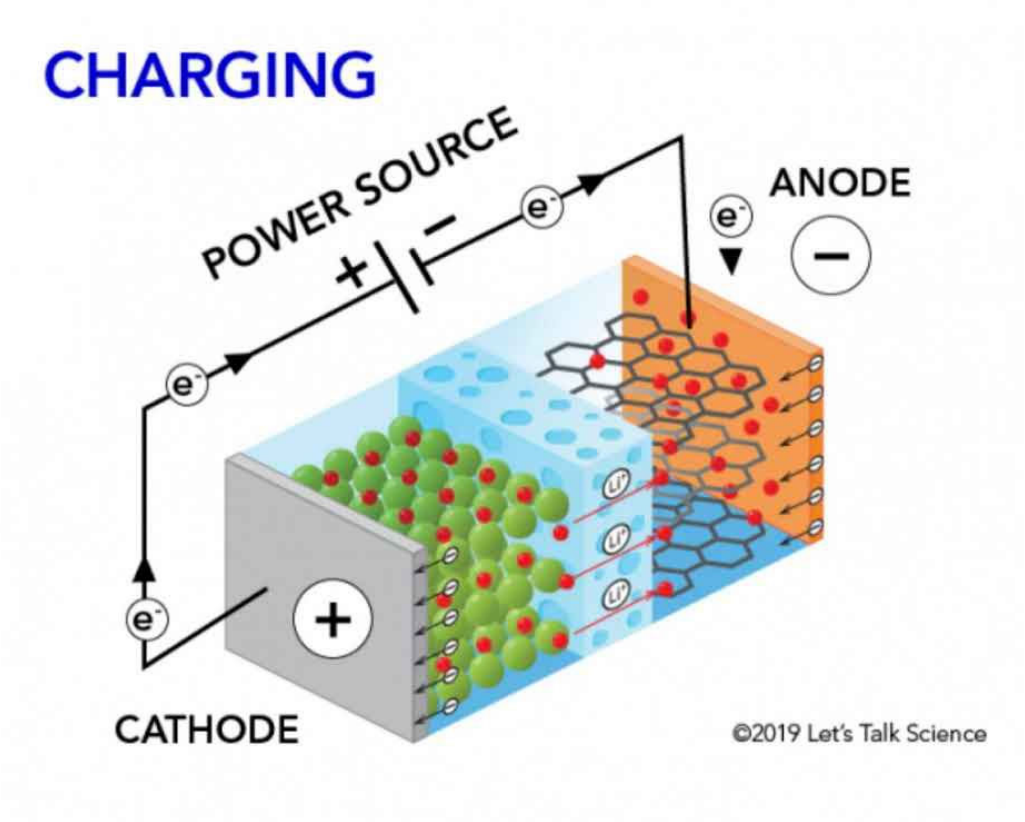


Fig. 5

262. As discussed above (Section VI.A.4.c), it is my opinion that POSAs would have understood these charging terminals to be "*conductive pads*" because POSAs would have known that in order to carry an electrical current, the charging terminals 56a and 56b (depicted as "*pads*") would be "*conductive*" as the flow of electrons required from a power source to recharge a battery requires a fully conductive circuit in which these electrons flow into and out of these charging terminals as shown in the diagram below.



Taken from: https://letstalkscience.ca/educational-resources/stem-explained/how-does-a-lithium-ion-battery-work

263. As seen in Figure 5, Griffin's headset uses four such "*conductive pads*," and thus Griffin gives POSAs reason to use at least four pads in Griffin's headset too.

d. [1B2]: "…corresponding conductive contacts of a counterpart connector external to and separate from the head-worn wireless electronic apparatus…"

264. Griffin's headset, which is used in the Griffin-Hollemans combination, includes charging terminals that mate with corresponding charging terminals in a

separate device like charging terminals 46 on Griffin's first module shown below in Figure 3 (below):

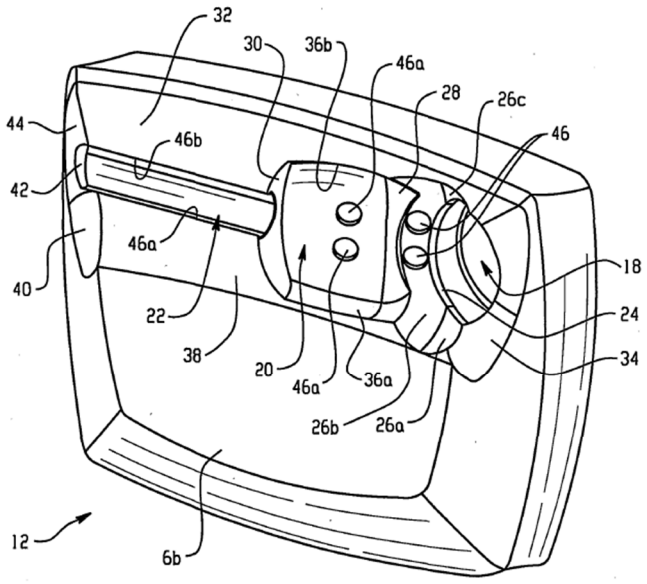


Fig. 3

265. In the Griffin-Hollemans' combination, "*the at least two conductive pads*" on the headset "*are configured to removably couple to corresponding conductive contacts*" on the separate device because they coupled to those corresponding contacts via one or more springs, *i.e.*, "*via spring force*," that retain the headset in the separate device. Griffin, 5:24-6:2.

266. Separately, Griffin also discloses the use of a "door" on the first module that is biased toward a closed position via a ***spring***. Griffin, 11:11-12:6. The spring-biased door would have also retained (and protected) the headset when it was placed in the first module for charging, and thus would also "*removably couple*" the two

modules' "*conductive contacts…via spring force*." Using such a spring-biased door would have been obvious to a person of ordinary skill in the art given Griffin's express disclosure and the benefits the door would provide, *i.e.*, a means to ensure charging contacts are pushed together and to physically shield the charging headset from damage.

e. [1C]: "a rechargeable battery…"

267. Griffin's headset, which is used in the Griffin-Hollemans combination, includes a rechargeable battery. Griffin, 9:3-5, 16:8-17; FIG. 16 (element 188).

f. [1D]: "a microphone…"

268. Griffin's headset, which is used in the Griffin-Hollemans combination, includes a microphone. Griffin, 6:16 ("microphone 14d"), 14:7 ("microphone 120d"), 16:8 ("a microphone and speaker 190"), FIGS. 4-5 (depicting microphone 14d), FIG. 15 (depicting microphone 120d), FIG. 16 (block diagram depicting element 190).

g. [1E]: "a touch-sensitive input surface…"

269. As discussed above, in the Griffin-Hollemans combination, Griffin's headset would include Hollemans' touch-sensitive surface, *e.g.*, a surface on main body 14b (Griffin, 6:16, FIG. 4), and a user would tap or otherwise touch that surface to control or adjust "*an operation of the [headset]based on receiving at least a touch input*," *e.g.*, volume of a telephone call, mute the microphone. Hollemans, 2:17-18

("a long tap for adjusting volume"); claim 15; *see also id.*, 2:15-19 (describing other temporal patterns and functions to be controlled), 4:46-56 (same), 5:55-6:60 (same).

5. Dependent Claims 3-5, 9, and 15-16

a. Claim 3

i. [3PRE]

270. *See* claim 1.

ii. [3A]: "…at least another microphone…"

271. Griffin's headset, which is used in the Griffin-Hollemans combination, includes "a noise cancellation circuit with a background noise microphone 48 as shown in Fig. 4. The background noise microphone 48 preferably detects background noise signals which are then subtracted from the corrupted speech received by the microphone 14d in the noise cancellation circuit. In this manner, a higher quality speech signal is provided." Griffin, 7:8-14.

iii. [3B]: "wherein the microphone is configured to be positioned closer to mouth of the user and the another microphone is configured to be positioned further from the mouth of the user,…"

272. Griffin's headset, which is used in the Griffin-Hollemans combination, positions its microphone 14d, *i.e.*, "*the microphone*," at the end of boom 14c "such that the microphone 14d is located in the proximity of the communication device user's mouth when the module 14 is in use." Griffin, 7:1-3.

273. Griffin's headset then positions its "background noise microphone 48," *i.e.*, "*the another microphone*," further from the user's mouth as seen in Figure 4 where microphone 48 is depicted as being positioned closer to the user's ear than the end of boom 14c:

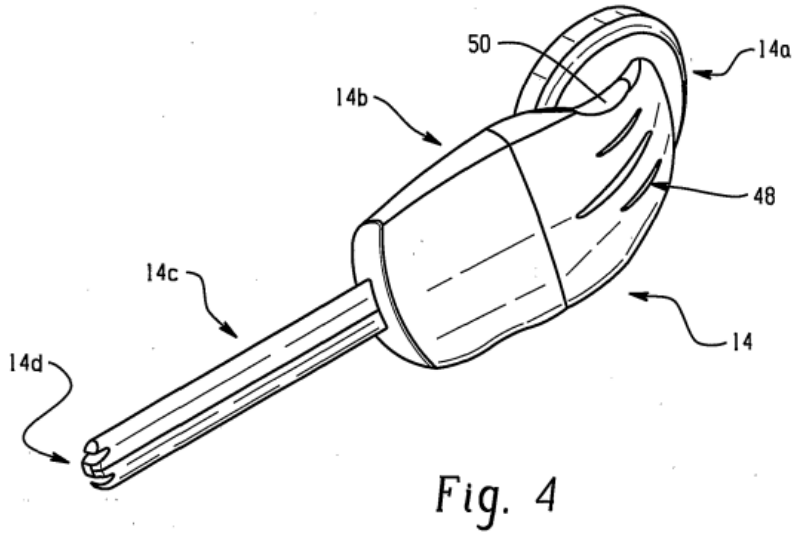


Fig. 4

iv. [3C]: "…at least some noise in the audio inputs configured to be cancelled…."

274. As discussed above, Griffin's headset, which is used in the Griffin-Hollemans combination, includes "a noise cancellation circuit," and that circuit "subtract[s]," *i.e.*, "*cancel[s]*," background noise signals "from the corrupted speech received by the microphone 14d. In this manner, a higher quality speech signal is provided." Griffin, 7:8-14.

b. Claim 4: "…identify a sliding action across at least a portion of the touch-sensitive input surface…."

275. As discussed above for claim 1, Griffin's headset would include Hollemans' touch-sensitive surface. In an obvious implementation of Griffin-Hollemans, the "integral processor 196" within Griffin's headset (Griffin, 16:9, FIG. 16), *i.e.*, "*a controller*," would be "*configured to identify a sliding action across at least a portion of the touch-sensitive input surface*." *See* claim 1.

276. Hollemans explains that its touch-sensitive surface "is used for picking up a gesture made on the [surface] with e.g., …a finger." Hollemans, 6:14-15. The gestures that the touch-sensitive surface can detect include a "planar gesture," and the gesture can be used to "scroll[] content on a display." Hollemans, 6:21-35. In view of these teachings, in my opinion POSAs would have had reason to implement the Griffin-Hollemans combination such that a user could scroll content (*e.g.*, a list of phone numbers) shown on a display of the phone (or PDA) to which Griffin's headset is wirelessly connected by sliding his or her finger up and down on the touch-sensitive surface. Griffin, 13:19-22 (describing embodiments where the headset connects to a "cellular telephone," or a "PDA"). Implemented in this manner, the combination's headset changes between "*a first or a second operation*," *i.e.*, scroll up or scroll down, "*based on identifying whether the sliding action is in a first direction or a direction opposite from the first direction across the at least a portion of the touch-sensitive input surface*."

c. Claim 5: "…determine whether the head-worn wireless electronic apparatus is being used…."

277. As discussed above in Section VIII.A.3, Griffin's headset would include Hollemans' touch-sensitive surface. In an obvious implementation of Griffin-Hollemans, Griffin's integral processor, *i.e.*, "*a controller*," would be "*configured to determine whether the head-worn wireless electronic apparatus is being used based on outputs from a sensor at least partially in the*" headset.

278. As discussed for claim 5 in Ground 2A *supra*, Hollemans teaches that its earbud preferably includes a second touch-sensitive surface that is positioned such that it is "touched substantially by the ear when the controller is substantially worn in or by a human ear." Hollemans, 2:19-32. Hollemans explains that "a control signal" from the earbud (*e.g.*, to control a function of a connected device like a phone) is only sent if the second touch-sensitive surface "is touched," which "prevent[s] unwanted activation of the device [being controlled by the earbud] and unnecessary battery exhaustion." *Id.* That is, the earbud's ability to change or adjust functions of a connected device only occurs when the earbud is being worn as detected by the second touch-sensitive surface.

279. Adding Hollemans' second touch-sensitive surface, *e.g.*, "an ordinary pressure sensor" (Hollemans, 3:38-43, claim 7), to Griffin's headset would have (**a**) preserved the battery of the headset by turning it off when the headset was not being worn and/or (**b**) preserved the battery life of the device with which the headset is

connected by ensuring it was not mistakenly activated when the headset was not being used. If the headset is known to be disconnected, the connected phone doesn't need to maintain a voice or audio link to the headset and thus the phone will save power. Likewise, if the headset is not in use it can shutdown all its functionality and just wake up intermittently to check the status of this "in use" detector in the headset. This intermittent polling of the "in use" detector would save considerable power consumption in the headset

280. Hollemans explicitly provides the motivation for (a) as its earbud is unable to send a control signal when the earbud is not worn and the reason for doing so is to conserve battery power of the device with which the earbud is connected. Hollemans, 2:19-32.

281. Griffin explicitly provides the motivation for (b). In particular, Griffin discloses an embodiment in which its headset "turn[s] off automatically" when it is placed in its docking/charging station. Griffin, 7:18-21. Griffin thus recognizes the benefits to turning its headset off when not in use. POSAs, however, would have recognized that an ordinary user may forget to place the headset in the docking/charging station and therefore using Hollemans' second touch-sensitive surface to detect whether the earbud is being worn would have augmented Griffin's teachings by allowing the headset to turn off when it was not being worn even if it was not placed into the docking/charging station.

282. The resulting Griffin-Hollemans combination would include Griffin's integral processor for executing the headset's various operations, and the processor would be "*configured to determine whether the head-worn wireless electronic apparatus is being used based on outputs from a sensor at least partially in the*" headset, *i.e.*, Hollemans' pressure sensor performing as a second touch-sensitive surface in the headset.

d. Claim 9: "…a force sensor."

283. As discussed for claim 5, the Griffin-Hollemans combination includes a pressure sensor, and a pressure sensor is a type of "*force sensor*." *Supra* claim 5.

e. Claim 15: "…in an ear of the user."

284. Griffin's headset, which is used in the Griffin-Hollemans combination, is "*configured to be worn in an ear of the user*." Griffin, 2:16-18 ("for insertion into the communication device user's ear"), 4:13-15 (same), 6:17-18 ("Operationally, the speaker 14a is placed in the ear of a communication device user with the boom 14c extending towards the user's mouth."), 14:20-21, FIG. 17 (depicting headset worn in user's ear), claim 1.

f. Claim 16

(1) [16PRE]

285. *See* claim 15.

(2) [16A]

286. *See* limitation [3A].

(3) [16B]

287. *See* limitation [3B].

(4) [16C]

288. *See* limitation [3C].

B. Ground 3B: The Griffin-Hollemans Combination in View of Schrager Renders Claim 2 Obvious.

289. I have been instructed by counsel for Bose to assume that Schrager qualifies as prior art to the Challenged Claims.

1. Schrager

290. Schrager discloses a system for operating various multimedia devices, including a cellphone, "in a hands-free manner through the use of voice commands and speech recognition technology." Schrager, 2:13-28. As Schrager explains, a drawback of then-existing multimedia devices is the need for a user to "have one or more free hands to operate a given device" and the distraction that such hands-based operation creates. *Id.* 1:64-2:9.

291. Schrager's system includes a headset that communicates wirelessly with a base unit using Bluetooth. *Id.*, 5:3-5, 6:15-18. The base unit includes one or more multimedia devices, including a cellphone and/or a music player. *Id.*, 2:16-25, 6:62-67, FIG. 1. The base unit also includes a "speech recognition engine 185" that

is "included in the memory of processor 150 or can be included within an additional memory 190 which is accessible by the processor." *Id.*, 7:21-28. "[T]he speech recognition engine 185 can receive digitized speech from the headset unit 105 and convert the received speech to text. The speech recognized text can be processed to determine one or more voice commands which can be executed by the processor 150." *Id.*, 7:28-32. Exemplary commands include increasing volume, answering or ending a telephone call, and making a telephone call. *Id.*, 10:58-60, 11:57-59, 12:29-31, 14:50-51.

292. Although Schrager's Figure 1 embodiment depicts its base unit as separate from the headset, Schrager explicitly teaches that "the base unit can be combined with the headset unit" such that Schrager's system "can be embodied as a single headset device capable of performing the various functions disclosed herein." *Id.*, 14:1-11.

2. The Combination

293. In view of Schrager, in my opinion POSAs would have been motivated to design the Griffin-Hollemans headset combination such that its "short-range RF transceiver 192" uses Schrager's Bluetooth-enabled transceiver and Schrager's speech recognition engine implements the headset's voice-control functionality.

294. Griffin's headset ("second communication module") is configured to transmit and receive "RF signals" over a wireless link (*e.g.*, Griffin, 2:9-11, claim

1), but Griffin does not specify what radio-frequency technology is used. Griffin also teaches that its headset (especially when used with a cellular telephone) can be adapted "for voice control" (Griffin, 19:6-13), but does not provide details on how such voice-control functionality is implemented.

295. Griffin thus leaves to POSAs' routine skill the selection of the particular radio-frequency and voice-control technologies that are used to implement the headset. Such a selection would have been well within the skill of a POSA. Schrager demonstrates two conventional approaches for implementing the design details that Griffin leaves to POSAs' skill.

296. First, Schrager discloses the use of Bluetooth as a well-known radio-frequency technology for transmitting audio from an external device to a headset. Schrager, 6:15-18. The use of Bluetooth as the technology that Griffin's headset uses for transmitting and receiving RF signals would have been the application of a known (indeed, standard) wireless technique to a known device (a wireless headset) to achieve a predictable result (a wireless headset that can transmit/receive audio signals). *See* EX1019, [0004] and EX1005, 7:9-12 (Goh) as further corroboration that the use of Bluetooth for wireless headsets was known.

297. Second, Schrager teaches that voice-control functionality can be provided by a "speech recognition engine 185" in the form of software stored in memory that a processor can access. Schrager, 7:28-32. Using Schrager's particular

voice-control functionality would (again) be the mere application of a known technique to a known device to achieve a predictable result.

298. In the Griffin-Hollemans-Schrager combination, Griffin's headset would be implemented such that its "short-range [wireless/RF] transceiver 192" is a Bluetooth-enabled transceiver. Griffin, 16:8, FIG. 16. Additionally, Griffin's voice-control functionality would be implemented using Schrager's speech recognition engine stored in memory in or accessible to Griffin's "integral processor 196." Griffin, 16:9, FIG. 16. It is my opinion that POSAs would have reasonably expected success in the proposed combination as it requires mere routine engineering skill to modify the headset accordingly and involves the use of conventional electronics (*e.g.*, a Bluetooth transceiver, a memory), and software that POSAs would have routinely used.

3. Claim 2

a. [2PRE]: "A head-worn wireless electronic apparatus as recited in claim 1 comprising:"

299. *See* [1PRE] (Ground 3A).

b. [2A]: "…Bluetooth"

300. As discussed above, Griffin's headset in the Griffin-Hollemans-Schrager combination includes a Bluetooth-enabled transceiver. Griffin, 16:8; Schrager, 6:15-18.

c. [2B]: "…codes for facilitating voice recognition to facilitate recognizing at least a word …."

301. As discussed above, Griffin's headset in the Griffin-Hollemans-Schrager combination includes memory in or accessible to Griffin's integral processor, and that memory stores Schrager's "speech recognition engine 185" for recognizing voice commands that a user wearing the headset utters into the headset's microphone such as a command to increase volume or answer/make a call. Griffin, 16:9; 19:6-13; Schrager, 10:58-60, 11:57-59, 12:29-31, 14:50-51.

C. Ground 3C: The Griffin-Hollemans Combination in View of Irvin Renders Claims 6 and 11 Obvious.

1. Irvin (EX1011)

302. Irvin is discussed above in Ground 1D.

2. The Combination

303. As discussed in Ground 3A with respect to claim 5, POSAs would have implemented the Griffin-Hollemans combination such that it included a sensor, *e.g.*, a pressure sensor, that provided data which the headset's integral processor uses to determine whether the headset was being worn so as to conserve power by when the headset is not worn.

304. In my opinion POSAs would have considered Irvin's accelerometer-based approach to determining whether a headset is being worn to be an obvious substitution for and/or addition to Hollemans' use of a touch-sensitive surface / pressure sensor. For the reasons discussed in relation to Grounds 1D, 2B and 3A,

POSAs would have recognized benefits to Griffin's headset determining whether it is being worn so that the headset's power would be preserved.

305. In my opinion POSAs would be motivated to implement the Griffin-Hollemans combination using Irvin's accelerometer as a replacement of Hollemans' pressure sensor (to better avoid false triggers) or in addition to Hollemans' pressure sensor (to provide better accuracy) for the same reasons as discussed above regarding Ground 2B. The resulting Griffin-Hollemans-Irvin combination retains the features of Griffin-Hollemans discussed in Ground 3A, but uses an accelerometer rather than, or in addition to, a pressure sensor.

3. Claim 6: "…an accelerometer."

306. As discussed above, an obvious implementation of the Griffin-Hollemans-Irvin combination uses an "accelerometer" as the sensor for detecting whether Griffin's headset is being used. Irvin, 7:15-17.

4. Claim 11[4]

307. *Supra* claim 6; *see also* claim 3 (Ground 3A).

[4] *See* fn. 2.

IX. CLAIM LISTING APPENDIX

Claim 1
[1PRE] A head-worn wireless electronic apparatus at least configured for producing audio outputs for a user comprising:
[1A] a speaker in the head-worn wireless electronic apparatus;
[1B1] an electrical connector at the head-worn wireless electronic apparatus, wherein the electrical connector includes at least two conductive pads, with the at least two conductive pads both on at least a surface of the head-worn wireless electronic apparatus,
[1B2] and wherein the at least two conductive pads are configured to removably couple to corresponding conductive contacts of a counterpart connector external to and separate from the head-worn wireless electronic apparatus, at least via spring-force, to at least enable each of the at least two conductive pads electrically connected to its corresponding conductive contact;
[1C] a rechargeable battery in the head-worn wireless electronic apparatus;
[1D] a microphone in the head-worn wireless electronic apparatus; and
[1E] a touch-sensitive input surface on the head-worn wireless electronic apparatus, wherein the touch-sensitive input surface is configured to generate at least an electrical signal for an operation of the head-worn wireless electronic apparatus based on receiving at least a touch input.
Claim 2
[2PRE] A head-worn wireless electronic apparatus as recited in claim 1 comprising:
[2A] wireless communication circuitry in the head-worn wireless electronic apparatus configured for coupling to at least a Bluetooth network; and
[2B] a storage medium configured to store at least computer program codes for facilitating voice recognition to facilitate recognizing at least a word received by at least the microphone for an operation of the head-worn wireless electronic apparatus.
Claim 3
[3PRE] A head-worn wireless electronic apparatus as recited in claim 1 comprising
[3A] at least another microphone in the head-worn wireless electronic apparatus,

[3B] wherein the microphone is configured to be positioned closer to mouth of the user and the another microphone is configured to be positioned further from the mouth of the user, when the head-worn wireless electronic apparatus is worn by the user, and
[3C] wherein at least the microphone and the another microphone are configured to receive audio inputs, with at least some noise in the audio inputs configured to be cancelled based on using at least the microphone and the another microphone.
Claim 4
A head-worn wireless electronic apparatus as recited in claim 1 comprising a controller configured to identify a sliding action across at least a portion of the touch-sensitive input surface, and to facilitate a first or a second operation of the head-worn wireless electronic apparatus based on identifying whether the sliding action is in a first direction or a direction opposite from the first direction across the at least a portion of the touch-sensitive input surface.
Claim 5
A head-worn wireless electronic apparatus as recited in claim 1 comprising a controller configured to determine whether the head-worn wireless electronic apparatus is being used based on outputs from a sensor at least partially in the head-worn wireless electronic apparatus.
Claim 6
A head-worn wireless electronic apparatus as recited in claim 1 comprising an accelerometer.
Claim 7
A head-worn wireless electronic apparatus as recited in claim 1 comprising an area configured for attachment via magnetic force.
Claim 8
A head-worn wireless electronic apparatus as recited in claim 7 comprising a magnet in the area.
Claim 9
A head-worn wireless electronic apparatus as recited in claim 1 comprising a force sensor.
Claim 10
A head-worn wireless electronic apparatus as recited in claim 3 comprising an area configured for attachment via magnetic force.
Claim 11

A head-worn wireless electronic apparatus as recited in claim comprising an accelerometer.
Claim 12
[12PRE] A head-worn wireless electronic apparatus as recited in claim 10 comprising:
[12A] wireless communication circuitry in the head-worn wireless electronic apparatus configured for coupling to at least a Bluetooth network; and
[12B] a storage medium configured to store at least computer program codes for facilitating voice recognition to facilitate recognizing at least a word received at least by the microphone for an operation of the head-worn wireless electronic apparatus.
Claim 13
A head-worn wireless electronic apparatus as recited in claim 12 comprising a controller configured to determine regarding whether the head-worn wireless electronic apparatus is being used based on outputs from a sensor at least partially in the head-worn wireless electronic apparatus.
Claim 14
A head-worn wireless electronic apparatus as recited in claim 12, wherein the controller is configured to identify a sliding action across at least a portion of the touch-sensitive input surface, and to facilitate a first or a second operation of the head-worn wireless electronic apparatus based on identifying whether the sliding action is in a first direction or a direction opposite from the first direction across the at least a portion of the touch-sensitive input surface.
Claim 15
A head-worn wireless electronic apparatus as recited in claim 1, wherein the apparatus is configured to be worn in an ear of the user.
Claim 16
[16PRE] A head-worn wireless electronic apparatus as recited in claim 15 comprising
[16A] at least another microphone in the head-worn wireless electronic apparatus,
[**16B]** wherein the microphone is configured to be positioned closer to mouth of the user than the another microphone, when the head-worn wireless electronic apparatus is worn by the user, and

[16C] wherein at least the microphone and the another microphone are configured to receive audio inputs, with at least some noise in the audio inputs configured to be cancelled based on using at least the microphone and the another microphone.
Claim 17
A head-worn wireless electronic apparatus as recited in claim 16 comprising an area configured for attachment via magnetic force.
Claim 18
[18PRE] A head-worn wireless electronic apparatus as recited in claim 17 comprising:
[18A] wireless communication circuitry in the head-worn wireless electronic apparatus configured for coupling to at least a Bluetooth network; and
[18B] a storage medium configured to store at least computer program codes for facilitating voice recognition to facilitate recognizing at least a word received by at least the microphone for an operation of the head-worn wireless electronic apparatus.
Claim 19
A head-worn wireless electronic apparatus as recited in claim 18 comprising a controller configured to determine whether the head-worn wireless electronic apparatus is being used.
Claim 20
A head-worn wireless electronic apparatus as recited in claim 19 comprising an accelerometer.

I declare that all statements made herein of my own knowledge are true, that all statements made on information and belief are believed to be true, and that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

I declare under penalty of perjury that the foregoing is true and correct.

Dated: 9/2/2025