EXHIBIT F-4

Invalidity of 12,044,901 in view of the Jabra BT800 System

On information and belief, systems comprising the Jabra BT800 were sold, on–sale, in public use, or otherwise publicly available prior to the earliest priority date of U.S. Patent No. 12,044,901 ("'901 patent") and qualify as prior art to the '901 patent at least under pre-AIA 35 U.S.C. §§ 102(a) and/or (b). The Jabra BT800 systems anticipate or, alone or with other references, render obvious, one or more of the Asserted Claims of the '901 patent. To the extent IngenioSpec contends the Jabra BT800 system does not disclose one or more limitations of the claims, it would have been obvious to combine the Jabra BT800 with the knowledge of a person of ordinary skill in the art ("POSITA") and/or with one or more of the following references to render the Asserted Claims of the '901 patent invalid. The chart below illustrates how the Asserted Claims of the '901 patent are invalid in view of the Jabra BT800 system and/or additional secondary references listed below, including but not limited to the prior art identified in Defendant's Invalidity Contentions.

- The Jabra FreeSpeak, which on information and belief was in public use and/or on sale at least as early as 2002, and is therefore prior art under 35 U.S.C. §§ 102(a) and (b);
- The Phonak Perseo, which on information and belief was in public use and/or on sale at least as early as 2002, and is therefore prior art under 35 U.S.C. §§ 102(a) and (b);
- 2004/0063456A1 ("Griffin '456") was filed on November 6, 2001, and published on April 1, 2004, and is therefore prior art under §§ 102(a), (b), and (e). Griffin '456 was filed as international application PCT No. PCT/CA01/01582. Moreover, WO 02/39600 ("Griffin '600") is an international application publication that claims priority to the same international application. Both qualify as prior art and have corresponding disclosures, and citation herein to Griffin '456 includes and incorporates by reference citations to the corresponding disclosures in Griffin '600;
- US7010332B1 ("Irvin '332") was filed on February 21, 2000, and published on March 7, 2006, and is therefore prior art under 35 U.S.C. § 102(e). Irvin '332 was filed as U.S. App. Ser. No. 09/507,586. Moreover, WO 01/63888 ("Irvin '888") is an international application publication that claims priority to the same U.S. application. Both qualify as prior art and have corresponding disclosures, and citation herein to Irvin '332 includes and incorporates by reference citations to the corresponding disclosures in Irvin '888;
- US7046230B2 ("Zadesky '230") was filed on July 1, 2002, and published on May 16, 2006, and is therefore prior art under 35 U.S.C. § 102(e). Zadesky '230 was filed as U.S. App. Ser. No. 10/188,182. Moreover, US2003/0076306A1 ("Zadesky '306") is publication of this U.S. application. Both qualify as prior art and have corresponding disclosures, and citation herein to Zadesky '230 includes and incorporates by reference citations to the corresponding disclosures in Zadesky '306;
- US2003/0067585A1 ("Miller '585") was filed on October 6, 2001, and published on April 10, 2003, and is therefore prior art under 35 U.S.C. §§ 102(a), (b), and (e);
- WO2004/093490 (Hollomans '490) was filed on April 15, 2004, and published on October 28, 2004, and is therefore prior art under 35 U.S.C. §§ 102(a) and (e);
- US2002/0131613A1 ("Jakob '613") was filed on January 22, 2002, and published on September 19, 2002, and is therefore prior art under 35 U.S.C. §§ 102(a), (b), and (e);

- US6349001B1 ("Spitzer '001") was filed on January 11, 2000, and published on February 19, 2002, and is therefore prior art under 35 U.S.C. §§ 102(a), (b), and (e);
- US2005/0192045A1 ("Lowles '045") was filed on February 27, 2004, and published on September 1, 2005, and is therefore prior art under 35 U.S.C. §§ 102(a) and (e);
- US6289100B1 ("Ritter '100") was filed on March 9, 1999, and published on September 11, 2001, and is therefore prior art under 35 U.S.C. §§ 102(a), (b), and (e);
- US7187960B2 ("Abreu '960") was filed on April 2, 2003, and published on March 6, 2007, and is therefore prior art under 35 U.S.C. § 102(e); and
- US7650007B2 ("Iuliis '007") was filed on August 24, 2005, and published on January 19, 2010, and is therefore prior art under 35 U.S.C. § 102(e).

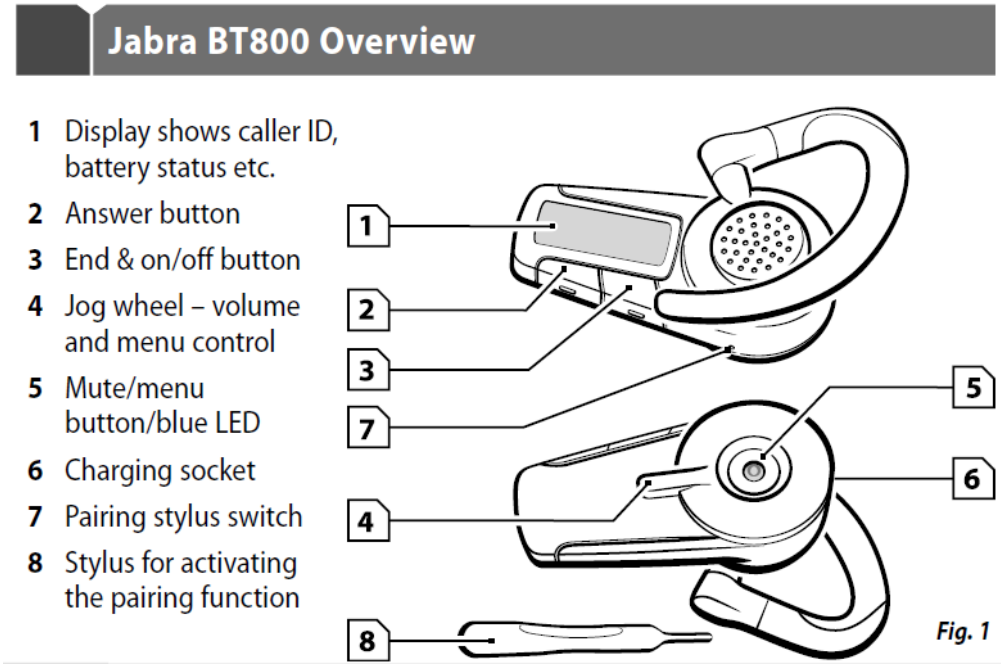
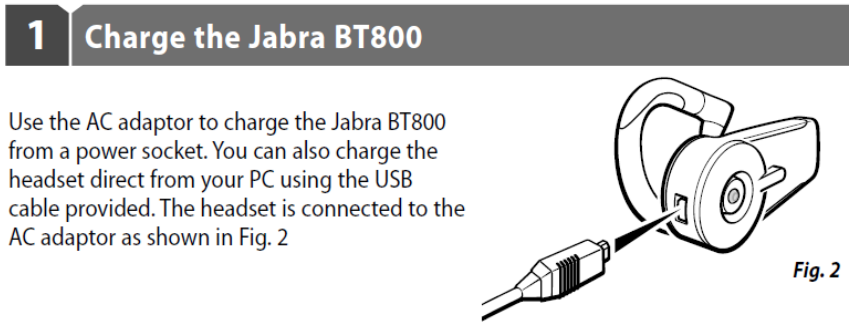
With respect to the proposed modifications to the Jabra BT800 system, such modification would have been obvious to try, an obvious combination of prior art elements according to known methods to yield predictable results, a simple substitution of one known element for another to obtain predictable results, a use of known techniques to improve a similar devices or method in the same way, an application of a known technique to a known device or method ready for improvement to yield predictable results, a variation of a known work in one field of endeavor for use in either the same field or a different one based on design incentives or other market forces with variations that are predictable to a POSITA, and/or obvious in view of teachings, suggestions, and motivations in the prior art that would have led a POSITA to modify or combine the prior art references.

The chart below illustrates how the asserted claims of the '901 patent are anticipated by the Jabra BT800 system and/or would have been obvious in view of by the Jabra BT800 system and/or additional secondary references. The excerpts cited herein are exemplary. For any claim limitation, Defendant may rely on excerpts cited for any other limitation and/or additional excerpts not set forth fully herein to the extent necessary to provide further explanation for a reference's disclosure of a limitation. Where an excerpt refers to or discusses a figure or figure items, that figure and any additional descriptions of that figure should be understood to be incorporated by reference as if set forth fully herein. Defendant reserves the right to further supplement this chart.

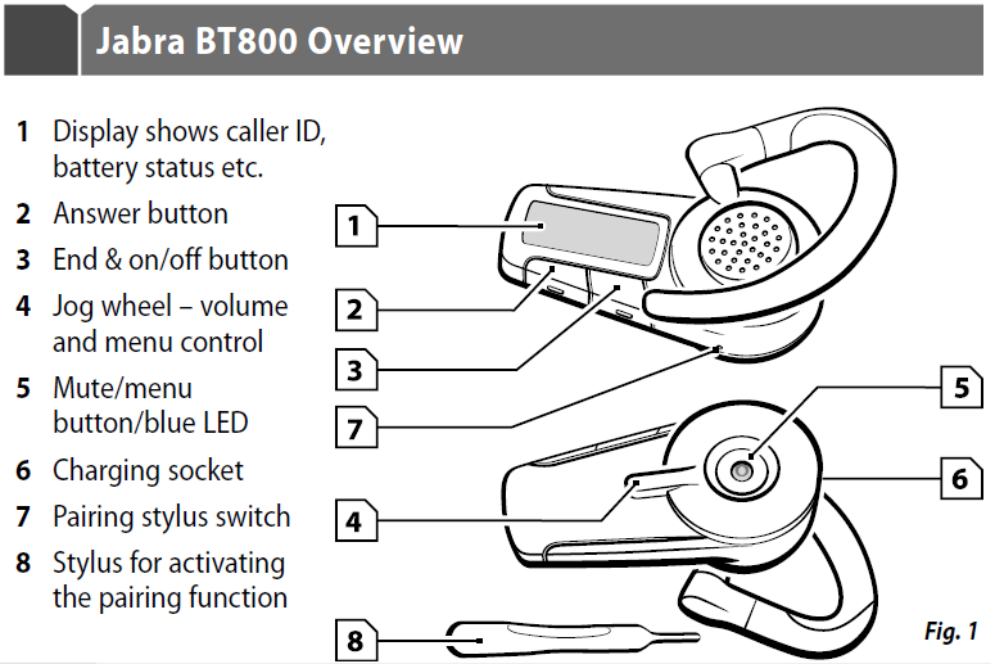
To the extent that these Invalidity Contentions rely on or otherwise embody particular interpretations of terms or phrases in the asserted claims, Defendant is not proposing any such interpretations as proper interpretations or constructions of those terms or phrases. Various positions put forth in this document are predicated on IngenioSpec's apparent interpretation of its claims as evidenced by its Infringement Contentions. Those positions are not intended to and do not necessarily reflect Defendant's interpretation of the true and proper scope of the asserted claims. Defendant further incorporates by reference all reservations of rights set forth in the Invalidity Contentions, as if fully set forth herein.

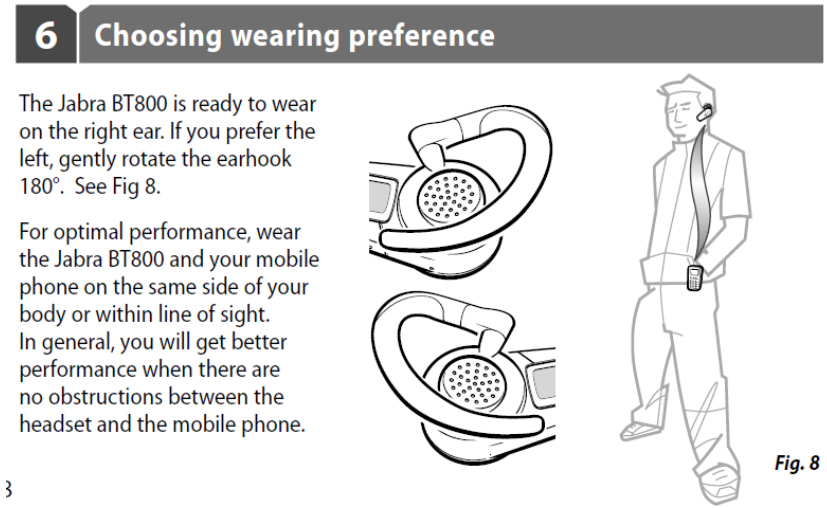
Defendant's arguments throughout these invalidity contentions are based on IngenioSpec's apparent interpretation of the claims in its infringement contentions. Defendant does not agree that such interpretation is proper and reserves the right to argue that the mapped actions do not infringe any claims of the '901 patent. In the alternative, should the Court or factfinder construe and/or apply the claims in a manner consistent with IngenioSpec's interpretations in its infringement contentions for the '901 patent, the claims are invalid for at least the reasons set forth herein.

Claims	Prior Art
1[pre]. A system, comprising:	The Jabra BT800 expressly or inherently discloses "[a] system." For example: The Jabra BT800 is a system including a Bluetooth headset and a charger. The following citations show examples of where the Jabra BT800 discloses this limitation. Jabra BT800 User Manual at Cover Page 

Claims	Prior Art
	Jabra BT800 User Manual at Page 2  Jabra BT800 User Manual at Page 4  To the extent that the Jabra BT800 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.

Claims	Prior Art
[1a] a head-worn personal electronic apparatus, including at least:	The Jabra BT800 expressly or inherently discloses "a head-worn personal electronic apparatus, including at least." For example: The Jabra BT800 is a Bluetooth headset worn on the head, for example, on an ear, as shown below (example of the claimed a head-worn personal electronic apparatus). The following citations show examples of where the Jabra BT800 discloses this limitation. Jabra BT800 User Manual at Page 2



Claims	Prior Art
	Jabra BT800 User Manual at Page 8  6 Choosing wearing preference The Jabra BT800 is ready to wear on the right ear. If you prefer the left, gently rotate the earhook 180°. See Fig 8. For optimal performance, wear the Jabra BT800 and your mobile phone on the same side of your body or within line of sight. In general, you will get better performance when there are no obstructions between the headset and the mobile phone. 3 Fig. 8 To the extent that the Jabra BT800 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[1b] a head-worn structure configured to be worn by a user;	The Jabra BT800 expressly or inherently discloses "a head-worn structure configured to be worn by a user." For example: The Jabra BT800 is a Bluetooth headset which is structure that is worn on a user's head because it is worn on a user's ear, as shown below (example of the claimed a head-worn structure configured to be worn by a user). The following citations show examples of where the Jabra BT800 discloses this limitation.

Claims	Prior Art
	Jabra BT800 User Manual at Page 2

Jabra BT800 Overview

1 Display shows caller ID, battery status etc.
2 Answer button
3 End & on/off button
4 Jog wheel – volume and menu control
5 Mute/menu button/blue LED
6 Charging socket
7 Pairing stylus switch
8 Stylus for activating the pairing function

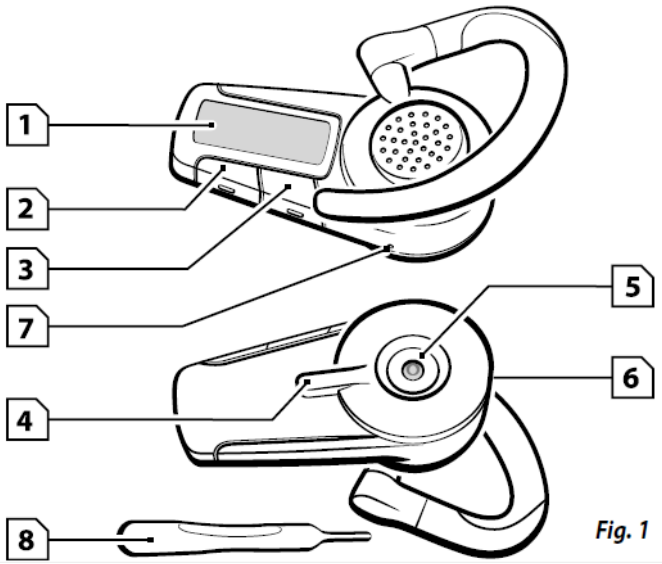
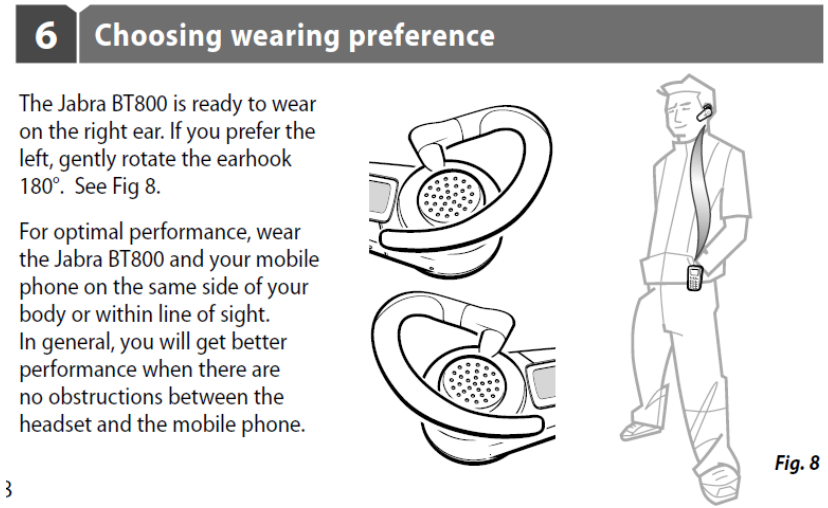


Fig. 1

Claims	Prior Art
	Jabra BT800 User Manual at Page 8  6 Choosing wearing preference The Jabra BT800 is ready to wear on the right ear. If you prefer the left, gently rotate the earhook 180°. See Fig 8. For optimal performance, wear the Jabra BT800 and your mobile phone on the same side of your body or within line of sight. In general, you will get better performance when there are no obstructions between the headset and the mobile phone. 3 Fig. 8 To the extent that the Jabra BT800 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[1c] a speaker at least partially contained within the head-worn structure, the speaker being configured to be worn proximate to an ear of the user when the head-worn structure is being worn by the user;	The Jabra BT800 expressly or inherently discloses "a speaker at least partially contained within the head-worn structure, the speaker being configured to be worn proximate to an ear of the user when the head-worn structure is being worn by the user." For example: The Jabra BT800 includes a speaker, as shown in the figures below, which is worn proximate to an ear of the user because the Jabra BT800 is worn on a user's ear (example of the claimed a speaker at least partially contained within the head-worn structure, the speaker being configured to be worn proximate to an ear of the user when the head-worn structure is being worn by the user). The following citations show examples of where the Jabra BT800 discloses this limitation.

Claims	Prior Art
	Jabra BT800 User Manual at Page 2

Jabra BT800 Overview

1 Display shows caller ID, battery status etc.
2 Answer button
3 End & on/off button
4 Jog wheel – volume and menu control
5 Mute/menu button/blue LED
6 Charging socket
7 Pairing stylus switch
8 Stylus for activating the pairing function

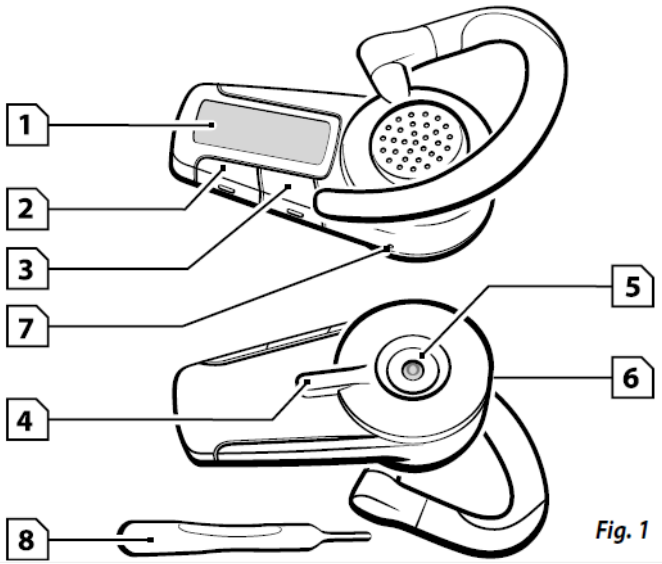
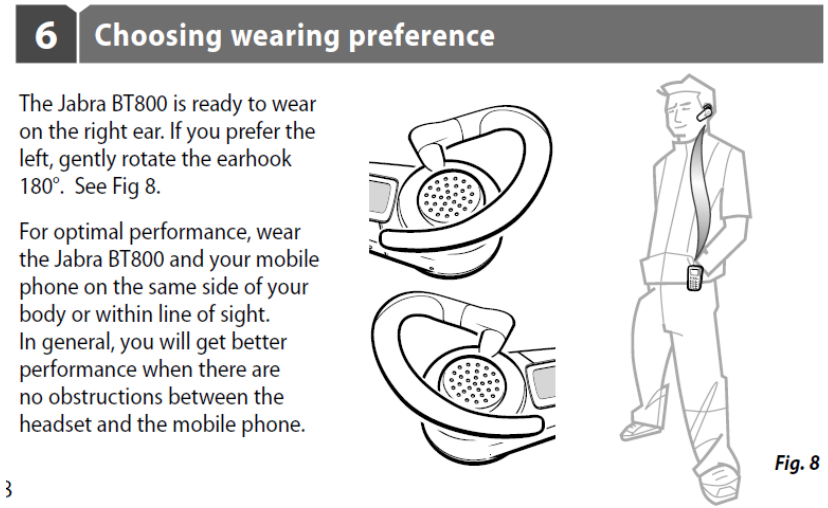


Fig. 1

Claims	Prior Art
	Jabra BT800 User Manual at Page 8  6 Choosing wearing preference The Jabra BT800 is ready to wear on the right ear. If you prefer the left, gently rotate the earhook 180°. See Fig 8. For optimal performance, wear the Jabra BT800 and your mobile phone on the same side of your body or within line of sight. In general, you will get better performance when there are no obstructions between the headset and the mobile phone. 3 Fig. 8 To the extent that the Jabra BT800 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[1d] a touch sensitive surface at least partially contained within the head-worn structure and configured to sense a touch input associated with the user;	The Jabra BT800, Hollemans '490, Zadesky '230, and Iuliis '007 expressly or inherently disclose "a touch sensitive surface at least partially contained within the head-worn structure and configured to sense a touch input associated with the user." For example: The Jabra BT800 includes a touch sensitive input surface because it includes a "Jog wheel" for "volume and menu control" that is configured to intake a user's sliding inputs, as shown below (example of the claimed a touch sensitive surface at least partially contained within the head-worn structure and configured to sense a touch input associated with the user). The following citations show examples of where the Jabra BT800 discloses this limitation.

Claims	Prior Art
	Jabra BT800 User Manual at Page 2

Jabra BT800 Overview

1 Display shows caller ID, battery status etc.
2 Answer button
3 End & on/off button
4 Jog wheel – volume and menu control
5 Mute/menu button/blue LED
6 Charging socket
7 Pairing stylus switch
8 Stylus for activating the pairing function

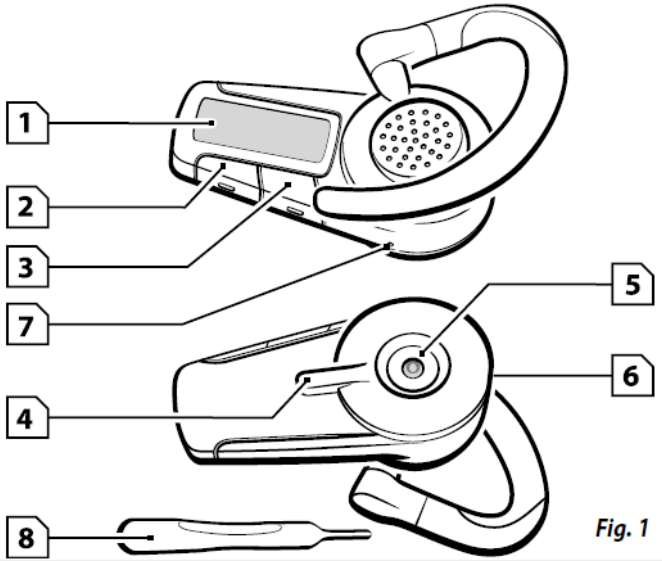


Fig. 1

Jabra BT800 User Manual at Page 4

The Jabra BT800 is designed to be simple to operate with a minimum of control buttons. The answer and end buttons on the headset will provide alternative operations depending on the length of time they are pressed.

Instruction:	Duration of press:
Tap	Press briefly
Press	Approx: 1 second
Press and hold	Approx: 5 seconds

Claims	Prior Art
	Jabra BT800 User Manual at Page 5

3 Basic usage of your Jabra BT800 headset

The operation of the basic features in the headset is very similar to your mobile phone.

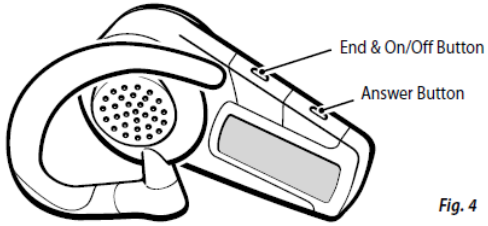
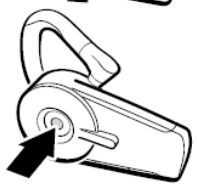
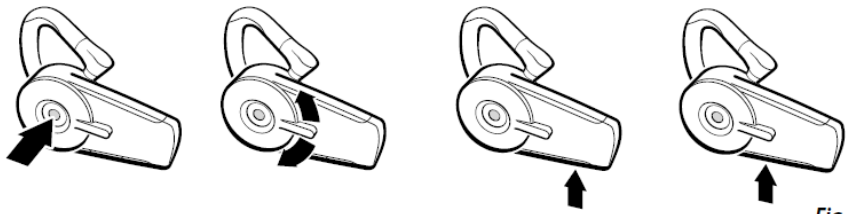


Fig. 4

1. **To answer a call**
   - You answer the call directly on the headset with a tap on the answer button. A simple tap on the headset's answer button will capture and transfer the call to the headset
2. **To end a call**
   - A tap on the end button terminates the active call
   - You can also reject an incoming call directly from the headset. Press the end button and the call will be rejected. Depending on the phone settings, the person who called you will either be forwarded to your voice mail or hear a busy signal
3. **To make a call**
   - If you make a call from the mobile phone, the call will (subject to phone settings) be automatically transferred to the headset
   - Voice dialing is activated with a tap on the answer button. For further information about using this feature, please consult your phone's user manual. You will get the best results if you record the voice-dialing tag through your headset
   - Activate last number redial with a press on the answer button on the headset

5

Claims	Prior Art
	Jabra BT800 User Manual at Page 5 **4. Volume control and mute function** • Your Jabra BT800 headset features an automatic volume control that adjusts the volume depending on ambient noise level. You can manually adjust the volume using the volume jog wheel see Fig 5 • During a conversation, press the mute button to mute the call. You un-mute by adjusting the volume level on the volume jog wheel or by tapping on the mute button see Fig 6  *Fig. 5*  *Fig. 6* Jabra BT800 User Manual at Page 6 **2. Access the menu** From the menu, you can adjust your settings according to your preferences. See Fig 7 • Access the menu when your are not receiving or making a call with a press on the mute / menu button • Use the jog wheel to navigate the menu • Select or activate a menu item with a tap on the answer button • Exit / go back in the menu with a tap on the end button   6 *Fig. 7* Hollemans '490 discloses a "personal audio system" (example of the claimed wireless wearable device) having a "controller" "touchpad" or "touch–sensitive area" (example of the claimed touch sensitive surface) that a user can use to input audio commands like play/pause, stop, fast forward, and rewind.

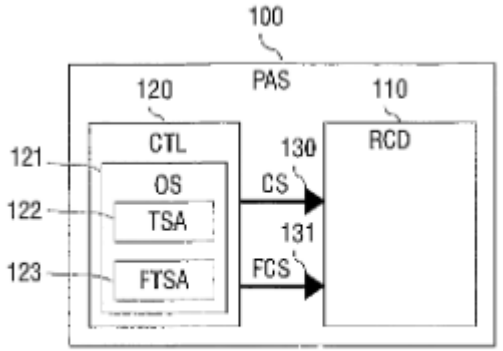
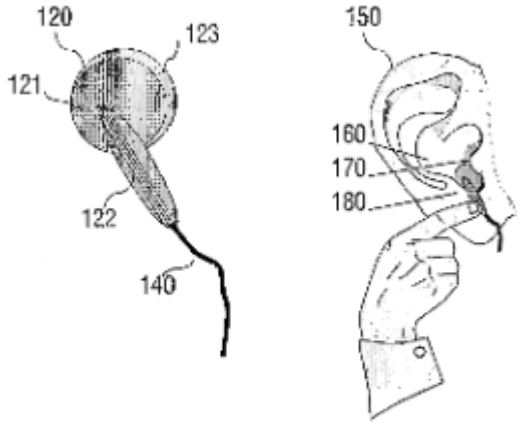
Claims	Prior Art
	The following citations show examples of where the Hollemans ’490 discloses this limitation. Hollemans ’490 at 1:10–3:21 A personal audio system as described in the opening paragraph is known from the now ubiquitous mobile audio devices like MP3 players and mobile phones. One particular example of such a system is the iPod MP3 player from Apple as reviewed in c’t 2002 Heft 26, pages 132-141, “Plattenmeister” by Peter Nonhoff-Arps, Sven Hansen, and available with product no. M8737LL/A (see also http://www.apple.com/ipod/). This and similar products typically comprise a set of two earpieces also known as ear buds that can be inserted into the ears of the user. These products typically also include a remote controller for controlling one or more functions of the device. A plug connects both the remote controller and the earpieces with the device, by plugging it into a socket of the device. The remote controller is usually included in the wire somewhere between the earpieces and the plug. As a result, the remote control has no fixed position but is dangling about as part of the wire. Hence, when the user wants to use the remote control for e.g. lowering volume, muting, or skipping an audio track or station, the user first needs to look for the remote controller. Subsequently, the user needs to get hold of the controller. This needs to be done in such a way that the controller has the right orientation for operating it. Finally, after being confident about the orientation of the controller, the user may try to find and operate the tiny button to activate the desired function. This requires considerable time and attention from the user, which may lead to dangerous situations when the user takes part in traffic. It is an object of the present invention to provide a personal audio system as described in the opening paragraph that does not suffer from the above-mentioned drawbacks. 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. The remote controller thus gets a fixed position with respect to the user in or by the human ear. It is easy to find one's ear. This prevents looking for the remote controller. In addition, the user is not tempted to look at the remote controller, because there is nothing relevant to be seen for controlling the device. To avoid having to find tiny buttons, merely touching the remote controller somewhere on its touch-sensitive area operates said remote controller, which detects being touched and subsequently sends the control signal to the device. Also the problem of finding the proper orientation of the remote controller is solved by wearing the remote controller in or by the ear, because its orientation becomes fixed with respect to the user. Advantageously, the controller is arranged to fit substantially in a human ear concha, such that the area is

Claims	Prior Art
	accessible for touching when the controller is fitted substantially in the concha. This fits in with a particularly comfortable and popular shape for the earpieces or ear buds. The shape consists of a thick disc containing a transducer and a protruding part from which a wire extends. When being worn, the protruding part of the earpiece offers a surface area that is easily accessible for touching. Advantageously, the controller is arranged to detect a temporal pattern in the touch-sensitive area being touched, and to send the control signal in response to detecting the temporal pattern. In general, the device offers a plurality of functions and capabilities. Rather than having more buttons on the remote control that may be hard to distinguish, the single touch-sensitive area is used for controlling the plurality of functions. The temporal pattern is a particularly appropriate user interface, because it is easy to create temporal patterns in touching the area rhythmically and because the temporal patterns can constitute a natural and consistent interface. 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. Advantageously, the outer surface has a further touch-sensitive area, such that the further touch-sensitive area is touched substantially by the ear when the controller is substantially worn in or by a human ear, the controller being arranged to send the control signal only if the further touch-sensitive area is touched. This will prevent the accidental remote control of the device when the remote controller is not worn, thus preventing unwanted activation of the device and unnecessary battery exhaustion. Advantageously, the controller is arranged to send a further control signal to the device if the further touch-sensitive area is touched. This makes it, for example, possible for the device to pause playing music as soon as the earpiece is taken out and to resume playing music upon re-insertion. In an embodiment of the personal audio system according to the invention, the system comprises a second controller for remotely controlling the device by sending a further control signal to the device, the second controller having an outer surface with a further touch-sensitive area, the second controller being arranged to be substantially worn in or by a human ear, and the second controller being further arranged to detect a further temporal pattern in the further touch-sensitive area being touched, and to send the further control signal in response to detecting the further temporal pattern. A second controller fits in with the natural symmetry of the human head. It also considerably enhances the user interface for controlling the device. For example, the symmetry can be exploited in such a way that a long tap at the left remote controller decreases the volume, but a long tap at the right controller increases the volume. Hollemans ’490 at 4:10–13 Figure 1 is a block diagram of an embodiment of a personal audio system 100 according to the invention. The personal audio system 100 comprises a remotely controllable device 110 and a controller 120 that remotely controls the device 110 by sending a signal 130 to the device 110.

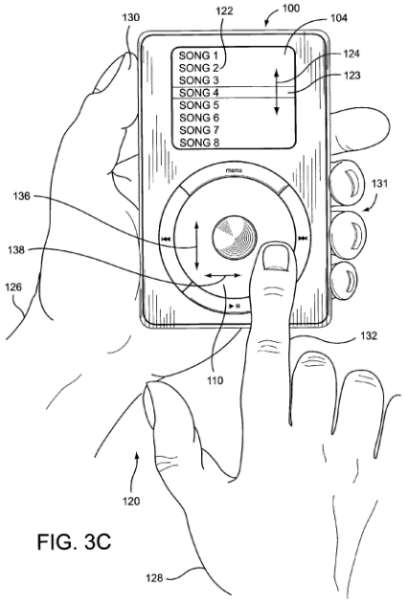
Claims	Prior Art
	Hollemans ’490 at 4:24–5:7 The controller 120 is used for commanding the device 110 to perform one or more of its functions or capabilities. The basic assumption is that the device 110 is remote or tucked away in a pocket or clamped to a belt or clothing, such that operating it becomes relatively hard. The controller 120 makes it possible to operate the device 110. The controller 120 is generally wired to the device 110 by means of a wire 140 (see figure 2) and a plug (not shown) that fits into a socket (not shown) of the device 110. The remote controller 120 has an outer surface 121, see also figure 2. The outer surface 121 is just the physical outer side of the controller 120. A part of this outer surface 121 is sensitive to being touched and is referred to as the touch-sensitive area 122. Optionally, the controller 120 comprises a second area that is sensitive to being touched, referred to as the further touch-sensitive area 123. The touch-sensitive area 122 can be realized in many ways, including a sensor for changes in capacity or induced voltages or currents, a grid of conducting parts between which changes in resistance are measured and detected, or an ordinary pressure sensor, button or temperature sensor. Another possibility is to measure and detect changes in either a passive or an active electromagnetic field. With the passive variant, the controller 120 relies on, for example, nearby power lines to generate measurable fields when being touched. With the active variant, the controller 120 generates an electromagnetic field of its own. Hollemans ’490 at 6:1–18 According to the invention, the remote controller 120 is suited to be worn in or by a human ear. The remote controller 120 may have various shapes and forms to meet this requirement. It could fit almost entirely in the auditory canal, much like a miniature hearing aid device, but it could also have the shape of a more conventional hearing aid device worn behind the ear cup, or a headset with a band over the head or in the neck, or the shape of a neck strap for carrying the device 110. Figure 2 shows an example of an embodiment of the remote controller according to the invention. A particularly comfortable and popular shape of the remote controller 120 consists of a thick disc containing a transducer and a protruding part from which a wire 140 extends. The disc fits in a concha 160 of a human ear 150 and is kept there by friction. The disc may in addition be kept there by the presence of a tragus 170 and an antitragus 180, being two cartilaginous edges of the conchal bowl 160 of the human ear 150. When being worn, the protruding part of the remote controller 120 offers a surface area 122 that is easily accessible for touching. Figure 3 shows an example of the functionality offered by an embodiment of the system according to the invention. Figure 4 shows another example of the functionality offered by an embodiment of the system according to the invention. The functionality of detecting temporal patterns offers a user interface that is convenient, logical and consistent.

Claims	Prior Art
	Hollemans ’490 at 6:19–33 A basic temporal pattern that can be detected is a short tap, which consists of the touch-sensitive area 122 being initially untouched and subsequently being touched for a short while, and subsequently being untouched again. The short while typically lasts between 40 and 300 milliseconds. Another basic temporal pattern is the long tap, which typically lasts between 400 milliseconds to several seconds. Yet another basic temporal pattern is a repeated long or short tap or another sequence of long and short taps. All of these temporal patterns may each be mapped to functions or capabilities of the device 110. The detection of the temporal pattern is preferably insensitive to deviations of the duration of the tap and to the criteria for determining being touched, like measured quantity levels and hysteresis. The detection of the temporal pattern may adapt itself to the history of detected patterns. One particular mapping may be, for example, that, in response to detecting a touch and hold, the device 110 gradually adapts a volume level as long as the area 122 is being touched. The direction of adaptation (increasing or decreasing the volume level) can be reversed with every touch and hold, or with a short tap in between. Hollemans ’490 at 7:19–23 The controller 120 may favorably be backward compatible with devices according to the prior art, such that the controller 120 according to the invention can be plugged in and used with conventional devices. Similarly, the device 110 may be backward compatible with controllers according to the prior art, such that the device 110 according to the invention can still (partially) be remotely controlled from conventional controllers. Hollemans ’490 at 8:1–18 In a first way, the touch-sensitive area is used to detect a tempo of being tapped. The tempo detected may be used to adjust a rhythm of a sound, e.g. as transferred by the personal audio system. The tempo detected may also be used to find or select matching content, for example, a song with a tempo that resembles the tempo detected. The tempo detected may also be used to adapt the speed of playback of the current music to the tempo detected. The tempo detected may also be used to enter metadata that pertains to the currently played music, by tapping along in the same tempo. An advantage is that tempo information may be entered in a natural way, without being dependent on menu navigation on a player that is relatively hard to operate. Another advantage is that no complex algorithms are required for obtaining meaningful and accurate tempo information, because relatively simple time averaging logic suffices. In a second way, the touch-sensitive area is used for detecting a pressure with which the area is touched. When a person presses harder on the touch-sensitive area of the remote control, more skin contacts the

Claims	Prior Art
	area. This increases a conductivity and lowers the measured skin resistance. By means of a precise measurement it is possible to sense these differences in pressure. The pressure may for example be used for a more sophisticated volume and cueing control. An example is changing a setting with a speed that is proportional with the pressure. Hollemans '490 at 8:19–33 In a third way, the touch-sensitive area is used for picking up a gesture made on the area with e.g. a stylus or a finger. The remote control may be extended for this purpose with means for detecting a gesture, e.g. a laser beetle, a small camera, an IR movement sensor, or a cross-capacitance sensor. The system may be arranged to detect a gesture being made on the area. The gesture detected may be used for controlling a setting of the system. Examples of a setting are a selection of a next or a previous track, a volume, a position of a stereo image, e.g. a panning position, a balance position. The gesture detected may also be used for controlling a mouse pointer, navigating a menu, entering a tapping pattern, scrolling content on display. The 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. The list may contain items like contacts, artists, song titles, etc. The gesture detected may be a user defined gesture for activating a user defined function. The gesture detected may be used for user identification by matching with initials or an autograph. The gesture may extend into two dimensions, e.g. a planar gesture, or it may extend into three dimensions. Hollemans '490 at 9:1–17 In a fourth way, the system may be arranged to operate in a plurality of modes, and to switch between the modes. A function that depends on the mode may be invoked in response to an input on the remote control. Each mode may e.g. correspond to an application of the system. The system may switch to another application in response to a command of the user, for example given via the touch-sensitive area. Touching the left earpiece, for example, may cause a move through a circular list of applications, and an application may be activated by touching the right earpiece. Also multiple applications may be active simultaneously, in which case a special command may be used to switch between applications, e.g., hold one earpiece while tapping on the other. Of course, other combinations may be used for this. Another way of switching between applications may not be initiated by the user, but by the system, e.g., on an incoming phone call or some other event. As soon as the incoming phone call is detected, the ring tone may be sounded, potentially mixed with the active sound source e.g. MP3 playback. While the incoming phone call is communicated to the user, the controls are mapped to the phone application rather than the audio playback application. In the phone application, touching the right earpiece could be mapped on answering the call and the left earpiece could be mapped to hanging up. As the user picks up the call, the

Claims	Prior Art
	playback of the music may be paused. Hollemans '490 at Figure 1  FIG.1 Hollemans '490 at Figure 2  FIG.2

Claims	Prior Art
	Hollemans ’490 at Figure 3  FIG.3 Hollemans ’490 at Figure 4  FIG.4 Zadesky ’230 discloses a “media player 100” that “includes a touch pad 110” (example of the claimed touch sensitive surface at least partially contained within the head-worn structure and configured to sense a touch input associated with the user) that “is configured to provide one or more control functions for controlling various applications.” The following citations show examples of where the Zadesky ’230 discloses this limitation.

Claims	Prior Art
	Zadesky ’230 at Figure 3C  FIG. 3C Zadesky ’230 at 1:47–65 In portable computing devices such as laptop computers, the input devices are commonly touch pads. With a touch pad, the movement of an input pointer (i.e., cursor) corresponds to the relative movements of the user's finger (or stylus) as the finger is moved along a surface of the touch pad. Touch pads can also make a selection on the display screen when one or more taps are detected on the surface of the touch pad. In some cases, any portion of the touch pad may be tapped, and in other cases a dedicated portion of the touch pad may be tapped. In stationary devices such as desktop computers, the input devices are generally selected from mice and trackballs. With a mouse, the movement of the input pointer corresponds to the relative movements of the mouse as the user moves the mouse along a surface. With a trackball, the movement of the input pointer corresponds to the relative movements of a ball as the user rotates the ball within a housing. Both mice and trackballs generally include one or more buttons for making selections on the display screen. Zadesky ’230 at 2:29–43 To elaborate further, touch pads generally include one or more sensors for detecting the proximity of the finger thereto. By way of example, the sensors may be based on resistive sensing, surface acoustic wave

Claims	Prior Art
	sensing, pressure sensing (e.g., strain gauge), optical sensing, capacitive sensing and the like. The sensors are generally dispersed about the touch pad with each sensor representing an x, y position. In most cases, the sensors are arranged in a grid of columns and rows. Distinct x and y position signals, which control the x, y movement of a pointer device on the display screen, are thus generated when a finger is moved across the grid of sensors within the touch pad. For brevity sake, the remaining discussion will be held to the discussion of capacitive sensing technologies. It should be noted, however, that the other technologies have similar features. Zadesky ’230 at 2:44–3:5 Capacitive sensing touch pads generally contain several layers of material. For example, the touch pad may include a protective shield, one or more electrode layers and a circuit board. The protective shield typically covers the electrode layer(s), and the electrode layer(s) is generally disposed on a front side of the circuit board. As is generally well known, the protective shield is the part of the touch pad that is touched by the user to implement cursor movements on a display screen. The electrode layer(s), on the other hand, is used to interpret the x, y position of the user's finger when the user's finger is resting or moving on the protective shield. The electrode layer (s) typically consists of a plurality of electrodes that are positioned in columns and rows so as to form a grid array. The columns and rows are generally based on the Cartesian coordinate system and thus the rows and columns correspond to the x and y directions. The touch pad may also include sensing electronics for detecting signals associated with the electrodes. For example, the sensing electronics may be adapted to detect the change in capacitance at each of the electrodes as the finger passes over the grid. The sensing electronics are generally located on the backside of the circuit board. By way of example, the sensing electronics may include an application specific integrated circuit (ASIC) that is configured to measure the amount of capacitance in each of the electrodes and to compute the position of finger movement based on the capacitance in each of the electrodes. The ASIC may also be configured to report this information to the computing device. Zadesky ’230 at 4:37–49 The present invention relates to touch pads. According to one aspect of the invention, a touch pad is provided on a media player to facilitate user interaction therewith. In one embodiment, the media player is a handheld device. According to another aspect of the invention, a touch pad is provided that can sense and resolve angular and/or radial positions of a moving object (e.g., finger) as it is moved in a largely rotational and/or radial manner across the touch pad. In one embodiment, the touch pad that is based on polar coordinates rather than Cartesian coordinates. Other aspects of the invention will become apparent below. In any case, the aspects are not limiting and the various aspects of the invention can be used

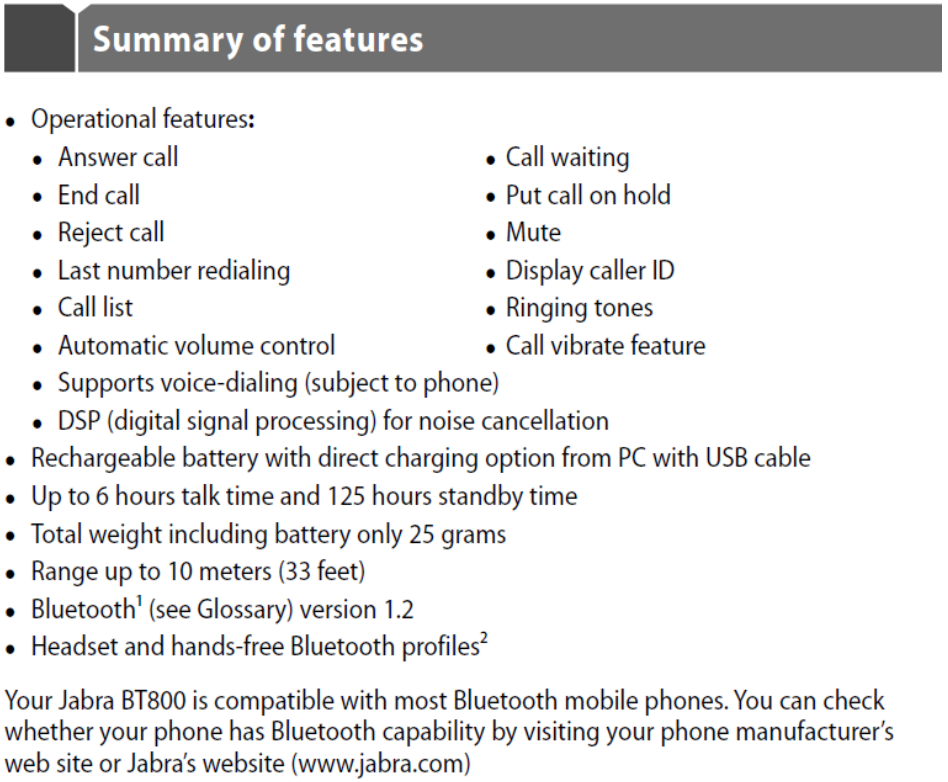
Claims	Prior Art
	separately or in combination. Zadesky ’230 at 5:61–6:19 The media player 100 also includes a touch pad 110. The touch pad 110 is configured to provide one or more control functions for controlling various applications associated with the media player 100. For example, the touch initiated control function may be used to move an object or perform an action on the display screen 104 or to make selections or issue commands associated with operating the media player 100. In most cases, the touch pad 110 is arranged to receive input from a finger moving across the surface of the touch pad 110 in order to implement the touch initiated control function. The touch pad may be widely varied. For example, the touch pad be a conventional touch pad based on the Cartesian coordinate system, or the touch pad may be a touch pad based on a polar coordinate system (the later will be described in greater detail below). The manner in which the touch pad 110 receives input may be widely varied. In one embodiment, the touch pad 110 is configured receive input from a linear finger motion. In another embodiment, the touch pad 110 is configured receive input from a rotary or swirling finger motion. In yet another embodiment, the touch pad 110 is configured receive input from a radial finger motion. Additionally or alternatively, the touch pad 110 may be arranged to receive input from a finger tapping on the touch pad 100. By way of example, the tapping finger may initiate a control function for playing a song, opening a menu and the like. Zadesky ’230 at 6:38–7:5 The direction of scrolling may be widely varied. For example, scrolling may be implemented vertically (up or down) or horizontally (left or right). In the case of vertical scrolling, when a user scrolls down, each new set of data appears at the bottom of the viewing area and all other sets of data move up one position. If the viewing area is full, the top set of data moves out of the viewing area. Similarly, when a user scrolls up, each new set of data appears at the top of the viewing area and all other sets of data move down one position. If the viewing area is full, the bottom set of data moves out of the viewing area. In one implementation, the scrolling feature may be used to move a Graphical User Interface (GUI) vertically (up and down), or horizontally (left and right) in order to bring more data into view on a display screen. By way of example, in the case of an MP3 player, the scrolling feature may be used to help browse through songs stored in the MP3 player. The direction that the finger moves may be arranged to control the direction of scrolling. For example, the touch pad may be arranged to move the GUI vertically up when the finger is moved in a first direction and vertically down when the finger is moved in a second direction To elaborate, the display screen 104, during operation, may display a list of media items (e.g., songs). A

Claims	Prior Art
	user of the media player 100 is able to linearly scroll through the list of media items by moving his or her finger across the touch pad 110. As the finger moves around the touch pad 110, the displayed items from the list of media items are varied such that the user is able to effectively scroll through the list of media items. However, since the list of media items can be rather lengthy, the invention provides the ability for the user to rapidly traverse (or scroll) through the list of media items. In effect, the user is able to accelerate their traversal of the list of media items by moving his or her finger at greater speeds. Zadesky '230 at 8:52–9:21 FIGS. 3A-3C show the media player 100 of FIG. 2 being used by a user 120, in accordance with different embodiments of the invention. In all of these embodiments, the user 120 is linearly scrolling 104 (as shown by arrow 124) through a list of songs 122 displayed on the display screen via a slider bar 123. As shown, the media device 100 is comfortably held by one hand 126 while being comfortably addressed by the other hand 128. This configuration generally allows the user 120 to easily actuate the touch pad 110 with one or more fingers. For example, the thumb 130 and rightmost fingers 131 (or leftmost fingers if left handed) of the first hand 126 are used to grip the sides of the media player 100 while a finger 132 of the opposite hand 128 is used to actuate the touch pad 110. As shown, the entire top surface of the touch pad 110 is accessible to the user's finger 130. Referring to FIG. 3A, and in accordance with one embodiment of the invention, the touch pad 110 can be continuously actuated by a simple swirling motion of the finger 132 as shown by arrow 134. By swirling, it is meant that the finger moves in an arcuate or circular manner. For example, the finger may rotate relative to an imaginary axis. In particular, the finger can be rotated through 360 degrees of rotation without stopping. This form of motion may produce continuous or incremental scrolling on the display screen 104. Referring to FIG. 3B, and in accordance with one embodiment of the invention, the user 120 can slide his or her finger 132 radially between the inner and outer perimeter of the touch pad 110. For example, the touch pad 110 may be actuated radially as shown by arrow 140. Referring to FIG. 3C, and in accordance with one embodiment of the invention, the user 120 can slide his or her finger 132 substantially tangentially from all sides of the touch pad 110. For example, the touch pad 110 may be actuated forwards and backwards as shown by arrows 136 and side to side by arrows 138. Zadesky '230 at 10:34–51 Additionally or alternatively, the system via the touch pad may be configured to transform radial motion an object such as a finger (as shown in FIG. 3B) into translational or linear motion on the display screen. By radial, it is meant that the object moves in a substantially radial direction from the center of the touch pad to an outer perimeter of the touch pad. In one embodiment, the touch pad is arranged to continuously determine the radial position of a finger relative to the planar surface of the touch pad. This allows a user

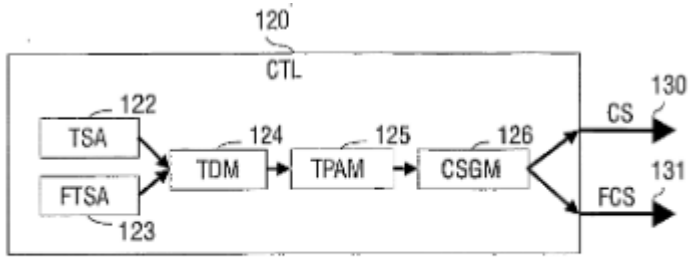
Claims	Prior Art
	to linearly scroll through a media list on the display screen by moving the object at least partially between the center and outer perimeter of the touch pad. For example, by moving the object between a small and large radius (e.g., 0–3 cm) on the touch pad. This may also allow a user to vary a characteristic of the media player. For example, by moving radially, the user may be able to change the volume of sound being played on the media player (i.e., acts like a potentiometer). Zadesky '230 at 13:36–60 The advantages of the invention are numerous. Different embodiments or implementations may yield one or more of the following advantages. It should be noted that this is not an exhaustive list and there may be other advantages which are not described herein. One advantage of the invention is that a user is able to easily and rapidly traverse a lengthy list of media items. Another advantage of the invention is that a substantial portion of the touch pad is accessible to the user, i.e., the touch pad provides a large surface area for manipulation thereof. Another advantage of the invention is that the touch pad can be continuously actuated by a simple swirling motion of a finger, i.e., the finger can be rotated through 360 degrees of rotation without stopping. Another advantage of the invention is that the touch pad provides more range of finger positions. For example, a left handed user may choose to use one portion of the touch pad while a right handed user may choose to use another portion of the touch pad. In essence, the touch pad is more ergonomic. Another advantage of the invention is that the touch pad makes the media player more aesthetically pleasing. Another advantage of the invention is that the touch pad allows an intuitive way to scroll on a display screen. For example, the user can manipulate the his or her finger side to side for horizontal scrolling and the user can manipulate his or her finger backwards and forwards for vertical scrolling. Iuliis '007 discloses "the input mechanism may correspond to touch sensing devices such as touch pads, touch screens or touch sensitive housings" (example of the claimed a touch sensitive surface at least partially contained within the head-worn structure and configured to sense a touch input associated with the user). Iuliis '007 at 9:33–48 The connector unit 102 may for example include input mechanisms such as buttons, dials, sliders, navigation pads, etc that allow a user to interact with the handheld electronic device 104 via the lanyard 100. In the case of a music player, the connector unit may include button controls for volume, play/pause and playing the next or previous songs. As a result, the user does not need to use the user interface from the handheld electronic device 104, which can be difficult when the user is on the go as for example when the user is exercising. Alternatively or additionally, the input mechanism may correspond to touch sensing devices such as touch pads, touch screens or touch sensitive housings. Examples of such devices can be

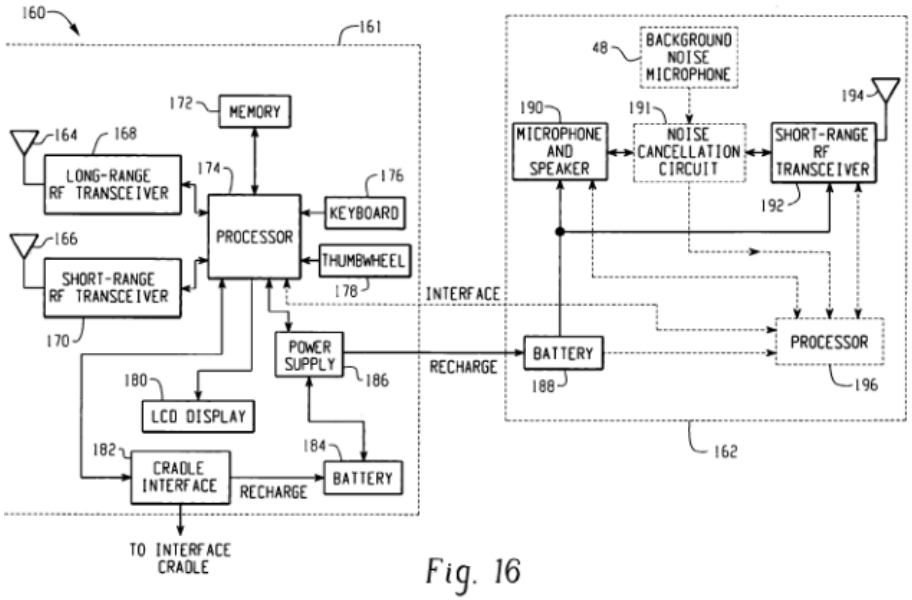
Claims	Prior Art
	found in U.S. patent application Ser. Nos. 10/188,182, 10/643,256, 10/840,862, 10/903,964, 11/038,590, 11/057,050, and 11/115,539, which are herein incorporated by reference. A POSITA would have been motivated to combine the Jabra BT800 with Zadesky '230 and the Logitech Mobile Bluetooth Headset with Hollomans '490 to advantageously increase the convenience of user input to the Jabra BT800. The Jabra BT800 expressly teaches and desires user inputs for volume control and other inputs, and teaches a "Jog wheel" that the user can slide for doing so. *See* Jabra BT800 User Manual at Pages 2, 4, 5. To the extent that further disclosure is required, a POSITA would have been motivated to implement a touch sensitive surface to increase the convenience and ease of use of these inputs. A POSITA would have been motivated to combine the Jabra BT 800 with Zadesky '230. A POSITA would have looked to Zadesky '230 because Zadesky '230 describes touchpad input techniques that "facilitate user interaction" with audio devices such as the Jabra BT800, and explains the "numerous" advantages, including ease and speed of use, accessibility, ergonomics. Zadesky '230, 3:26-37, 4:37-40, 5:61-6:8, 13:36-60. Zadesky describes using sliding input on a touchpad to improve on audio-device functions, such as volume adjustment, that are performed by the Jabra BT800's touch inputs. Zadesky '230, 10:40-51. A POSITA would have combined a touch sensitive surface with sliding inputs into the Jabra BT800 in order to realize Zadesky '230's advantages, such as faster, intuitive, and ergonomic user control. For example, Zadesky '230 teaches that with its touch screens, "a user is able to easily and rapidly traverse a lengthy list of media items," "the touch pad provides a large surface area for manipulation," "the touch pad can be continuously actuated by a simple swirling motion of the finger," "the touch pad provides more range of finger positions," "the touch pad is more ergonomic," "touch pad makes the media player more aesthetically pleasing," and "the touch pad allows an intuitive way scroll on the display screen." Zadesky '230, 13:36–60. These advantages are especially significant for the Jabra BT 800's wearable earpiece format, in which the user may not be able to see the touchpad (because it is worn on the user's ear), and may thus benefit from intuitive touch-based control techniques. A POSITA also would have recognized that including a touch sensitive surface would have advantageously allowed users to control audio playback without needing to look down at a controller device, and this would have been particularly advantageous in situations like driving when a user cannot look down at a separate controller device. *See* Hollemans '490, 1:10–3:21. Specifically, Hollemans '490 teaches that "[i]t is easy to find one's ear," which "prevents looking for the remote controller" and "the user is not tempted to look at the remote controller."Hollemans '490, at 2:10–18. The user can also advantageously "avoid having to find tiny buttons, merely touching the remote controller somewhere on its touch–sensitive area operations said remote controller." *Id*. Hollemans teaches several other advantages. *See* Hollemans '490, 1:10–3:21.

Claims	Prior Art
	A POSITA would have reasonably expected success in making this combination because Zadesky '230 explains that "in portable computing devices such as laptop computers, the input devices are commonly touch pads." Zadesky '230, 1:47–65, 1:42–44 (In the case of hand-held personal digital assistants (PDA), the input devices tend to utilize touch–sensitive display screens). As such, a POSITA would have known that touch pads were common in portable computing devices. A POSITA would have reasonably expected success in implementing Zadesky '230's touch pad because it requires no more than the straightforward application of conventional "common[] touch pads" to the Jabra FreeSpeak. Zadesky '230, 1:47–65. Thus, using Zadesky '230's touch pad as a user input on the Jabra BT800 would have used known features according to their known functions (common touch pads), to achieve predictable results (Jabra BT800 includes a touch pad for user input). A POSITA also would have been motivated to combine the Jabra BT800 with Hollomans '490, and reasonably expected success in doing so, for the same reasons discussed above for Zadesky '230. A POSITA would have been motivated to combine the Jabra BT800 with Iuliis '007, and reasonably expected success in doing so, for the same reasons discussed above for the other references. To the extent that Jabra BT800, Hollemans '490, Zadesky '230, and Iuliis '007 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of Jabra BT800, Hollemans '490, Zadesky '230, and '007 those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[1e] a rechargeable battery contained within the head-worn structure;	The Jabra BT800 expressly or inherently discloses "a rechargeable battery contained within the head-worn structure." For example: The Jabra BT800 includes a "Rechargeable battery with direct charging option" (example of the claimed a rechargeable battery contained within the head-worn structure). The following citations show examples of where the Jabra BT800 discloses this limitation.

Claims	Prior Art
	Jabra BT800 User Manual at Page 3  **Summary of features** • Operational features: • Answer call • End call • Reject call • Last number redialing • Call list • Automatic volume control • Call waiting • Put call on hold • Mute • Display caller ID • Ringing tones • Call vibrate feature • Supports voice-dialing (subject to phone) • DSP (digital signal processing) for noise cancellation • Rechargeable battery with direct charging option from PC with USB cable • Up to 6 hours talk time and 125 hours standby time • Total weight including battery only 25 grams • Range up to 10 meters (33 feet) • Bluetooth[1] (see Glossary) version 1.2 • Headset and hands-free Bluetooth profiles[2] Your Jabra BT800 is compatible with most Bluetooth mobile phones. You can check whether your phone has Bluetooth capability by visiting your phone manufacturer's web site or Jabra's website (www.jabra.com) To the extent that the Jabra BT800 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[1f] electronic circuitry contained within the head-worn structure, the electronic circuitry being electrically connected to at least the rechargeable battery, and the electronic circuitry being	The Jabra BT800, Hollemans '490, and Zadesky '230 expressly or inherently disclose "electronic circuitry contained within the head-worn structure, the electronic circuitry being electrically connected to at least the rechargeable battery, and the electronic circuitry being electrically connected to the touch sensitive surface." For example: On information and belief, the Jabra BT800 includes electronic circuitry, such as a processor, that is connected to the Jabra BT800's battery in order to power the electronic circuitry. On information and belief,

Claims	Prior Art
electrically connected to the touch sensitive surface;	the electronic circuity in the Jabra BT800, such as a processor, is also connected to any inputs, including the Jabra BT800's Jog Wheel, in order to receive inputs from the user. Hollemans '490's "controller" "touchpad" or "touch–sensitive area" (example of the claimed touch sensitive surface) is a "coupled to touch–detecting means" "circuit" (example of the claimed electronic circuitry being electrically connected to the touch sensitive surface). The following citations show examples of where the Hollemans '490 discloses this limitation. Hollemans '490 at 5:8–34 Figure 5 is a block diagram of an embodiment of the remote controller 120 according to the invention. The touch-sensitive area 122 and the further touch-sensitive area 123 are coupled to touch-detecting means 124. The touch-detecting means 124 measures the internal resistance of a part of the human body that touches the touch-sensitive area 122. Figure 6 shows an example of a circuit for the touch-detecting means 124. The internal resistance is determined with a voltage divider composed of the touch-sensitive area 122 and a resistor 129. Without touching, the output voltage of the divider will be the supply voltage, but with touching, the output voltage will decrease. Touching can thus be detected. The output voltage of the voltage divider 129, 122 is input for a buffer 127 that provides a copy of the voltage at its output 128. The output of the touch-detecting means 124 can be coupled to the input of temporal pattern analysis means 125. The temporal pattern analysis means 125 may comprise an A/D-converter (not shown) for converting the analog output signal of the touch-detecting means 124 into a digital representation of the output signal. The output signal of the temporal pattern analysis means 125 that represent detected temporal patterns may be coupled to control signal generating means 126, for generating and transmitting the control signal 130 and the further control signal 131. The control signal 130 sent by the controller 120 to the device 110 can take several forms. One example is that the control signal 130 is an electric DC current that runs upon closing a circuit between a pair of conductors in the wire 140. Also several resistance levels between two pins (not shown) of the plug (not shown) may represent several control signals. Another example is an electric AC current or voltage with a particular frequency or frequencies. These frequencies may advantageously be above the frequencies perceived by a human ear, so as to be multiplexed on the same wire 140 that carries audio frequencies. Yet another example is a digital electric signal. Wire 140 may carry the control signal 130, but other media like air or fiber could also carry it, especially in the case of an electromagnetic signal.

Claims	Prior Art
	Hollemans ’490 at Figure 5  FIG.5 Zadesky ’230 further discloses that “signals” from sensors are supplied to a “processor,” as such, a POSITA would have understood that the “processor” (example of the claimed electronic circuitry) was connected to Zadesky ’230’s “touch pad” (example of the claimed touch sensitive surface). The following citations show examples of where the Zadesky ’230 discloses this limitation. Zadesky ’230 at 9:62–10:33 The system 200 also includes a control assembly 212 that is coupled to the touch pad 202. The control assembly 212 is configured to acquire the position signals from the sensors and to supply the acquired signals to a processor 214 of the system. By way of example, the control assembly 212 may include an application specific integrated circuit (ASIC) that is configured to monitor the signals from the sensors, to compute the angular location, direction, speed and acceleration of the monitored signals and to report this information to the processor 214. The processor 214 is coupled between the control assembly 212 and the display screen 204. The processor 214 is configured to control motion inputs to the display screen 204. In one sequence, the processor 214 receives angular motion information from the control assembly 212 and then determines the next items of the media list 211 that are to be presented on the display screen 204. In making this determination, the processor 214 can take into consideration the length of the media list 211. Typically, the processor 214 will determine the rate of movement of the finger such that the transitioning to different items in the media list 211 can be performed faster when the finger is moved at greater speeds. In effect, to the user, the more rapid swirling of the finger enables effective acceleration of the transitioning of the list of media items 211. Alternatively, the control assembly 212 and processor 214 may be combined in some embodiments. Although not shown, the processor 214 can also control a buzzer to provide audio feedback to a user. The

Claims	Prior Art
	audio feedback can, for example, be a clicking sound produced by the buzzer. In one embodiment, the buzzer 216 is a piezo-electric buzzer. As the rate of transitioning through the list of media items increases, the frequency of the clicking sounds increases. Alternatively, when the rate that the finger is moved slows, the rate of transitioning through the list of media items decreases, and thus the frequency of the clicking sounds correspondingly slows. Hence, the clicking sounds provide audio feedback to the user as to the rate in which the media items within the list of media items are being traversed. Griffin '456's Figure 16, for example, illustrates a "processor" (example of the claimed electronic circuitry) electrically connected to the rechargeable "battery" (example of the claimed being electrically connected to at least the rechargeable battery). The following citations show examples of where the Griffin '456 discloses this limitation. Griffin '456 at Figure 16  Fig. 16 Griffin '456 at [0023]–[0025] FIG. 16 is an exemplary electrical block diagram of the multi-module communication devices shown in FIGS. 1-15; FIG. 17 illustrates one contemplated implementation of the communication device described above;

Claims	Prior Art
	FIG. 18 illustrates a further embodiment of a communication device that includes wireless communication between the device modules and a third module, such as an RF interface cradle; and Griffin '456 at [0053] FIG. 16 is an exemplary electrical block diagram 160 of the multi-module communication devices shown in FIGS. 1-15. Another type of communication device that could be modified for use with this system is described in co-pending U.S. patent applications Ser. Nos. 09/106,585, 09/344,432, 09/543,231, 09/634,774 and 09/663,972. These applications, which are co-owned with the present application, are hereby incorporated herein by reference. The communication devices described in these applications include only a single wireless RF component for communicating over a single communication path to a long-range wireless network. The devices shown in FIGS. 1-15 are similar to these devices in that they can communicate over a long-range wireless network, but also preferably include an RF interface for communicating over a short-range wireless network or link. A POSITA would have been motivated to combine the Jabra BT800 with Zadesky '230 and the Jabra BT800 with Hollomans '490, and reasonably expected success in doing so, for the reasons explained for [1d]. Moreover, a POSITA would have been motivated to connect the touch sensitive surface to the Jabra BT800's circuitry so that data from the touch sensitive surface could be processed and used. A POSITA would have reasonably expected success because connecting electronic components to a battery was was conventional in the art. To the extent that the Jabra BT800, Hollemans '490, and Zadesky '230 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Hollemans '490, and Zadesky '230, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[1g] wireless communication circuitry at least partially contained within the head-worn structure, the wireless communication circuitry being electrically connected to at least the rechargeable battery; and	The Jabra BT800 expressly or inherently discloses "wireless communication circuitry at least partially contained within the head-worn structure, the wireless communication circuitry being electrically connected to at least the rechargeable battery." For example: The Jabra BT800 includes wireless communication circuitry at least partially contained within the head-worn structure because it is a Bluetooth connected device. On information and belief, the Bluetooth circuitry is connected to the rechargeable battery inside the Jabra BT800 in order to power the Bluetooth circuitry (example of the claimed wireless communication circuitry at least partially contained within the head-worn structure, the wireless communication circuitry being electrically connected to at least the rechargeable battery).

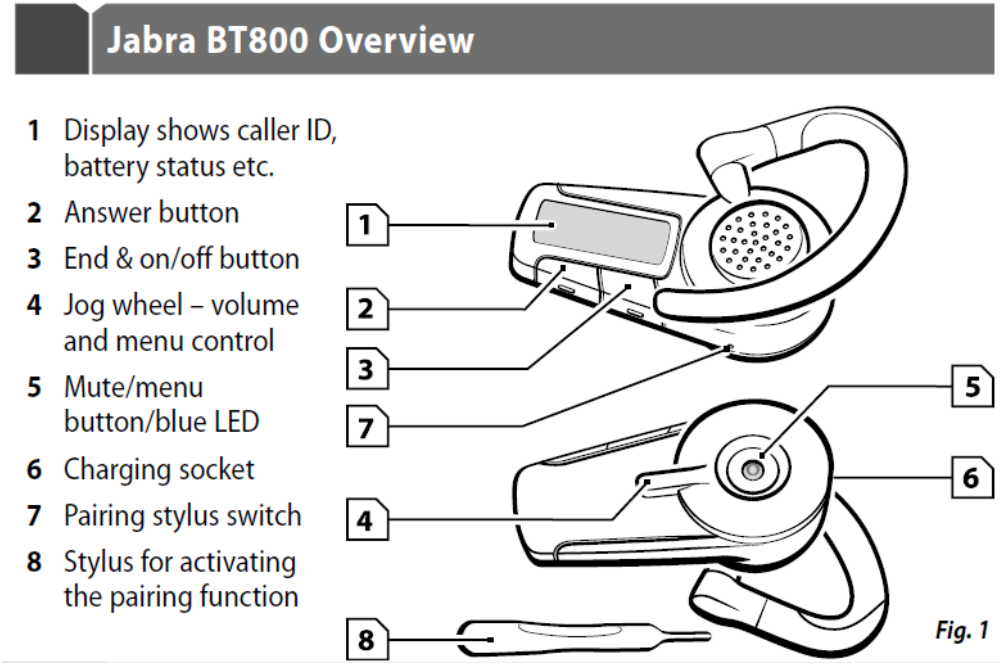
Claims	Prior Art
	The following citations show examples of where the Jabra BT800 discloses this limitation. Jabra BT800 User Manual at Page 3

Summary of features

- Operational features:
  - Answer call
  - End call
  - Reject call
  - Last number redialing
  - Call list
  - Automatic volume control
  - Call waiting
  - Put call on hold
  - Mute
  - Display caller ID
  - Ringing tones
  - Call vibrate feature
  - Supports voice-dialing (subject to phone)
  - DSP (digital signal processing) for noise cancellation
- Rechargeable battery with direct charging option from PC with USB cable
- Up to 6 hours talk time and 125 hours standby time
- Total weight including battery only 25 grams
- Range up to 10 meters (33 feet)
- Bluetooth[1] (see Glossary) version 1.2
- Headset and hands-free Bluetooth profiles[2]

Your Jabra BT800 is compatible with most Bluetooth mobile phones. You can check whether your phone has Bluetooth capability by visiting your phone manufacturer's web site or Jabra's website (www.jabra.com)

Claims	Prior Art
	Jabra BT800 User Manual at Page 4 **2 Pair (connect) with your Bluetooth headset** Before you get started, you need to pair[3] the Jabra BT800 with your mobile phone. 1. **Switch the Jabra BT800 on** Turn on the headset by pressing the on/off button. 2. **Put the headset in pairing mode** Put your headset in pairing mode with a press on the stylus switch marked (). Or put the headset in pairing mode from the display menu. – see Section 4 for details. The blue LED at the centre of the jog wheel (mute button) goes solid blue when the headset is in pairing mode. 3. **Set your Bluetooth phone to "discover" the Jabra BT800** Follow your phone's instruction guide. This usually involves going to a "setup", "connect", or "Bluetooth" menu **on your phone** and then selecting the option to "discover" or "add" a Bluetooth device*. (***See example from a Sony Ericsson T610 in Fig. 3***)  ***Fig. 3*** To the extent that the Jabra BT800 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[1h] at least one conductive element at least partially included within the head-worn structure, the at least one conductive element being at least partially exposed to enable interconnection therewith, the at least one conductive element	The Jabra BT800 and Jabra FreeSpeak expressly or inherently disclose "at least one conductive element at least partially included within the head-worn structure, the at least one conductive element being at least partially exposed to enable interconnection therewith, the at least one conductive element being electrically connected to at least the rechargeable battery." For example: The Jabra BT800 includes a "Charging socket" which includes at least one conductive element which is at least partially exposed to enable interconnection therewith. On information and belief, the "Charging socket"

Claims	Prior Art
being electrically connected to at least the rechargeable battery; and	is electrically connected to the rechargeable battery to allow it to be recharged (example of the claimed at least one conductive element at least partially included within the head-worn structure, the at least one conductive element being at least partially exposed to enable interconnection therewith, the at least one conductive element being electrically connected to at least the rechargeable battery). The following citations show examples of where the Jabra BT800 discloses this limitation. Jabra BT800 User Manual at Page 2  On information and belief, the Jabra FreeSpeak includes conductive pads on its surface to electrically connect with the charging cradle (example of the claimed at least one conductive element at least partially included within the head-worn structure, the at least one conductive element being at least partially exposed to enable interconnection therewith, the at least one conductive element being electrically connected to at least the rechargeable battery). For example, product images below show three metal contact pads on the surface of the Jabra FreeSpeak. The following citations show examples of where the Jabra FreeSpeak discloses this limitation.

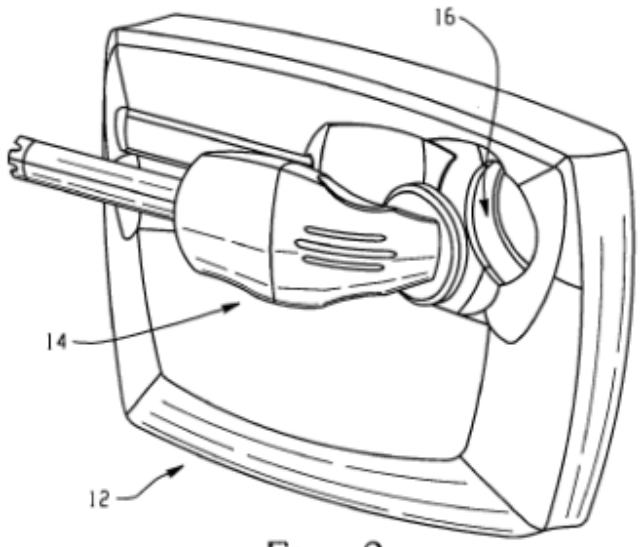
Claims	Prior Art
	Jabra FreeSpeak Brochure at Page 2 

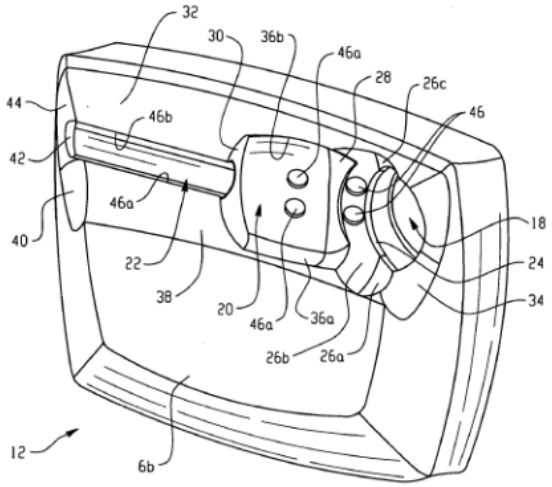
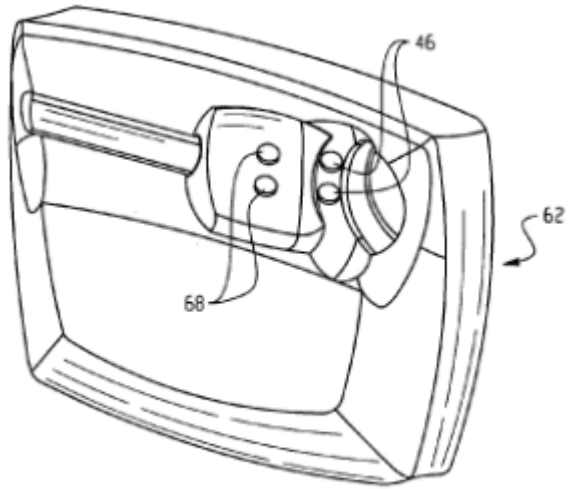
Claims	Prior Art
	 Jabra BT200 FreeSpeak Bluetooth Headset Review  A POSITA would have been motivated to combine the Jabra BT800 with the Jabra FreeSpeak because the Jabra FreeSpeak's surface charging areas would have allowed for the device to easily interface with a

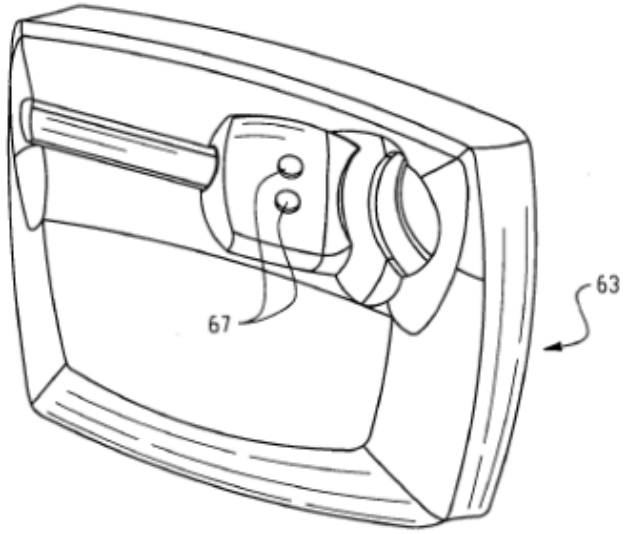
Claims	Prior Art
	charging cradle. Moreover, a POSITA would have been motivated to combine the Jabra BT800 with the Jabra FreeSpeak because they are products from the same company that a POSITA naturally would have put together. A POSITA would have reasonably expected success in including conductive elements, such as the Jabra FreeSpeak's conductive pads, on the surface of the Jabra BT800 because these metal contact pads are conventional components that would have been straightforwardly applied to the Jabra BT800's surface. And a POSITA further would have reasonably expected success because the Jabra BT800 with the Jabra FreeSpeak are similar products from the same company using analogous components in similar ways to achieve similar goals, such that a POSITA would have recognized they were compatible devices. To the extent that the Jabra BT800 and Jabra FreeSpeak does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[1i] a charging apparatus having at least a charging connector,	Jabra BT800, Jabra FreeSpeak, and Griffin '456 expressly or inherently disclose "a charging apparatus having at least a charging connector." For example: The Jabra FreeSpeak charges in a charging cradle, as shown below. (example of the claimed charging apparatus having at least a charging connector). The following citations show examples of where the Jabra FreeSpeak discloses this limitation.

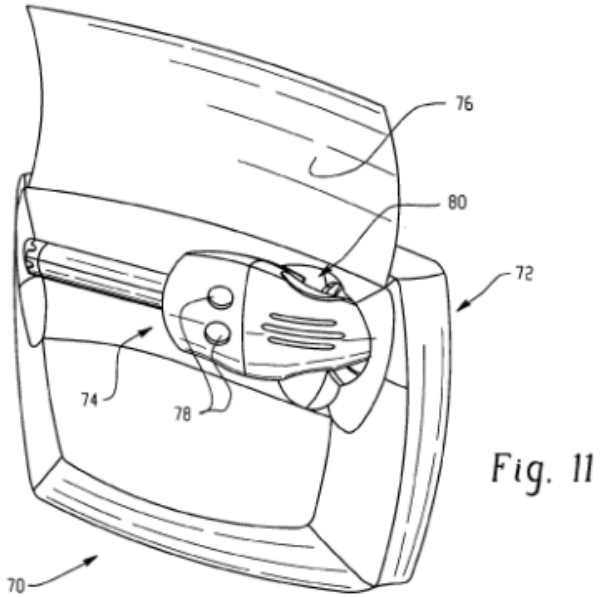
Claims	Prior Art
	Jabra FreeSpeak Brochure at Page 2  Amazon Jabra FreeSpeak Bluetooth Headset (on information and belief, image is representative of the prior art product)

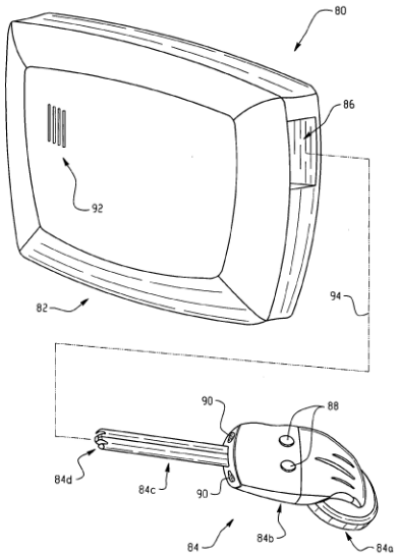
Claims	Prior Art
	 Griffin ’456 discloses a “first communication module” (example of the claimed a charging apparatus) which includes two “terminals 46” (example of the claimed at least a charging connector). The following citations show examples of where the Griffin ’456 discloses this limitation.

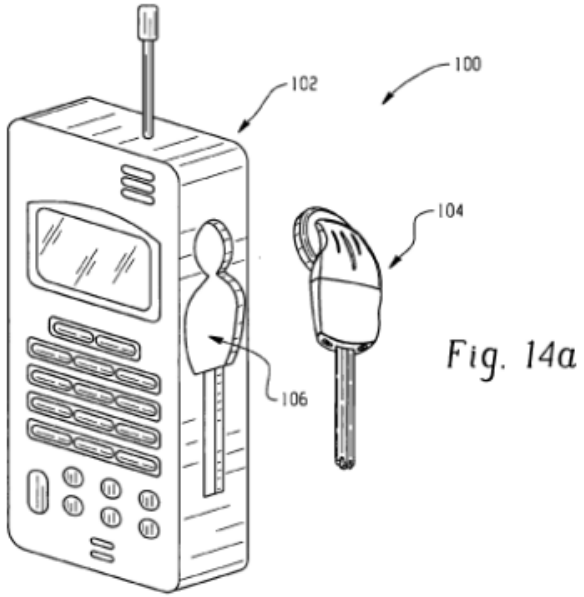
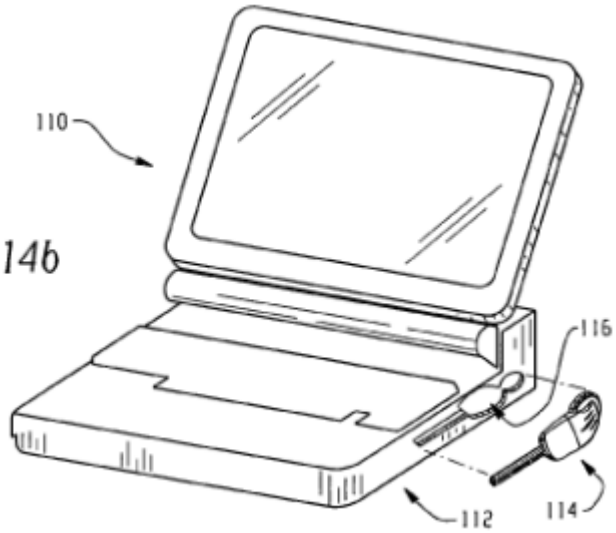
Claims	Prior Art
	Griffin ’456 at Figure 2  Fig. 2

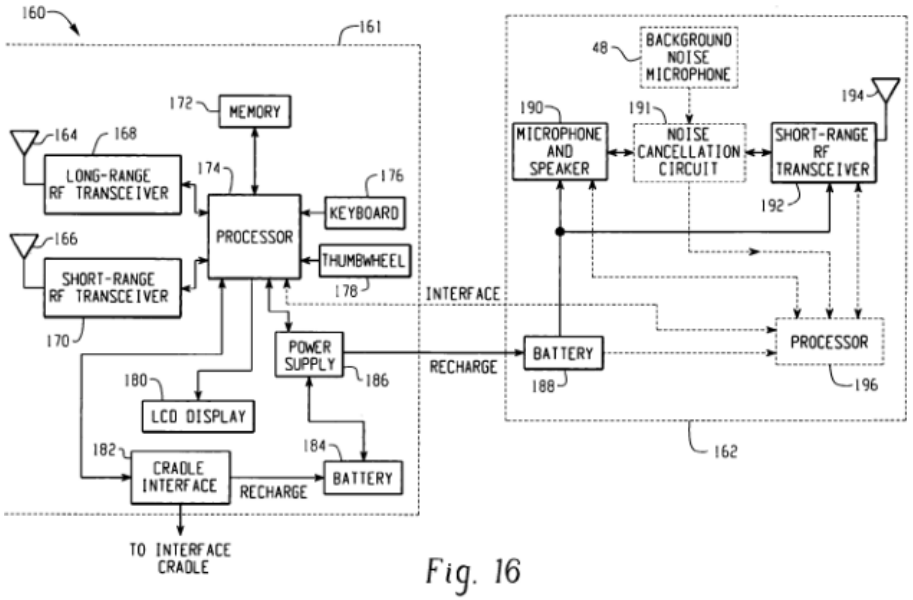
Claims	Prior Art
	Griffin ’456 at Figure 3  Fig. 3 Griffin ’456 at Figure 7  Fig. 7

Claims	Prior Art
	Griffin ’456 at Figure 9  Fig. 9

Claims	Prior Art
	Griffin ’456 at Figure 11  Fig. 11

Claims	Prior Art
	Griffin ’456 at Figure 13  Fig. 13

Claims	Prior Art
	Griffin ’456 at Figure 14a  Fig. 14a Griffin ’456 at Figure 14b  Fig. 14b

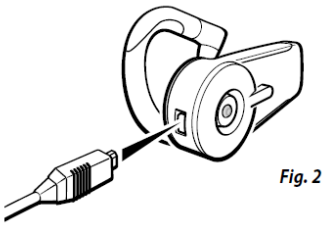
Claims	Prior Art
	Griffin ’456 at Figure 16  Fig. 16 Griffin ’456 at [0007] FIG. 1 is a bottom perspective view of an exemplary communication device having a first communication module and a second detachable communication module for insertion into the communication device user's ear; Griffin ’456 at [0027] Referring now to the drawing figures, FIG. 1 is a bottom perspective view of an exemplary communication device 10 having a first communication module 12 and a second detachable communication module 14 for insertion into the communication device user's ear. The first communication module 12 includes a housing with substantially parallel and planar opposite top and bottom walls 2a and 2b, substantially parallel and planar opposite side walls 4a and 4b, and substantially parallel and planar opposite front and back walls 6a and 6b. The back wall 6b preferably includes bevelled surfaces 8a-8d located along the edges where the back wall 6b adjoins the top, bottom and side walls 2a, 2b, 4a and 4b, but may also be planar, joining the top, bottom and side walls 2a, 2b, 4a and 4b at substantially right angles. The top wall 2a, bottom wall 2b and side walls 4a and 4b are preferably slightly curved, but may also be planar. The specific shapes of the housing walls are dependent upon the

Claims	Prior Art
	requirements of the first communication module 12, as will become apparent from the following description. Griffin '456 at [0028] FIG. 2 is another bottom perspective view of the exemplary communication device 10 shown in FIG. 1, in which the second communication module 14 has been removed from the first communication module 12. The housing of the first communication module 12 preferably includes a cavity 16 in which the second communication module may be detachably mounted. Griffin '456 at [0029] FIG. 3 provides a more detailed view of the cavity 16 in the housing of the first communication module 12. The cavity 16 preferably includes a plurality of subcavities that are shaped to accommodate the second communication module 12, each of which may be a different size, shape and depth. For instance, the exemplary cavity shown in FIG. 3 includes three subcavities: a substantially circular subcavity 18 having a first depth, a first rectangular cavity 20 having a second depth, and a second rectangular cavity 22 having a third depth. The cavity 16 also preferably includes a plurality of surfaces 24, 26b, 28 and 30 that provide smooth transitions between the subcavities 18, 20 and 22, and a plurality of surfaces 26a, 26c, 32, 34, 36a, 36b, 38, 40, 42, 44, 46a and 46b that are preferably contoured and sized primarily to produce a desired physical appearance when the second communication module 14 is mounted as in FIG. 1. Griffin '456 at [0030]–[0031] The surfaces of the cavity 16 preferably also provide for retention of the second communication module 14 within the cavity 16. Surfaces 36a and 36b and/or surfaces 46a and 46b may, for example, be contoured to engage the sides of the second communication module 14 in order to frictionally hold it within the cavity 16. In another embodiment, surfaces in or adjacent to the cavity 16 may include retention means, such as nubs or protrusions, that engage detents in corresponding parts of the second communication module 14, or vice versa, to detachably hold the second communication module 14 within the cavity 16. In yet another embodiment, other retention means, such as springs or otherwise elastically-biased protrusions or hooks, may be included on the first or second communication module that cooperate with appropriate mating retention means on the other of the first or second communication module. Alternatively, additional means to maintain the device in an assembled position, such as a movable clip arrangement, could be mounted on the first communication module 12. In order to remove the second communication module 14 from the cavity 16, the surfaces 26a, 26b and 26c are preferably contoured to provide spaces 48a and 48b (shown in FIG. 1) that enable a

Claims	Prior Art
	communication device user to grasp the sides of the second communication module 14. In addition, the second communication module 14 preferably includes depressions 50 and 52 (shown in FIGS. 4 and 5) that enable the communication device user to easily grip the module 14 while it is within the cavity 16. Preferably, the retention means described above are adapted to apply sufficient force to retain the second communication module 14 in a mounted position, while allowing a communication device user to easily remove the second communication module 14 for use. Griffin '456 at [0035] The charging terminals 56 on the second communication module 14 preferably mate with corresponding charging terminals 46 on the first communication module 12 shown in FIG. 3. Also shown in FIGS. 3 and 5 are alternative locations 46a and 56a for the respective charging terminals. The second communication module 14 preferably includes a rechargeable power source that is recharged by the first communication module 12 through the charging terminals 46 and 56 while the second communication module is in its fully mounted position as shown in FIG. 1. The charging terminals 46 on the first communication module 12 are preferably coupled to an internal power source through appropriate conversion and control circuitry in order to provide a charge to an additional power source in the second communication module. Griffin '456 at [0036] In addition, the charging terminals 46 and 56 preferably include appropriate structures or arrangements to prevent discharging of the respective power sources or damage to internal components caused by external contact with the terminals. For example, the charging terminals 56 may be recessed below the surface of the main body 14b of the second communication module 14 in order to reduce the likelihood of external contact with the charging terminals 56, resulting in a short-circuit. In such an embodiment, the charging terminals 46 on the first communication module 12 may protrude from the surface 26b in order to make contact with recessed charging terminals 56 in the second communication module 14. Griffin '456 at [0038] With reference again to FIG. 5, the second communication module 14 preferably includes a rechargeable power source that is charged through the recharging terminals 46 and 56 described above. It should be understood, however, that the second communication module 14 may alternatively include a single use power source, such as a non-rechargeable battery, making charging terminals 46 and 56 unnecessary. Griffin '456 at [0039] FIGS. 6-8 show an alternative communication device 60 embodiment in which a second communication

Claims	Prior Art
	module 64 may be mounted to a first communication module 62 in either an operative or inoperative position. FIG. 6 is a bottom perspective view of the communication device 60 showing operative-mode connection terminals 66 on the second communication module 64. FIG. 7 is a bottom perspective view of the first communication module 62 showing both operative-mode connection terminals 68 and inoperative-mode connection terminals 46. FIG. 8 is a bottom perspective view of the second communication module 64 showing inoperative-mode connection terminals 56. Griffin '456 at [0040] When the second communication module 64 is mounted in an inoperative assembled position, the inoperative-mode terminals 46 in the first communication module 62 are electrically connected with the inoperative-mode terminals 56 on a front wall 64b of the second communication module 64, as shown in FIG. 8. In the inoperative assembled position, the inoperative-mode terminals 46 and 56 preferably operate as described above to charge a power source in the second communication module 64. Griffin '456 at [0041] When the second communication module 64 is mounted in an operative assembled position, the operative-mode connection terminals 68 in the cavity of the first communication module 62, shown in FIG. 7, are electrically connected with the operative-mode connection terminals 66 on a back wall of a main body portion of the second communication module 64 shown in FIG. 6. In this operative assembled position, the speaker 64a and microphone 64d, shown in FIG. 8 face away from the cavity and are accessible for use by a user of the communication device. In addition, the operative-mode terminals 66 and 68 provide for simultaneous charging and use of the second communication module 64. For instance, the operative-mode terminals 66 and 68 may provide for operation of the second communication module 64 from the power source of the first communication module 62, while simultaneously charging the power source of the second communication module 64. The operative assembled position of the second communication module 64 thus provides for use of the second communication module 64 when its power source is incapable of supplying sufficient power, and thereby avoids recharge down time. Griffin '456 at [0043] FIGS. 9 and 10 show another embodiment 61 of a communication device in which a second communication module 65 may be mounted to a first communication module 63 in either an operative or inoperative position, and the first communication module 63 utilizes only one set of multifunctional connection terminals 67. FIG. 9 is a bottom perspective view of the first communication module 63 showing the multifunctional connection terminals 67. FIG. 10 is a bottom perspective view of the second

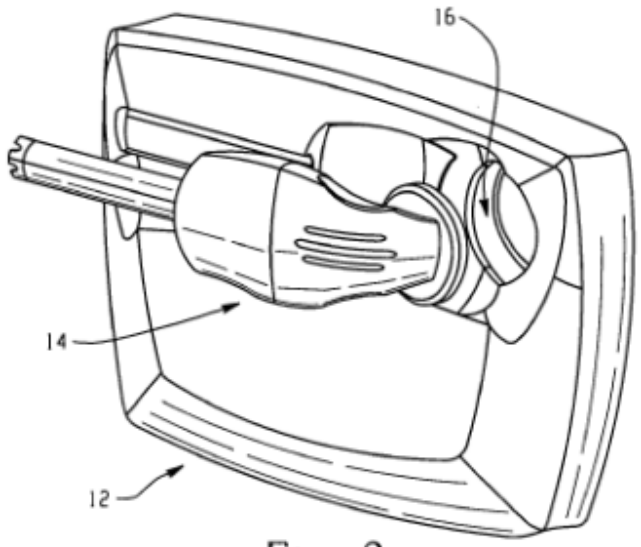
Claims	Prior Art
	communication module showing a set of charging terminals 69. One function of the connection terminals 67 on the first communication module 63 may be to cooperate with the charging terminals 69 positioned on the second communication module 65 in order to supply power to a rechargeable power source in the second communication module 65 while it is mounted in the inoperative position. In addition, the multifunctional connection terminals 67 may also contact a second set of terminals on the top face of the second communication module 65 (as shown in FIG. 6) when the second communication module 65 is mounted in its operative assembled position. The multifunctional connection terminals 67 may then provide for simultaneous charging and use of the second communication module 65 while it is mounted in its operative position. Griffin '456 at [0049] In addition, a set of contact terminals 88 on the second communication module 84 may cooperate with suitably located terminals inside cavity 86 to provide for recharging of a power source in the second module 84 and/or powering the second module 84 from the power source in the first module 82. In an alternative embodiment, a set of female terminals 90 may be located at a bottom edge of the main body 84b of the second communication module 84 that engage and electrically connect to corresponding male terminals inside the cavity 86. Griffin '456 at [0056] The second communication module 162 is preferably an RF-enabled ear-piece that may be connected to (both mechanically and electrically) the first communication module 161 as described above. The second communication module 162 preferably includes a microphone and a speaker 190, a short-range wireless transceiver 192, an antenna 194, a rechargeable battery 188, and possibly an integral processor 196. The second communication module 162 may also include a background noise microphone 48 and a noise cancellation circuit 191 as described above with reference to FIG. 4. When the second communication module 162 is placed into the first communication module 161, a shared secret can be exchanged between the two wireless components of the communication device 160 so that any communications between the first and second communication modules 161/162 may be encrypted. Also, the rechargeable battery 188 of the second module 162 may be recharged by the battery 184 of the first communication module 161 through power supply recharging circuitry 186 when the two modules are in electrical contact. A POSITA would have recognized that charging cases and charging cradles were well–known, routine, and conventional. A POSITA would have recognized that charging cases and charging cradles advantageously protected small Bluetooth headsets and prevented them from getting lost, like the Jabra BT800, while they

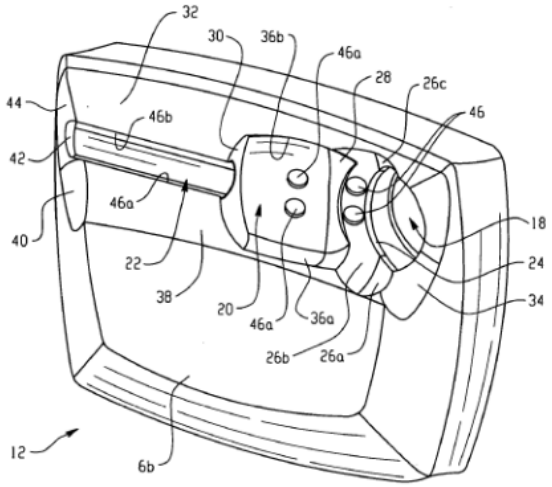
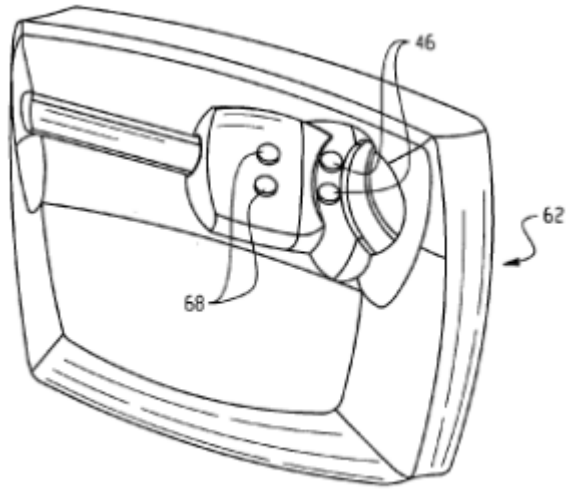
Claims	Prior Art
	were charging. A POSITA also would have recognized that such charging cases and charging cradles would have advantageously allowed the user to keep charging their headset while on the go. The Jabra BT800 expressly desires mobile and on the go charging because it includes a "Rechargable battery with direct charging option from PC with USB cable." Jabra BT800 User Manual at page 3. A POSITA would have recognized the advantages provided by charging cases and cradles, such as the charging case provided by Griffin, and been motivated to combine it with the Jabra BT800. A POSITA would have been motivated to combine the Jabra BT800 with the Jabra FreeSpeak, and reasonably expected success in doing so, for the same reasons explained above for Griffin '456. Moreover, a POSITA would have been motivated to combine the Jabra BT800 with the Jabra FreeSpeak because they are products from the same company that a POSITA naturally would have put together. And a POSITA further would have reasonably expected success because the Jabra BT800 with the Jabra FreeSpeak are similar products from the same company using analogous components in similar ways to achieve similar goals, such that a POSITA would have recognized they were compatible devices. To the extent that the Jabra BT800, the Jabra FreeSpeak, and Griffin '456 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, the Jabra FreeSpeak, and Griffin '456, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[1j] wherein on placement of the head-worn personal electronic apparatus in the charging apparatus, electrical connection results at least from the at least one conductive element connecting with the charging connector, and thereby the rechargeable battery of the head-worn personal electronic apparatus is able to be recharged while the head-worn personal electronic apparatus is placed in the charging apparatus.	The Jabra BT800, the Jabra FreeSpeak, and Griffin '456 expressly or inherently disclose "wherein on placement of the head-worn personal electronic apparatus in the charging apparatus, electrical connection results at least from the at least one conductive element connecting with the charging connector, and thereby the rechargeable battery of the head-worn personal electronic apparatus is able to be recharged while the head-worn personal electronic apparatus is placed in the charging apparatus." For example: The Jabra BT800's power socket couples with a power adapter for recharging. Jabra BT800 User Manual at Page 4 **1 Charge the Jabra BT800** Use the AC adaptor to charge the Jabra BT800 from a power socket. You can also charge the headset direct from your PC using the USB cable provided. The headset is connected to the AC adaptor as shown in Fig. 2  *Fig. 2*

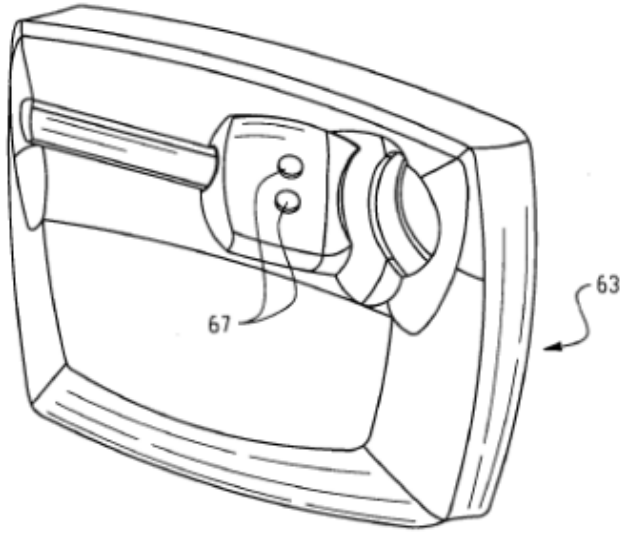
Claims	Prior Art
	The Jabra FreeSpeak charges in a charging cradle. On information and belief, the Jabra FreeSpeak's conductive contacts electrically connect with corresponding contacts of the charging connector in the charging cradle, as shown below (wherein on placement of the head-worn personal electronic apparatus in the charging apparatus, electrical connection results at least from the at least one conductive element connecting with the charging connector, and thereby the rechargeable battery of the head-worn personal electronic apparatus is able to be recharged while the head-worn personal electronic apparatus is placed in the charging apparatus). For example, product images from Amazon illustrate metal contacts at the bottom of the charging cradle, as shown below, which on information and belief electrically connect to the conductive contacts on the Jabra FreeSpeak to recharge the rechargeable battery. The following citations show examples of where the Jabra FreeSpeak discloses this limitation. Jabra FreeSpeak Brochure at Page 2 

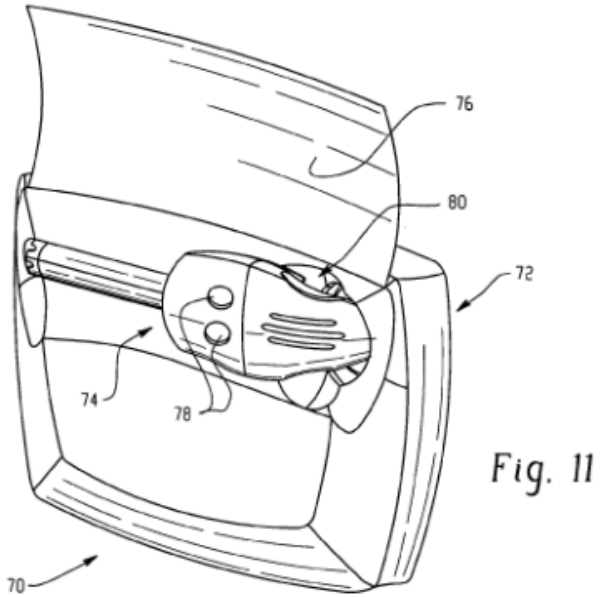
Claims	Prior Art
	 Amazon Jabra FreeSpeak Bluetooth Headset (on information and belief, image is representative of the prior art product)

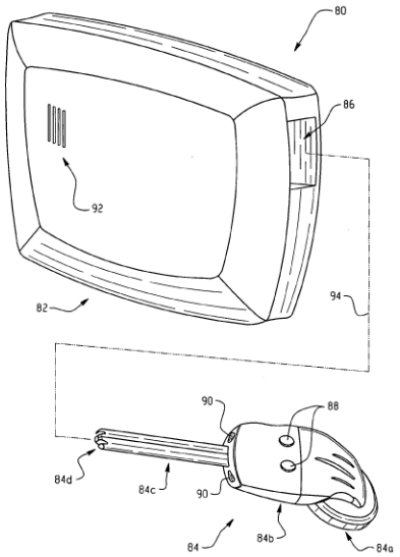
Claims	Prior Art
	 The "second communication module 64" (example of the claimed head-worn personal electronic apparatus) is retained "within the cavity" of "first communication module" (example of the claimed placement of the head-worn personal electronic apparatus in the charging apparatus) such that "the second communication module 14 preferably includes a rechargeable power source that is charged through the recharging terminals 46 and 56" (example of the claimed the rechargeable battery of the head-worn personal electronic apparatus is able to be recharged while the head-worn personal electronic apparatus is placed in the charging apparatus). The following citations show examples of where the Griffin '456 discloses this limitation.

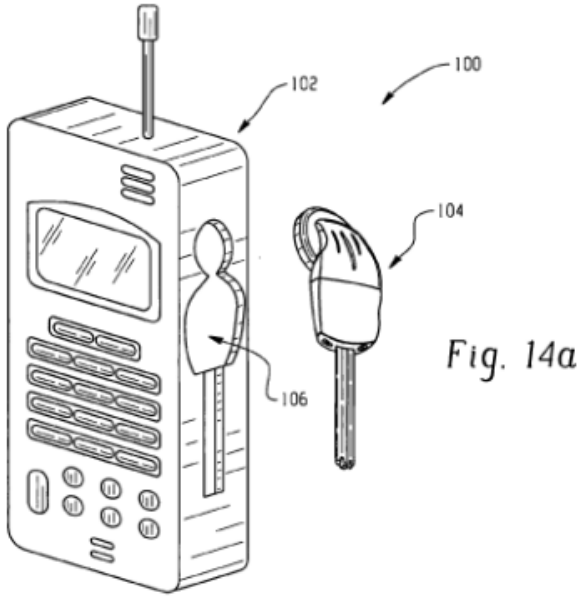
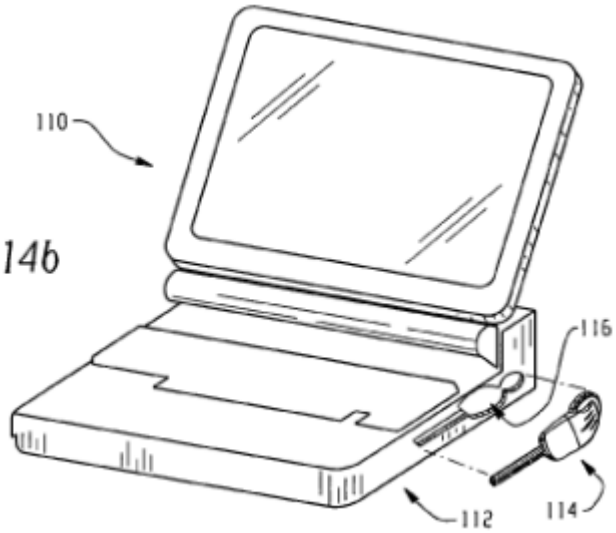
Claims	Prior Art
	Griffin ’456 at Figure 2  Fig. 2

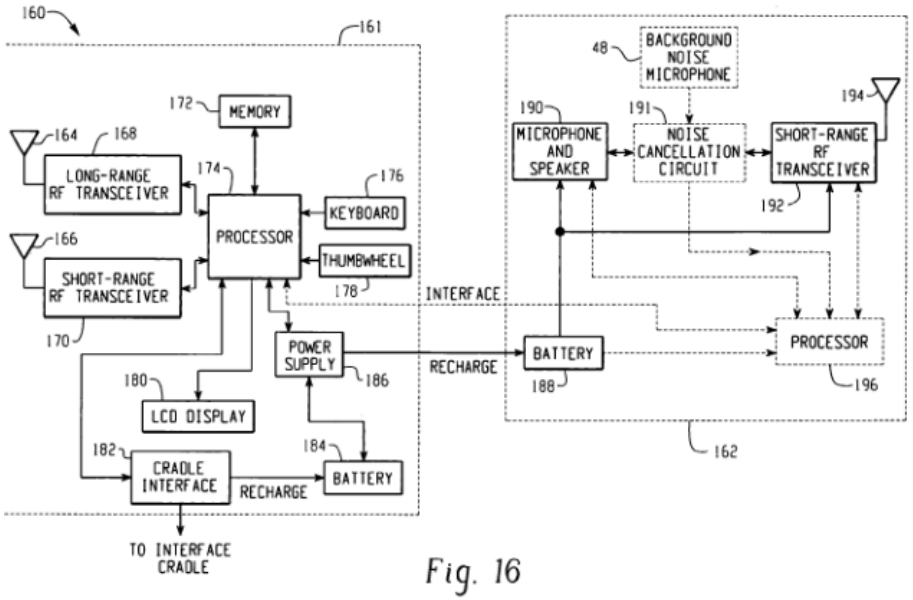
Claims	Prior Art
	Griffin ’456 at Figure 3  Fig. 3 Griffin ’456 at Figure 7  Fig. 7

Claims	Prior Art
	Griffin ’456 at Figure 9  Fig. 9

Claims	Prior Art
	Griffin ’456 at Figure 11  Fig. 11

Claims	Prior Art
	Griffin ’456 at Figure 13  Fig. 13

Claims	Prior Art
	Griffin ’456 at Figure 14a  Fig. 14a Griffin ’456 at Figure 14b  Fig. 14b

Claims	Prior Art
	Griffin ’456 at Figure 16  Fig. 16 Griffin ’456 at [0007] FIG. 1 is a bottom perspective view of an exemplary communication device having a first communication module and a second detachable communication module for insertion into the communication device user's ear; Griffin ’456 at [0027] Referring now to the drawing figures, FIG. 1 is a bottom perspective view of an exemplary communication device 10 having a first communication module 12 and a second detachable communication module 14 for insertion into the communication device user's ear. The first communication module 12 includes a housing with substantially parallel and planar opposite top and bottom walls 2a and 2b, substantially parallel and planar opposite side walls 4a and 4b, and substantially parallel and planar opposite front and back walls 6a and 6b. The back wall 6b preferably includes bevelled surfaces 8a-8d located along the edges where the back wall 6b adjoins the top, bottom and side walls 2a, 2b, 4a and 4b, but may also be planar, joining the top, bottom and side walls 2a, 2b, 4a and 4b at substantially right angles. The top wall 2a, bottom wall 2b and side walls 4a and 4b are preferably slightly curved, but may also be planar. The specific shapes of the housing walls are dependent upon the

Claims	Prior Art
	requirements of the first communication module 12, as will become apparent from the following description. Griffin '456 at [0028] FIG. 2 is another bottom perspective view of the exemplary communication device 10 shown in FIG. 1, in which the second communication module 14 has been removed from the first communication module 12. The housing of the first communication module 12 preferably includes a cavity 16 in which the second communication module may be detachably mounted. Griffin '456 at [0029] FIG. 3 provides a more detailed view of the cavity 16 in the housing of the first communication module 12. The cavity 16 preferably includes a plurality of subcavities that are shaped to accommodate the second communication module 12, each of which may be a different size, shape and depth. For instance, the exemplary cavity shown in FIG. 3 includes three subcavities: a substantially circular subcavity 18 having a first depth, a first rectangular cavity 20 having a second depth, and a second rectangular cavity 22 having a third depth. The cavity 16 also preferably includes a plurality of surfaces 24, 26b, 28 and 30 that provide smooth transitions between the subcavities 18, 20 and 22, and a plurality of surfaces 26a, 26c, 32, 34, 36a, 36b, 38, 40, 42, 44, 46a and 46b that are preferably contoured and sized primarily to produce a desired physical appearance when the second communication module 14 is mounted as in FIG. 1. Griffin '456 at [0030]–[0031] The surfaces of the cavity 16 preferably also provide for retention of the second communication module 14 within the cavity 16. Surfaces 36a and 36b and/or surfaces 46a and 46b may, for example, be contoured to engage the sides of the second communication module 14 in order to frictionally hold it within the cavity 16. In another embodiment, surfaces in or adjacent to the cavity 16 may include retention means, such as nubs or protrusions, that engage detents in corresponding parts of the second communication module 14, or vice versa, to detachably hold the second communication module 14 within the cavity 16. In yet another embodiment, other retention means, such as springs or otherwise elastically-biased protrusions or hooks, may be included on the first or second communication module that cooperate with appropriate mating retention means on the other of the first or second communication module. Alternatively, additional means to maintain the device in an assembled position, such as a movable clip arrangement, could be mounted on the first communication module 12. In order to remove the second communication module 14 from the cavity 16, the surfaces 26a, 26b and 26c are preferably contoured to provide spaces 48a and 48b (shown in FIG. 1) that enable a

Claims	Prior Art
	communication device user to grasp the sides of the second communication module 14. In addition, the second communication module 14 preferably includes depressions 50 and 52 (shown in FIGS. 4 and 5) that enable the communication device user to easily grip the module 14 while it is within the cavity 16. Preferably, the retention means described above are adapted to apply sufficient force to retain the second communication module 14 in a mounted position, while allowing a communication device user to easily remove the second communication module 14 for use. Griffin '456 at [0035] The charging terminals 56 on the second communication module 14 preferably mate with corresponding charging terminals 46 on the first communication module 12 shown in FIG. 3. Also shown in FIGS. 3 and 5 are alternative locations 46a and 56a for the respective charging terminals. The second communication module 14 preferably includes a rechargeable power source that is recharged by the first communication module 12 through the charging terminals 46 and 56 while the second communication module is in its fully mounted position as shown in FIG. 1. The charging terminals 46 on the first communication module 12 are preferably coupled to an internal power source through appropriate conversion and control circuitry in order to provide a charge to an additional power source in the second communication module. Griffin '456 at [0036] In addition, the charging terminals 46 and 56 preferably include appropriate structures or arrangements to prevent discharging of the respective power sources or damage to internal components caused by external contact with the terminals. For example, the charging terminals 56 may be recessed below the surface of the main body 14b of the second communication module 14 in order to reduce the likelihood of external contact with the charging terminals 56, resulting in a short-circuit. In such an embodiment, the charging terminals 46 on the first communication module 12 may protrude from the surface 26b in order to make contact with recessed charging terminals 56 in the second communication module 14. Griffin '456 at [0038] With reference again to FIG. 5, the second communication module 14 preferably includes a rechargeable power source that is charged through the recharging terminals 46 and 56 described above. It should be understood, however, that the second communication module 14 may alternatively include a single use power source, such as a non-rechargeable battery, making charging terminals 46 and 56 unnecessary. Griffin '456 at [0039] FIGS. 6-8 show an alternative communication device 60 embodiment in which a second communication

Claims	Prior Art
	module 64 may be mounted to a first communication module 62 in either an operative or inoperative position. FIG. 6 is a bottom perspective view of the communication device 60 showing operative-mode connection terminals 66 on the second communication module 64. FIG. 7 is a bottom perspective view of the first communication module 62 showing both operative-mode connection terminals 68 and inoperative-mode connection terminals 46. FIG. 8 is a bottom perspective view of the second communication module 64 showing inoperative-mode connection terminals 56. Griffin '456 at [0040] When the second communication module 64 is mounted in an inoperative assembled position, the inoperative-mode terminals 46 in the first communication module 62 are electrically connected with the inoperative-mode terminals 56 on a front wall 64b of the second communication module 64, as shown in FIG. 8. In the inoperative assembled position, the inoperative-mode terminals 46 and 56 preferably operate as described above to charge a power source in the second communication module 64. Griffin '456 at [0041] When the second communication module 64 is mounted in an operative assembled position, the operative-mode connection terminals 68 in the cavity of the first communication module 62, shown in FIG. 7, are electrically connected with the operative-mode connection terminals 66 on a back wall of a main body portion of the second communication module 64 shown in FIG. 6. In this operative assembled position, the speaker 64a and microphone 64d, shown in FIG. 8 face away from the cavity and are accessible for use by a user of the communication device. In addition, the operative-mode terminals 66 and 68 provide for simultaneous charging and use of the second communication module 64. For instance, the operative-mode terminals 66 and 68 may provide for operation of the second communication module 64 from the power source of the first communication module 62, while simultaneously charging the power source of the second communication module 64. The operative assembled position of the second communication module 64 thus provides for use of the second communication module 64 when its power source is incapable of supplying sufficient power, and thereby avoids recharge down time. Griffin '456 at [0042] Any of the retaining means discussed above could be used to mount the second module 64 in the operative position. For example, a friction fit between the main body 64b of the second communication module 64 and the corresponding cavity in the first communication module 62 will preferably retain the second module 64 in its assembled inoperative position. The main body 64b, or at least a part thereof, could then be fabricated such that the back portion, in which terminals 66 are positioned, and the front

Claims	Prior Art
	portion are substantially symmetric. The second communication module 64 may then be retained in either its operative or inoperative assembled position within the cavity in the first communication module 62. A similar arrangement could alternatively be implemented based on friction fit retention of the boom portion 64c of the second communication module 64. Griffin '456 at [0043] FIGS. 9 and 10 show another embodiment 61 of a communication device in which a second communication module 65 may be mounted to a first communication module 63 in either an operative or inoperative position, and the first communication module 63 utilizes only one set of multifunctional connection terminals 67. FIG. 9 is a bottom perspective view of the first communication module 63 showing the multifunctional connection terminals 67. FIG. 10 is a bottom perspective view of the second communication module showing a set of charging terminals 69. One function of the connection terminals 67 on the first communication module 63 may be to cooperate with the charging terminals 69 positioned on the second communication module 65 in order to supply power to a rechargeable power source in the second communication module 65 while it is mounted in the inoperative position. In addition, the multifunctional connection terminals 67 may also contact a second set of terminals on the top face of the second communication module 65 (as shown in FIG. 6) when the second communication module 65 is mounted in its operative assembled position. The multifunctional connection terminals 67 may then provide for simultaneous charging and use of the second communication module 65 while it is mounted in its operative position. Griffin '456 at [0049] In addition, a set of contact terminals 88 on the second communication module 84 may cooperate with suitably located terminals inside cavity 86 to provide for recharging of a power source in the second module 84 and/or powering the second module 84 from the power source in the first module 82. In an alternative embodiment, a set of female terminals 90 may be located at a bottom edge of the main body 84b of the second communication module 84 that engage and electrically connect to corresponding male terminals inside the cavity 86. Griffin '456 at [0056] The second communication module 162 is preferably an RF-enabled ear-piece that may be connected to (both mechanically and electrically) the first communication module 161 as described above. The second communication module 162 preferably includes a microphone and a speaker 190, a short-range wireless transceiver 192, an antenna 194, a rechargeable battery 188, and possibly an integral processor 196. The

Claims	Prior Art
	second communication module 162 may also include a background noise microphone 48 and a noise cancellation circuit 191 as described above with reference to FIG. 4. When the second communication module 162 is placed into the first communication module 161, a shared secret can be exchanged between the two wireless components of the communication device 160 so that any communications between the first and second communication modules 161/162 may be encrypted. Also, the rechargeable battery 188 of the second module 162 may be recharged by the battery 184 of the first communication module 161 through power supply recharging circuitry 186 when the two modules are in electrical contact. A POSITA would have been motivated to combine the Jabra B800 with Griffin '456 and the Jabra BT800 with the Jabra FreeSpeak, and reasonably expected success in doing so, for the reasons explained above for [1i]. *Supra* [1i]. To the extent that the Jabra BT800, the Jabra FreeSpeak, and Griffin '456 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, the Jabra FreeSpeak, and Griffin '456, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
2. A system as recited in claim 1, wherein the sensed touch input by the touch sensitive surface operates to at least alter operation of the head-worn personal electronic apparatus.	The Jabra BT800, Hollemans '490, Zadesky '230, and Iuliis '007 expressly or inherently disclose "[a] system as recited in claim 1, wherein the sensed touch input by the touch sensitive surface operates to at least alter operation of the head-worn personal electronic apparatus." For example: The Jabra BT800's "Jog wheel" is used for "volume and menu control" (example of the claimed wherein the sensed touch input by the touch sensitive surface operates to at least alter operation of the head-worn personal electronic apparatus). The following citations show examples of where the Jabra BT800 discloses this limitation.

Claims	Prior Art
	Jabra BT800 User Manual at Page 2

Jabra BT800 Overview

1 Display shows caller ID, battery status etc.
2 Answer button
3 End & on/off button
4 Jog wheel – volume and menu control
5 Mute/menu button/blue LED
6 Charging socket
7 Pairing stylus switch
8 Stylus for activating the pairing function

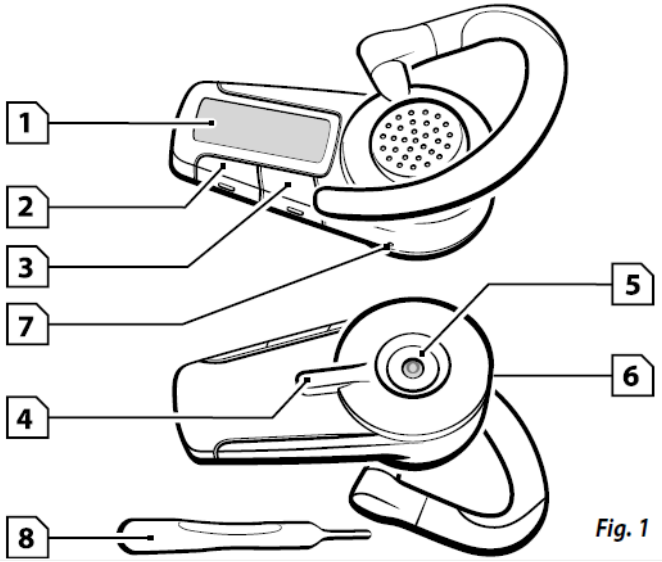


Fig. 1

Jabra BT800 User Manual at Page 4

The Jabra BT800 is designed to be simple to operate with a minimum of control buttons. The answer and end buttons on the headset will provide alternative operations depending on the length of time they are pressed.

Instruction:	Duration of press:
Tap	Press briefly
Press	Approx: 1 second
Press and hold	Approx: 5 seconds

Claims	Prior Art
	Jabra BT800 User Manual at Page 5

3 Basic usage of your Jabra BT800 headset

The operation of the basic features in the headset is very similar to your mobile phone.

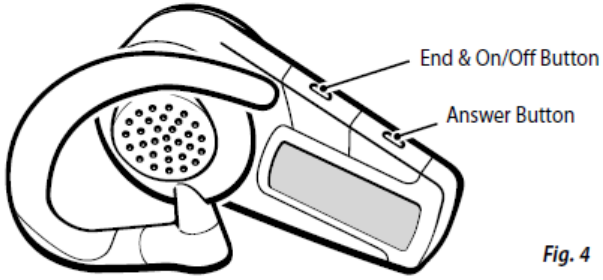
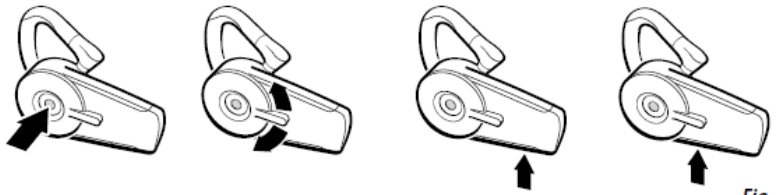


Fig. 4

1. **To answer a call**
   - You answer the call directly on the headset with a tap on the answer button. A simple tap on the headset's answer button will capture and transfer the call to the headset
2. **To end a call**
   - A tap on the end button terminates the active call
   - You can also reject an incoming call directly from the headset. Press the end button and the call will be rejected. Depending on the phone settings, the person who called you will either be forwarded to your voice mail or hear a busy signal
3. **To make a call**
   - If you make a call from the mobile phone, the call will (subject to phone settings) be automatically transferred to the headset
   - Voice dialing is activated with a tap on the answer button. For further information about using this feature, please consult your phone's user manual. You will get the best results if you record the voice-dialing tag through your headset
   - Activate last number redial with a press on the answer button on the headset

Claims	Prior Art
	Jabra BT800 User Manual at Page 5 **4. Volume control and mute function** • Your Jabra BT800 headset features an automatic volume control that adjusts the volume depending on ambient noise level. You can manually adjust the volume using the volume jog wheel see Fig 5 • During a conversation, press the mute button to mute the call. You un-mute by adjusting the volume level on the volume jog wheel or by tapping on the mute button see Fig 6  *Fig. 5*  *Fig. 6* Jabra BT800 User Manual at Page 6 **2. Access the menu** From the menu, you can adjust your settings according to your preferences. See Fig 7 • Access the menu when your are not receiving or making a call with a press on the mute / menu button • Use the jog wheel to navigate the menu • Select or activate a menu item with a tap on the answer button • Exit / go back in the menu with a tap on the end button   5 *Fig. 7* Hollemans ’490’s “controller” “touchpad” or “touch–sensitive area” (example of the claimed touch sensitive surface) receives input commands including increase or decrease volume, play/pause, stop, fast forward, and rewind (example of the claimed wherein the sensed touch input by the touch sensitive surface operates to at least alter operation of the head-worn personal electronic apparatus). The following citations show examples of where the Hollemans ’490 discloses this limitation.

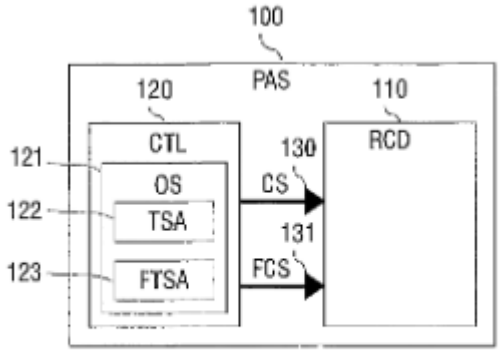
Claims	Prior Art
	Hollemans ’490 at 1:10–3:21 A personal audio system as described in the opening paragraph is known from the now ubiquitous mobile audio devices like MP3 players and mobile phones. One particular example of such a system is the iPod MP3 player from Apple as reviewed in c’t 2002 Heft 26, pages 132-141, “Plattenmeister” by Peter Nonhoff-Arps, Sven Hansen, and available with product no. M8737LL/A (see also http://www.apple.com/ipod/). This and similar products typically comprise a set of two earpieces also known as ear buds that can be inserted into the ears of the user. These products typically also include a remote controller for controlling one or more functions of the device. A plug connects both the remote controller and the earpieces with the device, by plugging it into a socket of the device. The remote controller is usually included in the wire somewhere between the earpieces and the plug. As a result, the remote control has no fixed position but is dangling about as part of the wire. Hence, when the user wants to use the remote control for e.g. lowering volume, muting, or skipping an audio track or station, the user first needs to look for the remote controller. Subsequently, the user needs to get hold of the controller. This needs to be done in such a way that the controller has the right orientation for operating it. Finally, after being confident about the orientation of the controller, the user may try to find and operate the tiny button to activate the desired function. This requires considerable time and attention from the user, which may lead to dangerous situations when the user takes part in traffic. It is an object of the present invention to provide a personal audio system as described in the opening paragraph that does not suffer from the above-mentioned drawbacks. 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. The remote controller thus gets a fixed position with respect to the user in or by the human ear. It is easy to find one's ear. This prevents looking for the remote controller. In addition, the user is not tempted to look at the remote controller, because there is nothing relevant to be seen for controlling the device. To avoid having to find tiny buttons, merely touching the remote controller somewhere on its touch-sensitive area operates said remote controller, which detects being touched and subsequently sends the control signal to the device. Also the problem of finding the proper orientation of the remote controller is solved by wearing the remote controller in or by the ear, because its orientation becomes fixed with respect to the user. 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. This fits in with a

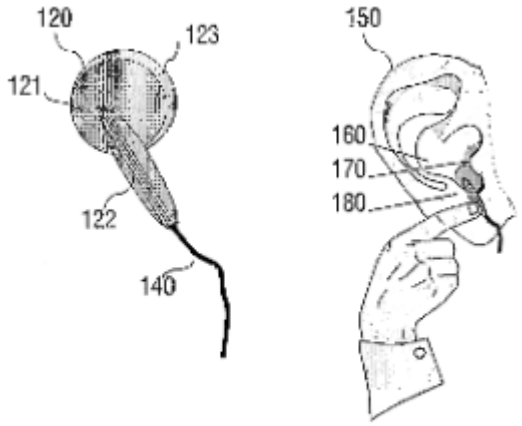
Claims	Prior Art
	particularly comfortable and popular shape for the earpieces or ear buds. The shape consists of a thick disc containing a transducer and a protruding part from which a wire extends. When being worn, the protruding part of the earpiece offers a surface area that is easily accessible for touching. Advantageously, the controller is arranged to detect a temporal pattern in the touch-sensitive area being touched, and to send the control signal in response to detecting the temporal pattern. In general, the device offers a plurality of functions and capabilities. Rather than having more buttons on the remote control that may be hard to distinguish, the single touch-sensitive area is used for controlling the plurality of functions. The temporal pattern is a particularly appropriate user interface, because it is easy to create temporal patterns in touching the area rhythmically and because the temporal patterns can constitute a natural and consistent interface. 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. Advantageously, the outer surface has a further touch-sensitive area, such that the further touch-sensitive area is touched substantially by the ear when the controller is substantially worn in or by a human ear, the controller being arranged to send the control signal only if the further touch-sensitive area is touched. This will prevent the accidental remote control of the device when the remote controller is not worn, thus preventing unwanted activation of the device and unnecessary battery exhaustion. Advantageously, the controller is arranged to send a further control signal to the device if the further touch-sensitive area is touched. This makes it, for example, possible for the device to pause playing music as soon as the earpiece is taken out and to resume playing music upon re-insertion. In an embodiment of the personal audio system according to the invention, the system comprises a second controller for remotely controlling the device by sending a further control signal to the device, the second controller having an outer surface with a further touch-sensitive area, the second controller being arranged to be substantially worn in or by a human ear, and the second controller being further arranged to detect a further temporal pattern in the further touch-sensitive area being touched, and to send the further control signal in response to detecting the further temporal pattern. A second controller fits in with the natural symmetry of the human head. It also considerably enhances the user interface for controlling the device. For example, the symmetry can be exploited in such a way that a long tap at the left remote controller decreases the volume, but a long tap at the right controller increases the volume. Hollemans ’490 at 4:10–13 Figure 1 is a block diagram of an embodiment of a personal audio system 100 according to the invention. The personal audio system 100 comprises a remotely controllable device 110 and a controller 120 that remotely controls the device 110 by sending a signal 130 to the device 110.

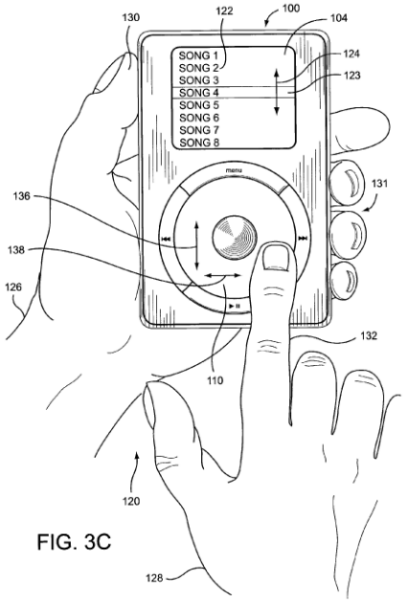
Claims	Prior Art
	Hollemans ’490 at 4:24–5:7 The controller 120 is used for commanding the device 110 to perform one or more of its functions or capabilities. The basic assumption is that the device 110 is remote or tucked away in a pocket or clamped to a belt or clothing, such that operating it becomes relatively hard. The controller 120 makes it possible to operate the device 110. The controller 120 is generally wired to the device 110 by means of a wire 140 (see figure 2) and a plug (not shown) that fits into a socket (not shown) of the device 110. The remote controller 120 has an outer surface 121, see also figure 2. The outer surface 121 is just the physical outer side of the controller 120. A part of this outer surface 121 is sensitive to being touched and is referred to as the touch-sensitive area 122. Optionally, the controller 120 comprises a second area that is sensitive to being touched, referred to as the further touch-sensitive area 123. The touch-sensitive area 122 can be realized in many ways, including a sensor for changes in capacity or induced voltages or currents, a grid of conducting parts between which changes in resistance are measured and detected, or an ordinary pressure sensor, button or temperature sensor. Another possibility is to measure and detect changes in either a passive or an active electromagnetic field. With the passive variant, the controller 120 relies on, for example, nearby power lines to generate measurable fields when being touched. With the active variant, the controller 120 generates an electromagnetic field of its own. Hollemans ’490 at 6:1–18 According to the invention, the remote controller 120 is suited to be worn in or by a human ear. The remote controller 120 may have various shapes and forms to meet this requirement. It could fit almost entirely in the auditory canal, much like a miniature hearing aid device, but it could also have the shape of a more conventional hearing aid device worn behind the ear cup, or a headset with a band over the head or in the neck, or the shape of a neck strap for carrying the device 110. Figure 2 shows an example of an embodiment of the remote controller according to the invention. A particularly comfortable and popular shape of the remote controller 120 consists of a thick disc containing a transducer and a protruding part from which a wire 140 extends. The disc fits in a concha 160 of a human ear 150 and is kept there by friction. The disc may in addition be kept there by the presence of a tragus 170 and an antitragus 180, being two cartilaginous edges of the conchal bowl 160 of the human ear 150. When being worn, the protruding part of the remote controller 120 offers a surface area 122 that is easily accessible for touching. Figure 3 shows an example of the functionality offered by an embodiment of the system according to the invention. Figure 4 shows another example of the functionality offered by an embodiment of the system according to the invention. The functionality of detecting temporal patterns offers a user interface that is convenient, logical and consistent.

Claims	Prior Art
	Hollemans ’490 at 6:19–33 A basic temporal pattern that can be detected is a short tap, which consists of the touch-sensitive area 122 being initially untouched and subsequently being touched for a short while, and subsequently being untouched again. The short while typically lasts between 40 and 300 milliseconds. Another basic temporal pattern is the long tap, which typically lasts between 400 milliseconds to several seconds. Yet another basic temporal pattern is a repeated long or short tap or another sequence of long and short taps. All of these temporal patterns may each be mapped to functions or capabilities of the device 110. The detection of the temporal pattern is preferably insensitive to deviations of the duration of the tap and to the criteria for determining being touched, like measured quantity levels and hysteresis. The detection of the temporal pattern may adapt itself to the history of detected patterns. One particular mapping may be, for example, that, in response to detecting a touch and hold, the device 110 gradually adapts a volume level as long as the area 122 is being touched. The direction of adaptation (increasing or decreasing the volume level) can be reversed with every touch and hold, or with a short tap in between. Hollemans ’490 at 7:11–18 To further enhance the user interface, the device 110 may provide immediate acoustic feedback in response to being touched. One example of such feedback is providing an audible hum or beep when the area 122 is detected as being touched. Another example is that the audio feedback represents the activated function of the device 110, for example, by varying volume, pitch, rhythm or melody or combinations thereof of the audio feedback. Yet another example of feedback is the use of a recorded or synthesized human voice informing the user about the activated function of the device 110 or about the capabilities of the device 110 and how to remotely control them. Hollemans ’490 at 7:19–23 The controller 120 may favorably be backward compatible with devices according to the prior art, such that the controller 120 according to the invention can be plugged in and used with conventional devices. Similarly, the device 110 may be backward compatible with controllers according to the prior art, such that the device 110 according to the invention can still (partially) be remotely controlled from conventional controllers. Hollemans ’490 at 8:1–18 In a first way, the touch-sensitive area is used to detect a tempo of being tapped. The tempo detected may be used to adjust a rhythm of a sound, e.g. as transferred by the personal audio system. The tempo detected may also be used to find or select matching content, for example, a song with a tempo that

Claims	Prior Art
	resembles the tempo detected. The tempo detected may also be used to adapt the speed of playback of the current music to the tempo detected. The tempo detected may also be used to enter metadata that pertains to the currently played music, by tapping along in the same tempo. An advantage is that tempo information may be entered in a natural way, without being dependent on menu navigation on a player that is relatively hard to operate. Another advantage is that no complex algorithms are required for obtaining meaningful and accurate tempo information, because relatively simple time averaging logic suffices. In a second way, the touch-sensitive area is used for detecting a pressure with which the area is touched. When a person presses harder on the touch-sensitive area of the remote control, more skin contacts the area. This increases a conductivity and lowers the measured skin resistance. By means of a precise measurement it is possible to sense these differences in pressure. The pressure may for example be used for a more sophisticated volume and cueing control. An example is changing a setting with a speed that is proportional with the pressure. Hollemans ’490 at 8:19–33 In a third way, the touch-sensitive area is used for picking up a gesture made on the area with e.g. a stylus or a finger. The remote control may be extended for this purpose with means for detecting a gesture, e.g. a laser beetle, a small camera, an IR movement sensor, or a cross-capacitance sensor. The system may be arranged to detect a gesture being made on the area. The gesture detected may be used for controlling a setting of the system. Examples of a setting are a selection of a next or a previous track, a volume, a position of a stereo image, e.g. a panning position, a balance position. The gesture detected may also be used for controlling a mouse pointer, navigating a menu, entering a tapping pattern, scrolling content on display. The 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. The list may contain items like contacts, artists, song titles, etc. The gesture detected may be a user defined gesture for activating a user defined function. The gesture detected may be used for user identification by matching with initials or an autograph. The gesture may extend into two dimensions, e.g. a planar gesture, or it may extend into three dimensions. Hollemans ’490 at 9:1–17 In a fourth way, the system may be arranged to operate in a plurality of modes, and to switch between the modes. A function that depends on the mode may be invoked in response to an input on the remote control. Each mode may e.g. correspond to an application of the system. The system may switch to another application in response to a command of the user, for example given via the touch-sensitive area. Touching the left earpiece, for example, may cause a move through a circular list of applications, and an

Claims	Prior Art
	application may be activated by touching the right earpiece. Also multiple applications may be active simultaneously, in which case a special command may be used to switch between applications, e.g., hold one earpiece while tapping on the other. Of course, other combinations may be used for this. Another way of switching between applications may not be initiated by the user, but by the system, e.g., on an incoming phone call or some other event. As soon as the incoming phone call is detected, the ring tone may be sounded, potentially mixed with the active sound source e.g. MP3 playback. While the incoming phone call is communicated to the user, the controls are mapped to the phone application rather than the audio playback application. In the phone application, touching the right earpiece could be mapped on answering the call and the left earpiece could be mapped to hanging up. As the user picks up the call, the playback of the music may be paused. Hollemans '490 at Figure 1  FIG.1

Claims	Prior Art
	Hollemans ’490 at Figure 2  FIG.2 Hollemans ’490 at Figure 3  FIG.3

Claims	Prior Art
	Hollemans ’490 at Figure 4  FIG.4 Zadesky ’230 discloses a “touchpad 110” (example of the claimed touch sensitive surface) to “receive input from a finger moving across the surface of the touch pad 110” which can “change the volume of sound being played” (example of the claimed operates to at least alter operation of the head-worn personal electronic apparatus). The following citations show examples of where the Zadesky ’230 discloses this limitation. Zadesky ’230 at Figure 3C  FIG. 3C

Claims	Prior Art
	Zadesky ’230 at 1:47–65 In portable computing devices such as laptop computers, the input devices are commonly touch pads. With a touch pad, the movement of an input pointer (i.e., cursor) corresponds to the relative movements of the user's finger (or stylus) as the finger is moved along a surface of the touch pad. Touch pads can also make a selection on the display screen when one or more taps are detected on the surface of the touch pad. In some cases, any portion of the touch pad may be tapped, and in other cases a dedicated portion of the touch pad may be tapped. In stationary devices such as desktop computers, the input devices are generally selected from mice and trackballs. With a mouse, the movement of the input pointer corresponds to the relative movements of the mouse as the user moves the mouse along a surface. With a trackball, the movement of the input pointer corresponds to the relative movements of a ball as the user rotates the ball within a housing. Both mice and trackballs generally include one or more buttons for making selections on the display screen. Zadesky ’230 at 2:29–43 To elaborate further, touch pads generally include one or more sensors for detecting the proximity of the finger thereto. By way of example, the sensors may be based on resistive sensing, surface acoustic wave sensing, pressure sensing (e.g., strain gauge), optical sensing, capacitive sensing and the like. The sensors are generally dispersed about the touch pad with each sensor representing an x, y position. In most cases, the sensors are arranged in a grid of columns and rows. Distinct x and y position signals, which control the x, y movement of a pointer device on the display screen, are thus generated when a finger is moved across the grid of sensors within the touch pad. For brevity sake, the remaining discussion will be held to the discussion of capacitive sensing technologies. It should be noted, however, that the other technologies have similar features. Zadesky ’230 at 2:44–3:5 Capacitive sensing touch pads generally contain several layers of material. For example, the touch pad may include a protective shield, one or more electrode layers and a circuit board. The protective shield typically covers the electrode layer(s), and the electrode layer(s) is generally disposed on a front side of the circuit board. As is generally well known, the protective shield is the part of the touch pad that is touched by the user to implement cursor movements on a display screen. The electrode layer(s), on the other hand, is used to interpret the x, y position of the user's finger when the user's finger is resting or moving on the protective shield. The electrode layer (s) typically consists of a plurality of electrodes that are positioned in columns and rows so as to form a grid array. The columns and rows are generally based on the Cartesian coordinate system and thus the rows and columns correspond to the x and y directions.

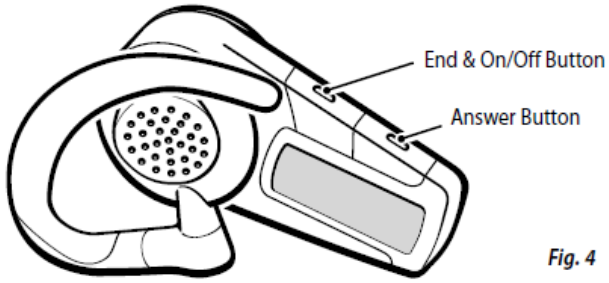
Claims	Prior Art
	The touch pad may also include sensing electronics for detecting signals associated with the electrodes. For example, the sensing electronics may be adapted to detect the change in capacitance at each of the electrodes as the finger passes over the grid. The sensing electronics are generally located on the backside of the circuit board. By way of example, the sensing electronics may include an application specific integrated circuit (ASIC) that is configured to measure the amount of capacitance in each of the electrodes and to compute the position of finger movement based on the capacitance in each of the electrodes. The ASIC may also be configured to report this information to the computing device. Zadesky '230 at 4:37–49 The present invention relates to touch pads. According to one aspect of the invention, a touch pad is provided on a media player to facilitate user interaction therewith. In one embodiment, the media player is a handheld device. According to another aspect of the invention, a touch pad is provided that can sense and resolve angular and/or radial positions of a moving object (e.g., finger) as it is moved in a largely rotational and/or radial manner across the touch pad. In one embodiment, the touch pad that is based on polar coordinates rather than Cartesian coordinates. Other aspects of the invention will become apparent below. In any case, the aspects are not limiting and the various aspects of the invention can be used separately or in combination. Zadesky '230 at 5:61–6:19 The media player 100 also includes a touch pad 110. The touch pad 110 is configured to provide one or more control functions for controlling various applications associated with the media player 100. For example, the touch initiated control function may be used to move an object or perform an action on the display screen 104 or to make selections or issue commands associated with operating the media player 100. In most cases, the touch pad 110 is arranged to receive input from a finger moving across the surface of the touch pad 110 in order to implement the touch initiated control function. The touch pad may be widely varied. For example, the touch pad be a conventional touch pad based on the Cartesian coordinate system, or the touch pad may be a touch pad based on a polar coordinate system (the later will be described in greater detail below). The manner in which the touch pad 110 receives input may be widely varied. In one embodiment, the touch pad 110 is configured receive input from a linear finger motion. In another embodiment, the touch pad 110 is configured receive input from a rotary or swirling finger motion. In yet another embodiment, the touch pad 110 is configured receive input from a radial finger motion. Additionally or alternatively, the touch pad 110 may be arranged to receive input from a finger tapping on the touch pad 100. By way of example, the tapping finger may initiate a control function for playing a song, opening a menu and the like.

Claims	Prior Art
	Zadesky ’230 at 6:38–7:5 The direction of scrolling may be widely varied. For example, scrolling may be implemented vertically (up or down) or horizontally (left or right). In the case of vertical scrolling, when a user scrolls down, each new set of data appears at the bottom of the viewing area and all other sets of data move up one position. If the viewing area is full, the top set of data moves out of the viewing area. Similarly, when a user scrolls up, each new set of data appears at the top of the viewing area and all other sets of data move down one position. If the viewing area is full, the bottom set of data moves out of the viewing area. In one implementation, the scrolling feature may be used to move a Graphical User Interface (GUI) vertically (up and down), or horizontally (left and right) in order to bring more data into view on a display screen. By way of example, in the case of an MP3 player, the scrolling feature may be used to help browse through songs stored in the MP3 player. The direction that the finger moves may be arranged to control the direction of scrolling. For example, the touch pad may be arranged to move the GUI vertically up when the finger is moved in a first direction and vertically down when the finger is moved in a second direction To elaborate, the display screen 104, during operation, may display a list of media items (e.g., songs). A user of the media player 100 is able to linearly scroll through the list of media items by moving his or her finger across the touch pad 110. As the finger moves around the touch pad 110, the displayed items from the list of media items are varied such that the user is able to effectively scroll through the list of media items. However, since the list of media items can be rather lengthy, the invention provides the ability for the user to rapidly traverse (or scroll) through the list of media items. In effect, the user is able to accelerate their traversal of the list of media items by moving his or her finger at greater speeds. Zadesky ’230 at 8:52–9:21 FIGS. 3A-3C show the media player 100 of FIG. 2 being used by a user 120, in accordance with different embodiments of the invention. In all of these embodiments, the user 120 is linearly scrolling 104 (as shown by arrow 124) through a list of songs 122 displayed on the display screen via a slider bar 123. As shown, the media device 100 is comfortably held by one hand 126 while being comfortably addressed by the other hand 128. This configuration generally allows the user 120 to easily actuate the touch pad 110 with one or more fingers. For example, the thumb 130 and rightmost fingers 131 (or leftmost fingers if left handed) of the first hand 126 are used to grip the sides of the media player 100 while a finger 132 of the opposite hand 128 is used to actuate the touch pad 110. As shown, the entire top surface of the touch pad 110 is accessible to the user's finger 130. Referring to FIG. 3A, and in accordance with one embodiment of the invention, the touch pad 110 can be continuously actuated by a simple swirling motion of the finger 132 as shown by arrow 134. By swirling, it is meant that the finger moves in an arcuate or circular manner. For example, the finger may rotate relative to an imaginary axis. In particular, the finger can be rotated through 360 degrees of rotation

Claims	Prior Art
	without stopping. This form of motion may produce continuous or incremental scrolling on the display screen 104. Referring to FIG. 3B, and in accordance with one embodiment of the invention, the user 120 can slide his or her finger 132 radially between the inner and outer perimeter of the touch pad 110. For example, the touch pad 110 may be actuated radially as shown by arrow 140. Referring to FIG. 3C, and in accordance with one embodiment of the invention, the user 120 can slide his or her finger 132 substantially tangentially from all sides of the touch pad 110. For example, the touch pad 110 may be actuated forwards and backwards as shown by arrows 136 and side to side by arrows 138. Zadesky '230 at 10:34–51 Additionally or alternatively, the system via the touch pad may be configured to transform radial motion an object such as a finger (as shown in FIG. 3B) into translational or linear motion on the display screen. By radial, it is meant that the object moves in a substantially radial direction from the center of the touch pad to an outer perimeter of the touch pad. In one embodiment, the touch pad is arranged to continuously determine the radial position of a finger relative to the planar surface of the touch pad. This allows a user to linearly scroll through a media list on the display screen by moving the object at least partially between the center and outer perimeter of the touch pad. For example, by moving the object between a small and large radius (e.g., 0–3 cm) on the touch pad. This may also allow a user to vary a characteristic of the media player. For example, by moving radially, the user may be able to change the volume of sound being played on the media player (i.e., acts like a potentiometer). Zadesky '230 at 13:13–27 The various aspects of the invention described above can be used alone or in various combinations. The invention is preferably implemented by a combination of hardware and software, but can also be implemented in hardware or software. The invention can also be embodied as computer readable code on a computer readable medium. The computer readable medium is any data storage device that can store data which can thereafter be read by a computer system. Examples of the computer readable medium include read-only memory, random-access memory, CD-ROMs, DVDs, magnetic tape, optical data storage devices, and carrier waves. The computer readable medium can also be distributed over a network coupled computer systems so that the computer readable code is stored and executed in a distributed fashion. Zadesky '230 at 13:36–60 The advantages of the invention are numerous. Different embodiments or implementations may yield one or more of the following advantages. It should be noted that this is not an exhaustive list and there may be

Claims	Prior Art
	other advantages which are not described herein. One advantage of the invention is that a user is able to easily and rapidly traverse a lengthy list of media items. Another advantage of the invention is that a substantial portion of the touch pad is accessible to the user, i.e., the touch pad provides a large surface area for manipulation thereof. Another advantage of the invention is that the touch pad can be continuously actuated by a simple swirling motion of a finger, i.e., the finger can be rotated through 360 degrees of rotation without stopping. Another advantage of the invention is that the touch pad provides more range of finger positions. For example, a left handed user may choose to use one portion of the touch pad while a right handed user may choose to use another portion of the touch pad. In essence, the touch pad is more ergonomic. Another advantage of the invention is that the touch pad makes the media player more aesthetically pleasing. Another advantage of the invention is that the touch pad allows an intuitive way to scroll on a display screen. For example, the user can manipulate the his or her finger side to side for horizontal scrolling and the user can manipulate his or her finger backwards and forwards for vertical scrolling. Iuliis '007 discloses "the input mechanism may correspond to touch sensing devices such as touch pads, touch screens or touch sensitive housings" which "controls for volume, play/pause and playing the next or previous songs" (example of the claimed wherein the sensed touch input by the touch sensitive surface operates to at least alter operation of the head-worn personal electronic apparatus). Iuliis '007 at 9:33–48 The connector unit 102 may for example include input mechanisms such as buttons, dials, sliders, navigation pads, etc that allow a user to interact with the handheld electronic device 104 via the lanyard 100. In the case of a music player, the connector unit may include button controls for volume, play/pause and playing the next or previous songs. As a result, the user does not need to use the user interface from the handheld electronic device 104, which can be difficult when the user is on the go as for example when the user is exercising. Alternatively or additionally, the input mechanism may correspond to touch sensing devices such as touch pads, touch screens or touch sensitive housings. Examples of such devices can be found in U.S. patent application Ser. Nos. 10/188,182, 10/643,256, 10/840,862, 10/903,964, 11/038,590, 11/057,050, and 11/115,539, which are herein incorporated by reference. A POSITA would have been motivated to combine the Jabra BT800 with Zadesky '230, the Jabra BT800 with Hollemans '490, and the Jabra BT800 with Iuliis '007, and reasonably expected success in doing so, for the reasons explained for [1d]. *Supra* [1d]. Moreover, as explained for [1d]. The Jabra BT800 expressly includes sliding user inputs for volume control and answering calls, and a POSITA would have been motivated to alter these operation based on sensed inputs from the touch sensitive surface to increase convenience and ease of use for the user. *Supra* [1d].

Claims	Prior Art
	To the extent that the Jabra BT800, Hollemans '490, Zadesky '230, Iuliis '007 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Hollemans '490, Zadesky '230, and Iuliis '007, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[3a] A system as recited in claim 2, wherein the head-worn personal electronic apparatus is configured to support voice calls to the user, and	The Jabra BT800 expressly or inherently discloses "wherein the head-worn personal electronic apparatus is configured to support voice calls to the user." For example: The Jabra BT800 is configured to support voice calls to the user, and, for example, "Answer call" and "Reject call" (example of the claimed wherein the head-worn personal electronic apparatus is configured to support voice calls to the user). The following citations show examples of where the Jabra BT800 discloses this limitation. Jabra BT800 User Manual at Page 3 **Summary of features** • Operational features: • Answer call • End call • Reject call • Last number redialing • Call list • Automatic volume control • Call waiting • Put call on hold • Mute • Display caller ID • Ringing tones • Call vibrate feature • Supports voice-dialing (subject to phone) • DSP (digital signal processing) for noise cancellation • Rechargeable battery with direct charging option from PC with USB cable • Up to 6 hours talk time and 125 hours standby time • Total weight including battery only 25 grams • Range up to 10 meters (33 feet) • Bluetooth[1] (see Glossary) version 1.2 • Headset and hands-free Bluetooth profiles[2] Your Jabra BT800 is compatible with most Bluetooth mobile phones. You can check whether your phone has Bluetooth capability by visiting your phone manufacturer's web site or Jabra's website (www.jabra.com)

Claims	Prior Art
	Jabra BT800 User Manual at Page 5 **3 Basic usage of your Jabra BT800 headset** The operation of the basic features in the headset is very similar to your mobile phone.  *Fig. 4* 1. **To answer a call** • You answer the call directly on the headset with a tap on the answer button. A simple tap on the headset's answer button will capture and transfer the call to the headset 2. **To end a call** • A tap on the end button terminates the active call • You can also reject an incoming call directly from the headset. Press the end button and the call will be rejected. Depending on the phone settings, the person who called you will either be forwarded to your voice mail or hear a busy signal 3. **To make a call** • If you make a call from the mobile phone, the call will (subject to phone settings) be automatically transferred to the headset • Voice dialing is activated with a tap on the answer button. For further information about using this feature, please consult your phone's user manual. You will get the best results if you record the voice-dialing tag through your headset • Activate last number redial with a press on the answer button on the headset
[3b] wherein the at least one operation of the head-worn personal electronic apparatus being altered concerns at least accepting or declining a voice call to the user.	To the extent that the Jabra BT800 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.

Claims	Prior Art
	The Jabra BT800 allows the user to "Answer call" or ""Reject call" which can be done with a "simple tap" (example of the claimed wherein the at least one operation of the head-worn personal electronic apparatus being altered concerns at least accepting or declining a voice call to the user). The following citations show examples of where the Jabra BT800 discloses this limitation. Jabra BT800 User Manual at Page 3 **Summary of features** • Operational features: • Answer call • End call • Reject call • Last number redialing • Call list • Automatic volume control • Call waiting • Put call on hold • Mute • Display caller ID • Ringing tones • Call vibrate feature • Supports voice-dialing (subject to phone) • DSP (digital signal processing) for noise cancellation • Rechargeable battery with direct charging option from PC with USB cable • Up to 6 hours talk time and 125 hours standby time • Total weight including battery only 25 grams • Range up to 10 meters (33 feet) • Bluetooth[1] (see Glossary) version 1.2 • Headset and hands-free Bluetooth profiles[2] Your Jabra BT800 is compatible with most Bluetooth mobile phones. You can check whether your phone has Bluetooth capability by visiting your phone manufacturer's web site or Jabra's website (www.jabra.com) Jabra BT800 User Manual at Page 4 The Jabra BT800 is designed to be simple to operate with a minimum of control buttons. The answer and end buttons on the headset will provide alternative operations depending on the length of time they are pressed. | Instruction:	Duration of press:
Tap	Press briefly
Press	Approx: 1 second
Press and hold	Approx: 5 seconds

Claims	Prior Art
	Jabra BT800 User Manual at Page 5

3 Basic usage of your Jabra BT800 headset

The operation of the basic features in the headset is very similar to your mobile phone.

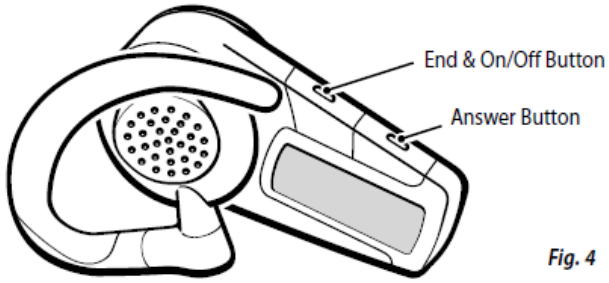


Fig. 4

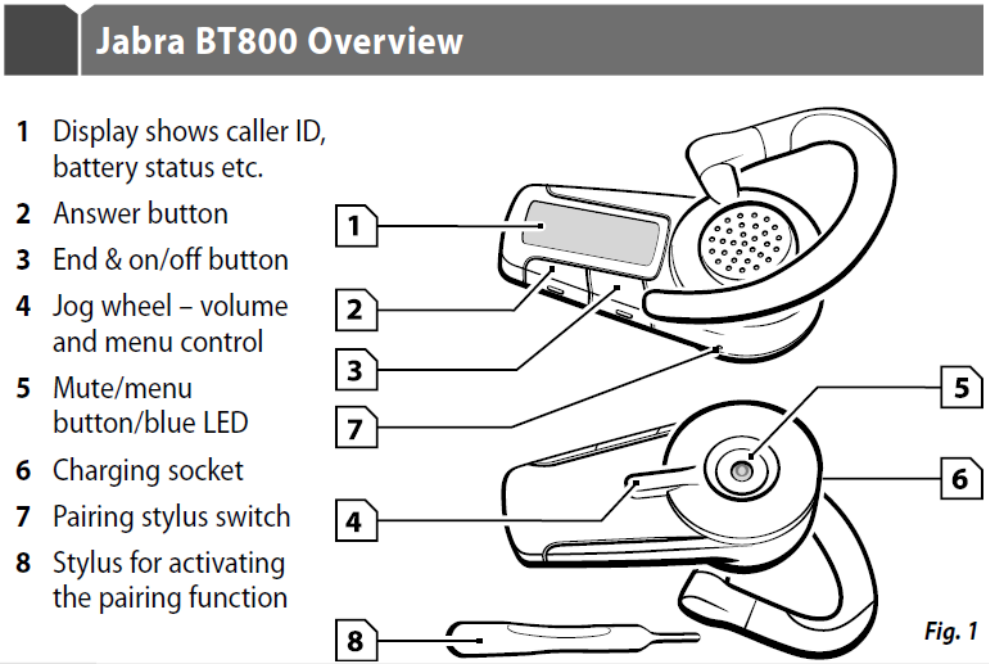
1. **To answer a call**
   - You answer the call directly on the headset with a tap on the answer button. A simple tap on the headset's answer button will capture and transfer the call to the headset
2. **To end a call**
   - A tap on the end button terminates the active call
   - You can also reject an incoming call directly from the headset. Press the end button and the call will be rejected. Depending on the phone settings, the person who called you will either be forwarded to your voice mail or hear a busy signal
3. **To make a call**
   - If you make a call from the mobile phone, the call will (subject to phone settings) be automatically transferred to the headset
   - Voice dialing is activated with a tap on the answer button. For further information about using this feature, please consult your phone's user manual. You will get the best results if you record the voice-dialing tag through your headset
   - Activate last number redial with a press on the answer button on the headset

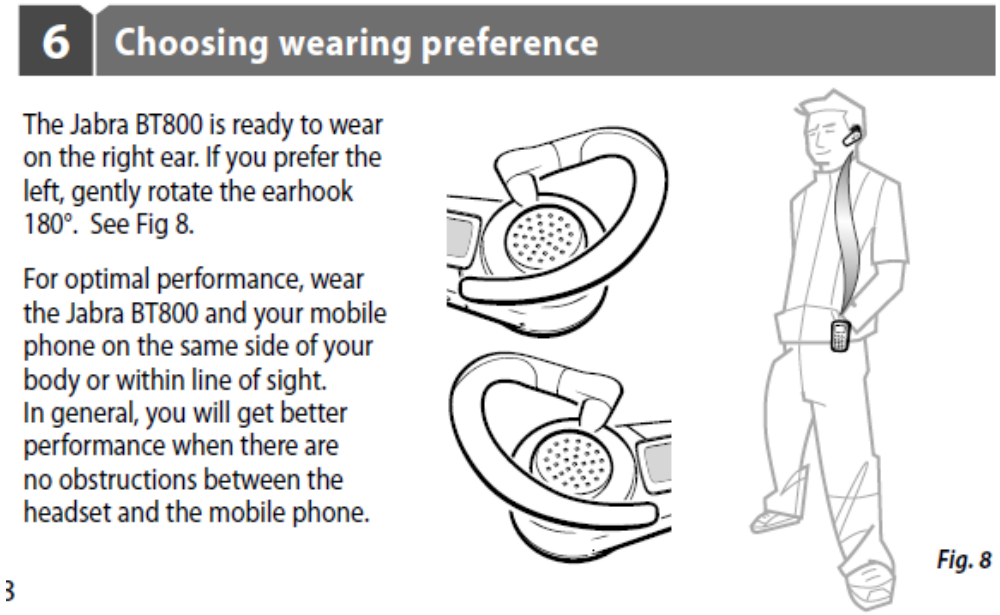
Hollemans '490 discloses, for example, "touching the right earpiece could be mapped on answering the call" (example of the claimed wherein the at least one operation of the head-worn personal electronic apparatus being altered concerns at least accepting or declining a voice call to the user).

The following citations show examples of where the Hollemans '490 discloses this limitation.

Claims	Prior Art
	Hollemans ’490 at 9:1–17 In a fourth way, the system may be arranged to operate in a plurality of modes, and to switch between the modes. A function that depends on the mode may be invoked in response to an input on the remote control. Each mode may e.g. correspond to an application of the system. The system may switch to another application in response to a command of the user, for example given via the touch-sensitive area. Touching the left earpiece, for example, may cause a move through a circular list of applications, and an application may be activated by touching the right earpiece. Also multiple applications may be active simultaneously, in which case a special command may be used to switch between applications, e.g., hold one earpiece while tapping on the other. Of course, other combinations may be used for this. Another way of switching between applications may not be initiated by the user, but by the system, e.g., on an incoming phone call or some other event. As soon as the incoming phone call is detected, the ring tone may be sounded, potentially mixed with the active sound source e.g. MP3 playback. While the incoming phone call is communicated to the user, the controls are mapped to the phone application rather than the audio playback application. In the phone application, touching the right earpiece could be mapped on answering the call and the left earpiece could be mapped to hanging up. As the user picks up the call, the playback of the music may be paused. A POSITA would have recognized that the Jabra BT800 expressly teaches answering a phone call via user inputs to the Jabra BT800. See Jabra BT800 User Manual at Pages 3, 5. A POSITA would have been motivated to seek out advantageous and convenient ways to allow users to handle and answer phone calls. A POSITA would have been motivated to combine answering a voice call via a touch sensitive surface input, and reasonably expected success in doing so, for the same reasons explained for [1d] and claim 2. *Supra* [1d], claim 2. Specifically, a POSITA would have recognized that the advantages of using a touch sensitive surface to control operations, as explained for [1d], would have also advantageously improved the convenience of answering or declining voice calls. *Supra* [1d]. And answering or declining a voice call constitutes altering an operation, as discussed for claim 2. *Supra* claim 2. To the extent that the Jabra BT800 and Hollemans ’490 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800 and Hollemans ’490, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
4[a]. A system as recited in claim 2, wherein the head-worn personal electronic apparatus is configured	The Jabra BT800 expressly or inherently discloses “[a] system as recited in claim 2, wherein the head-worn personal electronic apparatus is configured to support audio output to the user via the speaker.” For example:

Claims	Prior Art
to support audio output to the user via the speaker, and	The Jabra BT800 includes a speaker, shown in the figures below, which outputs audio to the user and allows for "volume ... control" (example of the claimed wherein the head-worn personal electronic apparatus is configured to support audio output to the user via the speaker). The following citations show examples of where the Jabra BT800 discloses this limitation. Jabra BT800 User Manual at Page 2



Claims	Prior Art
	Jabra BT800 User Manual at Page 8  6 Choosing wearing preference The Jabra BT800 is ready to wear on the right ear. If you prefer the left, gently rotate the earhook 180°. See Fig 8. For optimal performance, wear the Jabra BT800 and your mobile phone on the same side of your body or within line of sight. In general, you will get better performance when there are no obstructions between the headset and the mobile phone. 3 Fig. 8 To the extent that the Jabra BT800 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of Jabra BT800, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[4b] wherein the at least one operation of the head-worn personal electronic apparatus being altered concerns control of the audio output being provided to the user.	The Jabra BT800, Hollemans '490, Zadesky '230, and Iuliis '007 expressly or inherently disclose "wherein the at least one operation of the head-worn personal electronic apparatus being altered concerns control of the audio output being provided to the user." For example: The Jabra BT800's "Jog wheel" can be used for "volume ... control" (example of the claimed wherein the at least one operation of the head-worn personal electronic apparatus being altered concerns control of the audio output being provided to the user). The following citations show examples of where the Jabra BT800 discloses this limitation.

Claims	Prior Art
	Jabra BT800 User Manual at Page 5

3 Basic usage of your Jabra BT800 headset

The operation of the basic features in the headset is very similar to your mobile phone.

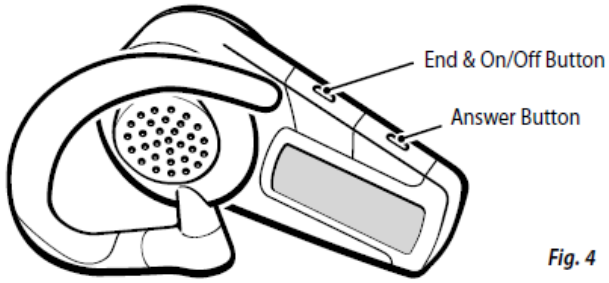
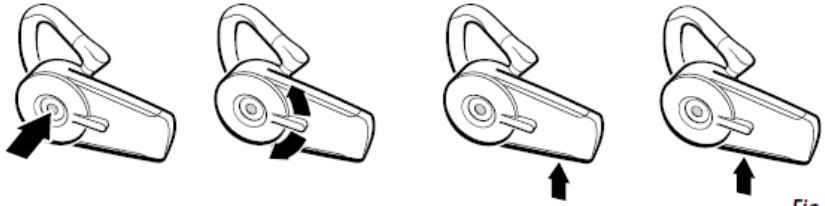


Fig. 4

1. **To answer a call**
   - You answer the call directly on the headset with a tap on the answer button. A simple tap on the headset's answer button will capture and transfer the call to the headset
2. **To end a call**
   - A tap on the end button terminates the active call
   - You can also reject an incoming call directly from the headset. Press the end button and the call will be rejected. Depending on the phone settings, the person who called you will either be forwarded to your voice mail or hear a busy signal
3. **To make a call**
   - If you make a call from the mobile phone, the call will (subject to phone settings) be automatically transferred to the headset
   - Voice dialing is activated with a tap on the answer button. For further information about using this feature, please consult your phone's user manual. You will get the best results if you record the voice-dialing tag through your headset
   - Activate last number redial with a press on the answer button on the headset

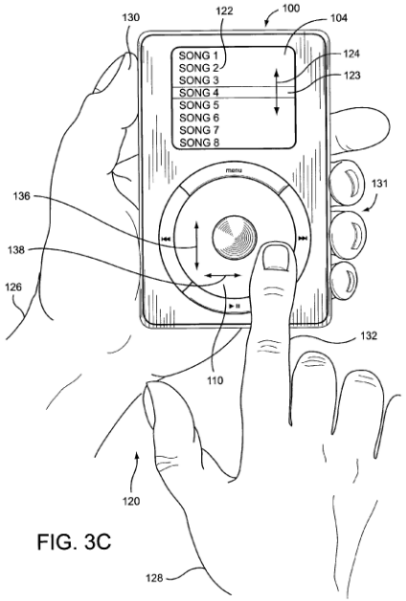
Claims	Prior Art
	Jabra BT800 User Manual at Page 5 **4. Volume control and mute function** • Your Jabra BT800 headset features an automatic volume control that adjusts the volume depending on ambient noise level. You can manually adjust the volume using the volume jog wheel see Fig 5 • During a conversation, press the mute button to mute the call. You un-mute by adjusting the volume level on the volume jog wheel or by tapping on the mute button see Fig 6  *Fig. 5*  *Fig. 6* Jabra BT800 User Manual at Page 6 **2. Access the menu** From the menu, you can adjust your settings according to your preferences. See Fig 7 • Access the menu when your are not receiving or making a call with a press on the mute / menu button • Use the jog wheel to navigate the menu • Select or activate a menu item with a tap on the answer button • Exit / go back in the menu with a tap on the end button   5 *Fig. 7* Hollemans ’490 receives a touch input and, for example, “in response to detecting a touch and hold ... adapts the volume level,” play/pause, stop, forward, or reverse audio (example of the claimed operation of the head-worn personal electronic apparatus being altered concerns control of the audio output being provided to the user).

Claims	Prior Art
	The following citations show examples of where the Hollemans ’490 discloses this limitation. Hollemans ’490 at 1:10–3:21 A personal audio system as described in the opening paragraph is known from the now ubiquitous mobile audio devices like MP3 players and mobile phones. One particular example of such a system is the iPod MP3 player from Apple as reviewed in c’t 2002 Heft 26, pages 132-141, “Plattenmeister” by Peter Nonhoff-Arps, Sven Hansen, and available with product no. M8737LL/A (see also http://www.apple.com/ipod/). This and similar products typically comprise a set of two earpieces also known as ear buds that can be inserted into the ears of the user. These products typically also include a remote controller for controlling one or more functions of the device. A plug connects both the remote controller and the earpieces with the device, by plugging it into a socket of the device. The remote controller is usually included in the wire somewhere between the earpieces and the plug. As a result, the remote control has no fixed position but is dangling about as part of the wire. Hence, when the user wants to use the remote control for e.g. lowering volume, muting, or skipping an audio track or station, the user first needs to look for the remote controller. Subsequently, the user needs to get hold of the controller. This needs to be done in such a way that the controller has the right orientation for operating it. Finally, after being confident about the orientation of the controller, the user may try to find and operate the tiny button to activate the desired function. This requires considerable time and attention from the user, which may lead to dangerous situations when the user takes part in traffic. It is an object of the present invention to provide a personal audio system as described in the opening paragraph that does not suffer from the above-mentioned drawbacks. 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. The remote controller thus gets a fixed position with respect to the user in or by the human ear. It is easy to find one's ear. This prevents looking for the remote controller. In addition, the user is not tempted to look at the remote controller, because there is nothing relevant to be seen for controlling the device. To avoid having to find tiny buttons, merely touching the remote controller somewhere on its touch-sensitive area operates said remote controller, which detects being touched and subsequently sends the control signal to the device. Also the problem of finding the proper orientation of the remote controller is solved by wearing the remote controller in or by the ear, because its orientation becomes fixed with respect to the user. Advantageously, the controller is arranged to fit substantially in a human ear concha, such that the area is

Claims	Prior Art
	accessible for touching when the controller is fitted substantially in the concha. This fits in with a particularly comfortable and popular shape for the earpieces or ear buds. The shape consists of a thick disc containing a transducer and a protruding part from which a wire extends. When being worn, the protruding part of the earpiece offers a surface area that is easily accessible for touching. Advantageously, the controller is arranged to detect a temporal pattern in the touch-sensitive area being touched, and to send the control signal in response to detecting the temporal pattern. In general, the device offers a plurality of functions and capabilities. Rather than having more buttons on the remote control that may be hard to distinguish, the single touch-sensitive area is used for controlling the plurality of functions. The temporal pattern is a particularly appropriate user interface, because it is easy to create temporal patterns in touching the area rhythmically and because the temporal patterns can constitute a natural and consistent interface. 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. Advantageously, the outer surface has a further touch-sensitive area, such that the further touch-sensitive area is touched substantially by the ear when the controller is substantially worn in or by a human ear, the controller being arranged to send the control signal only if the further touch-sensitive area is touched. This will prevent the accidental remote control of the device when the remote controller is not worn, thus preventing unwanted activation of the device and unnecessary battery exhaustion. Advantageously, the controller is arranged to send a further control signal to the device if the further touch-sensitive area is touched. This makes it, for example, possible for the device to pause playing music as soon as the earpiece is taken out and to resume playing music upon re-insertion. In an embodiment of the personal audio system according to the invention, the system comprises a second controller for remotely controlling the device by sending a further control signal to the device, the second controller having an outer surface with a further touch-sensitive area, the second controller being arranged to be substantially worn in or by a human ear, and the second controller being further arranged to detect a further temporal pattern in the further touch-sensitive area being touched, and to send the further control signal in response to detecting the further temporal pattern. A second controller fits in with the natural symmetry of the human head. It also considerably enhances the user interface for controlling the device. For example, the symmetry can be exploited in such a way that a long tap at the left remote controller decreases the volume, but a long tap at the right controller increases the volume. Hollemans ’490 at 6:19–33 A basic temporal pattern that can be detected is a short tap, which consists of the touch-sensitive area 122 being initially untouched and subsequently being touched for a short while, and subsequently being untouched again. The short while typically lasts between 40 and 300 milliseconds. Another basic temporal pattern is the long tap, which typically lasts between 400 milliseconds to several seconds. Yet another basic temporal pattern is a repeated long or short tap or another sequence of long and short taps. All of

Claims	Prior Art
	these temporal patterns may each be mapped to functions or capabilities of the device 110. The detection of the temporal pattern is preferably insensitive to deviations of the duration of the tap and to the criteria for determining being touched, like measured quantity levels and hysteresis. The detection of the temporal pattern may adapt itself to the history of detected patterns. One particular mapping may be, for example, that, in response to detecting a touch and hold, the device 110 gradually adapts a volume level as long as the area 122 is being touched. The direction of adaptation (increasing or decreasing the volume level) can be reversed with every touch and hold, or with a short tap in between. Hollemans ’490 at 7:11–18 To further enhance the user interface, the device 110 may provide immediate acoustic feedback in response to being touched. One example of such feedback is providing an audible hum or beep when the area 122 is detected as being touched. Another example is that the audio feedback represents the activated function of the device 110, for example, by varying volume, pitch, rhythm or melody or combinations thereof of the audio feedback. Yet another example of feedback is the use of a recorded or synthesized human voice informing the user about the activated function of the device 110 or about the capabilities of the device 110 and how to remotely control them. Hollemans ’490 at 8:19–33 In a third way, the touch-sensitive area is used for picking up a gesture made on the area with e.g. a stylus or a finger. The remote control may be extended for this purpose with means for detecting a gesture, e.g. a laser beetle, a small camera, an IR movement sensor, or a cross-capacitance sensor. The system may be arranged to detect a gesture being made on the area. The gesture detected may be used for controlling a setting of the system. Examples of a setting are a selection of a next or a previous track, a volume, a position of a stereo image, e.g. a panning position, a balance position. The gesture detected may also be used for controlling a mouse pointer, navigating a menu, entering a tapping pattern, scrolling content on display. The 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. The list may contain items like contacts, artists, song titles, etc. The gesture detected may be a user defined gesture for activating a user defined function. The gesture detected may be used for user identification by matching with initials or an autograph. The gesture may extend into two dimensions, e.g. a planar gesture, or it may extend into three dimensions. Hollemans ’490 at 9:1–17 In a fourth way, the system may be arranged to operate in a plurality of modes, and to switch between the

Claims	Prior Art
	modes. A function that depends on the mode may be invoked in response to an input on the remote control. Each mode may e.g. correspond to an application of the system. The system may switch to another application in response to a command of the user, for example given via the touch-sensitive area. Touching the left earpiece, for example, may cause a move through a circular list of applications, and an application may be activated by touching the right earpiece. Also multiple applications may be active simultaneously, in which case a special command may be used to switch between applications, e.g., hold one earpiece while tapping on the other. Of course, other combinations may be used for this. Another way of switching between applications may not be initiated by the user, but by the system, e.g., on an incoming phone call or some other event. As soon as the incoming phone call is detected, the ring tone may be sounded, potentially mixed with the active sound source e.g. MP3 playback. While the incoming phone call is communicated to the user, the controls are mapped to the phone application rather than the audio playback application. In the phone application, touching the right earpiece could be mapped on answering the call and the left earpiece could be mapped to hanging up. As the user picks up the call, the playback of the music may be paused. Hollemans ’490 at Figure 3  FIG.3

Claims	Prior Art
	Hollemans ’490 at Figure 4  FIG.4 Zadesky ’230 discloses a “touchpad 110” to “receive input from a finger moving across the surface of the touch pad 110” which can “change the volume of sound being played” (example of the claimed operation of the head-worn personal electronic apparatus being altered concerns control of the audio output being provided to the user). The following citations show examples of where the Zadesky ’230 discloses this limitation. Zadesky ’230 at Figure 3C  FIG. 3C

Claims	Prior Art
	Zadesky ’230 at 1:47–65 In portable computing devices such as laptop computers, the input devices are commonly touch pads. With a touch pad, the movement of an input pointer (i.e., cursor) corresponds to the relative movements of the user's finger (or stylus) as the finger is moved along a surface of the touch pad. Touch pads can also make a selection on the display screen when one or more taps are detected on the surface of the touch pad. In some cases, any portion of the touch pad may be tapped, and in other cases a dedicated portion of the touch pad may be tapped. In stationary devices such as desktop computers, the input devices are generally selected from mice and trackballs. With a mouse, the movement of the input pointer corresponds to the relative movements of the mouse as the user moves the mouse along a surface. With a trackball, the movement of the input pointer corresponds to the relative movements of a ball as the user rotates the ball within a housing. Both mice and trackballs generally include one or more buttons for making selections on the display screen. Zadesky ’230 at 4:37–49 The present invention relates to touch pads. According to one aspect of the invention, a touch pad is provided on a media player to facilitate user interaction therewith. In one embodiment, the media player is a handheld device. According to another aspect of the invention, a touch pad is provided that can sense and resolve angular and/or radial positions of a moving object (e.g., finger) as it is moved in a largely rotational and/or radial manner across the touch pad. In one embodiment, the touch pad that is based on polar coordinates rather than Cartesian coordinates. Other aspects of the invention will become apparent below. In any case, the aspects are not limiting and the various aspects of the invention can be used separately or in combination. Zadesky ’230 at 5:61–6:19 The media player 100 also includes a touch pad 110. The touch pad 110 is configured to provide one or more control functions for controlling various applications associated with the media player 100. For example, the touch initiated control function may be used to move an object or perform an action on the display screen 104 or to make selections or issue commands associated with operating the media player 100. In most cases, the touch pad 110 is arranged to receive input from a finger moving across the surface of the touch pad 110 in order to implement the touch initiated control function. The touch pad may be widely varied. For example, the touch pad be a conventional touch pad based on the Cartesian coordinate system, or the touch pad may be a touch pad based on a polar coordinate system (the later will be described in greater detail below). The manner in which the touch pad 110 receives input may be widely varied. In one embodiment, the

Claims	Prior Art
	touch pad 110 is configured receive input from a linear finger motion. In another embodiment, the touch pad 110 is configured receive input from a rotary or swirling finger motion. In yet another embodiment, the touch pad 110 is configured receive input from a radial finger motion. Additionally or alternatively, the touch pad 110 may be arranged to receive input from a finger tapping on the touch pad 100. By way of example, the tapping finger may initiate a control function for playing a song, opening a menu and the like. Zadesky '230 at 13:36–60 The advantages of the invention are numerous. Different embodiments or implementations may yield one or more of the following advantages. It should be noted that this is not an exhaustive list and there may be other advantages which are not described herein. One advantage of the invention is that a user is able to easily and rapidly traverse a lengthy list of media items. Another advantage of the invention is that a substantial portion of the touch pad is accessible to the user, i.e., the touch pad provides a large surface area for manipulation thereof. Another advantage of the invention is that the touch pad can be continuously actuated by a simple swirling motion of a finger, i.e., the finger can be rotated through 360 degrees of rotation without stopping. Another advantage of the invention is that the touch pad provides more range of finger positions. For example, a left handed user may choose to use one portion of the touch pad while a right handed user may choose to use another portion of the touch pad. In essence, the touch pad is more ergonomic. Another advantage of the invention is that the touch pad makes the media player more aesthetically pleasing. Another advantage of the invention is that the touch pad allows an intuitive way to scroll on a display screen. For example, the user can manipulate the his or her finger side to side for horizontal scrolling and the user can manipulate his or her finger backwards and forwards for vertical scrolling. Iuliis '007 discloses "the input mechanism may correspond to touch sensing devices such as touch pads, touch screens or touch sensitive housings" which "controls for volume, play/pause and playing the next or previous songs" (example of the claimed operation of the head-worn personal electronic apparatus being altered concerns control of the audio output being provided to the user). Iuliis '007 at 9:33–48 The connector unit 102 may for example include input mechanisms such as buttons, dials, sliders, navigation pads, etc that allow a user to interact with the handheld electronic device 104 via the lanyard 100. In the case of a music player, the connector unit may include button controls for volume, play/pause and playing the next or previous songs. As a result, the user does not need to use the user interface from

Claims	Prior Art
	the handheld electronic device 104, which can be difficult when the user is on the go as for example when the user is exercising. Alternatively or additionally, the input mechanism may correspond to touch sensing devices such as touch pads, touch screens or touch sensitive housings. Examples of such devices can be found in U.S. patent application Ser. Nos. 10/188,182, 10/643,256, 10/840,862, 10/903,964, 11/038,590, 11/057,050, and 11/115,539, which are herein incorporated by reference. A POSITA would have been motivated to combine the Jabra BT800 with Zadesky '230, the Jabra BT800 with Hollemans '490, and the Jabra BT800 with Iuliis '007, to include a touchpad that alters audio output to implement the same advantageous control of the second communication module explained for [1d], claim 2, and [3b]. *Supra* [1d], claim 2, [3b]. A POSITA also would have reasonably expected success in making this combination for the same reasons discussed above for [1d], claim 2, and [3b]. *Supra* [1d], claim 2, [3b]. To the extent that the Jabra BT800, Hollemans '490, Zadesky '230, Iuliis '007, does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Hollemans '490, Zadesky '230, Iuliis '007, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
5. A system as recited in claim 2, wherein the head-worn personal electronic apparatus is configured to distinguish at least a direction of the user input with respect to the touch sensitive surface.	The Jabra BT800, Hollemans '490, and Zadesky '230 expressly or inherently disclose "[a] system as recited in claim 2, wherein the head-worn personal electronic apparatus is configured to distinguish at least a direction of the user input with respect to the touch sensitive surface." For example: On information and belief, the Jabra BT800 is configured to distinguish the direction of the "Jog wheel" input, e.g., left or right, as shown in by the arrows in the figures below (example of the claimed head-worn personal electronic apparatus is configured to distinguish at least a direction of the user input with respect to the touch sensitive surface). The following citations show examples of where the Jabra BT800 discloses this limitation.

Claims	Prior Art
	Jabra BT800 User Manual at Page 2

Jabra BT800 Overview

1 Display shows caller ID, battery status etc.
2 Answer button
3 End & on/off button
4 Jog wheel – volume and menu control
5 Mute/menu button/blue LED
6 Charging socket
7 Pairing stylus switch
8 Stylus for activating the pairing function

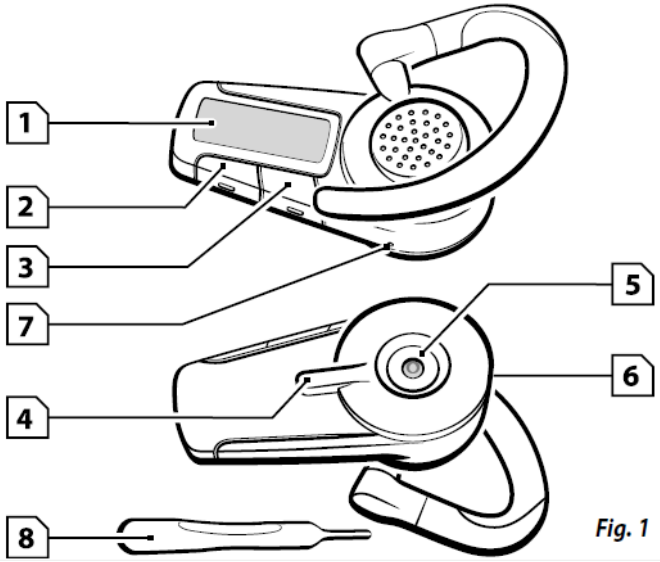


Fig. 1

Jabra BT800 User Manual at Page 5

4. Volume control and mute function

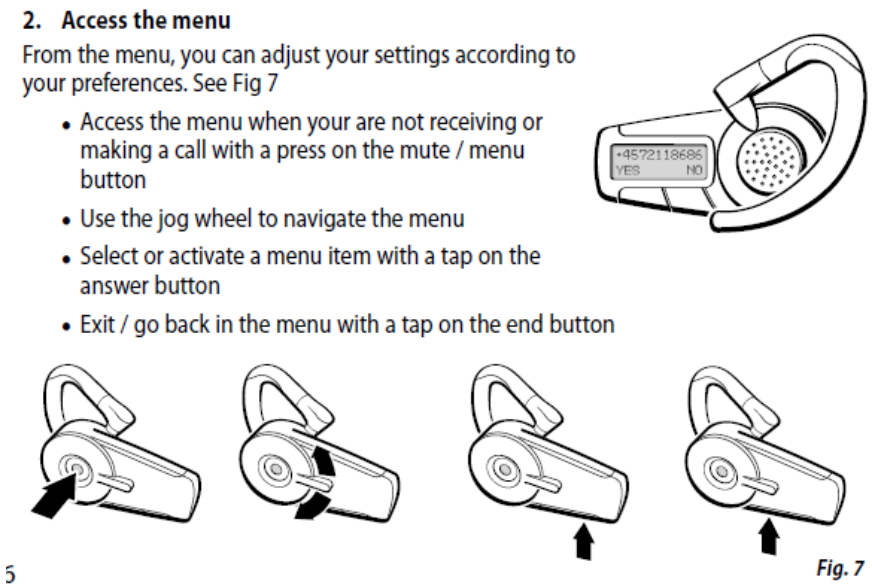
- Your Jabra BT800 headset features an automatic volume control that adjusts the volume depending on ambient noise level. You can manually adjust the volume using the volume jog wheel see Fig 5
- During a conversation, press the mute button to mute the call. You un-mute by adjusting the volume level on the volume jog wheel or by tapping on the mute button see Fig 6



Fig. 5

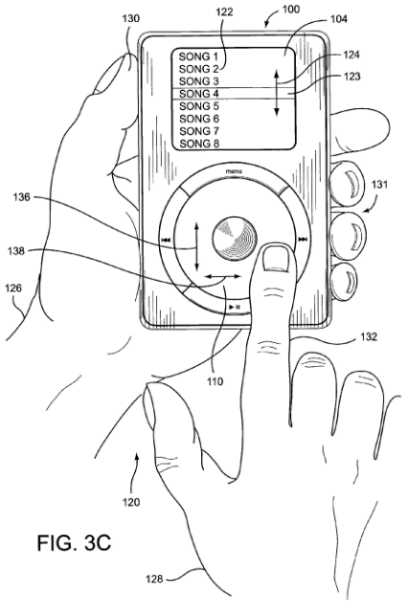


Fig. 6

Claims	Prior Art
	Jabra BT800 User Manual at Page 6  **2. Access the menu** From the menu, you can adjust your settings according to your preferences. See Fig 7 • Access the menu when your are not receiving or making a call with a press on the mute / menu button • Use the jog wheel to navigate the menu • Select or activate a menu item with a tap on the answer button • Exit / go back in the menu with a tap on the end button 5 *Fig. 7* Hollemans '490's "touchpad" or "touch–sensitive area" (example of the claimed touch sensitive surface) can be "used for picking up a gesture made on the area" with a "finger" (example of the claimed head-worn personal electronic apparatus is configured to distinguish at least a direction of the user input with respect to the touch sensitive surface). The following citations show examples of where the Hollemans '490 discloses this limitation. Hollemans '490 at 1:10–3:21 A personal audio system as described in the opening paragraph is known from the now ubiquitous mobile audio devices like MP3 players and mobile phones. One particular example of such a system is the iPod MP3 player from Apple as reviewed in c't 2002 Heft 26, pages 132-141, "Plattenmeister" by Peter Nonhoff-Arps, Sven Hansen, and available with product no. M8737LL/A (see also http://www.apple.com/ipod/). This and similar products typically comprise a set of two earpieces also known as ear buds that can be inserted into the ears of the user. These products typically also include a remote controller for controlling one or more functions of the device. A plug connects both the remote controller and the earpieces with the device, by plugging it into a socket of the device. The remote controller is usually included in the wire

Claims	Prior Art
	somewhere between the earpieces and the plug. As a result, the remote control has no fixed position but is dangling about as part of the wire. Hence, when the user wants to use the remote control for e.g. lowering volume, muting, or skipping an audio track or station, the user first needs to look for the remote controller. Subsequently, the user needs to get hold of the controller. This needs to be done in such a way that the controller has the right orientation for operating it. Finally, after being confident about the orientation of the controller, the user may try to find and operate the tiny button to activate the desired function. This requires considerable time and attention from the user, which may lead to dangerous situations when the user takes part in traffic. It is an object of the present invention to provide a personal audio system as described in the opening paragraph that does not suffer from the above-mentioned drawbacks. 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. The remote controller thus gets a fixed position with respect to the user in or by the human ear. It is easy to find one's ear. This prevents looking for the remote controller. In addition, the user is not tempted to look at the remote controller, because there is nothing relevant to be seen for controlling the device. To avoid having to find tiny buttons, merely touching the remote controller somewhere on its touch-sensitive area operates said remote controller, which detects being touched and subsequently sends the control signal to the device. Also the problem of finding the proper orientation of the remote controller is solved by wearing the remote controller in or by the ear, because its orientation becomes fixed with respect to the user. 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. This fits in with a particularly comfortable and popular shape for the earpieces or ear buds. The shape consists of a thick disc containing a transducer and a protruding part from which a wire extends. When being worn, the protruding part of the earpiece offers a surface area that is easily accessible for touching. Advantageously, the controller is arranged to detect a temporal pattern in the touch-sensitive area being touched, and to send the control signal in response to detecting the temporal pattern. In general, the device offers a plurality of functions and capabilities. Rather than having more buttons on the remote control that may be hard to distinguish, the single touch-sensitive area is used for controlling the plurality of functions. The temporal pattern is a particularly appropriate user interface, because it is easy to create temporal patterns in touching the area rhythmically and because the temporal patterns can constitute a natural and consistent interface. An example is a single short tap for pause/play, double short tap for next

Claims	Prior Art
	track, triple short tap for next artist/album and a long tap for adjusting the volume. Advantageously, the outer surface has a further touch-sensitive area, such that the further touch-sensitive area is touched substantially by the ear when the controller is substantially worn in or by a human ear, the controller being arranged to send the control signal only if the further touch-sensitive area is touched. This will prevent the accidental remote control of the device when the remote controller is not worn, thus preventing unwanted activation of the device and unnecessary battery exhaustion. Advantageously, the controller is arranged to send a further control signal to the device if the further touch-sensitive area is touched. This makes it, for example, possible for the device to pause playing music as soon as the earpiece is taken out and to resume playing music upon re-insertion. In an embodiment of the personal audio system according to the invention, the system comprises a second controller for remotely controlling the device by sending a further control signal to the device, the second controller having an outer surface with a further touch-sensitive area, the second controller being arranged to be substantially worn in or by a human ear, and the second controller being further arranged to detect a further temporal pattern in the further touch-sensitive area being touched, and to send the further control signal in response to detecting the further temporal pattern. A second controller fits in with the natural symmetry of the human head. It also considerably enhances the user interface for controlling the device. For example, the symmetry can be exploited in such a way that a long tap at the left remote controller decreases the volume, but a long tap at the right controller increases the volume. Hollemans ’490 at 8:19–33 In a third way, the touch-sensitive area is used for picking up a gesture made on the area with e.g. a stylus or a finger. The remote control may be extended for this purpose with means for detecting a gesture, e.g. a laser beetle, a small camera, an IR movement sensor, or a cross-capacitance sensor. The system may be arranged to detect a gesture being made on the area. The gesture detected may be used for controlling a setting of the system. Examples of a setting are a selection of a next or a previous track, a volume, a position of a stereo image, e.g. a panning position, a balance position. The gesture detected may also be used for controlling a mouse pointer, navigating a menu, entering a tapping pattern, scrolling content on display. The 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. The list may contain items like contacts, artists, song titles, etc. The gesture detected may be a user defined gesture for activating a user defined function. The gesture detected may be used for user identification by matching with initials or an autograph. The gesture may extend into two dimensions, e.g. a planar gesture, or it may extend into three dimensions.

Claims	Prior Art
	Zadesky ’230 discloses a “touchpad 110” to “receive input from a finger moving across the surface of the touch pad 110” where “the direction that the finger moves may be arranged to control the direction of scrolling,” i.e., by moving “vertically up when the finger is moved in a first direction and vertically down when the finger is moved in a second direction” (example of the claimed distinguish at least a direction of the user input with respect to the touch sensitive surface). The following citations show examples of where the Zadesky ’230 discloses this limitation. Zadesky ’230 at Figure 3C  FIG. 3C Zadesky ’230 at 1:47–65 In portable computing devices such as laptop computers, the input devices are commonly touch pads. With a touch pad, the movement of an input pointer (i.e., cursor) corresponds to the relative movements of the user's finger (or stylus) as the finger is moved along a surface of the touch pad. Touch pads can also make a selection on the display screen when one or more taps are detected on the surface of the touch pad. In some cases, any portion of the touch pad may be tapped, and in other cases a dedicated portion of the touch pad may be tapped. In stationary devices such as desktop computers, the input devices are generally selected from mice and trackballs. With a mouse, the movement of the input pointer corresponds to the relative movements of the mouse as the user moves the mouse along a surface. With a trackball, the movement of the input pointer corresponds to the relative movements of a ball as the user rotates the ball

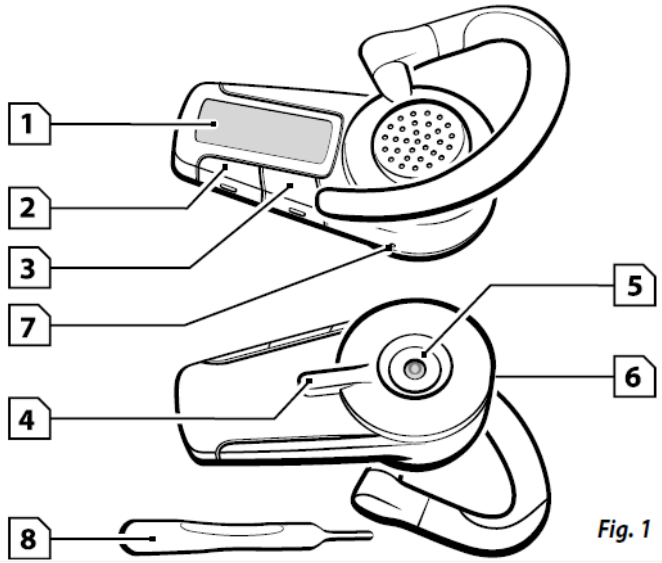
Claims	Prior Art
	within a housing. Both mice and trackballs generally include one or more buttons for making selections on the display screen. Zadesky ’230 at 2:29–43 To elaborate further, touch pads generally include one or more sensors for detecting the proximity of the finger thereto. By way of example, the sensors may be based on resistive sensing, surface acoustic wave sensing, pressure sensing (e.g., strain gauge), optical sensing, capacitive sensing and the like. The sensors are generally dispersed about the touch pad with each sensor representing an x, y position. In most cases, the sensors are arranged in a grid of columns and rows. Distinct x and y position signals, which control the x, y movement of a pointer device on the display screen, are thus generated when a finger is moved across the grid of sensors within the touch pad. For brevity sake, the remaining discussion will be held to the discussion of capacitive sensing technologies. It should be noted, however, that the other technologies have similar features. Zadesky ’230 at 2:44–3:5 Capacitive sensing touch pads generally contain several layers of material. For example, the touch pad may include a protective shield, one or more electrode layers and a circuit board. The protective shield typically covers the electrode layer(s), and the electrode layer(s) is generally disposed on a front side of the circuit board. As is generally well known, the protective shield is the part of the touch pad that is touched by the user to implement cursor movements on a display screen. The electrode layer(s), on the other hand, is used to interpret the x, y position of the user's finger when the user's finger is resting or moving on the protective shield. The electrode layer (s) typically consists of a plurality of electrodes that are positioned in columns and rows so as to form a grid array. The columns and rows are generally based on the Cartesian coordinate system and thus the rows and columns correspond to the x and y directions. The touch pad may also include sensing electronics for detecting signals associated with the electrodes. For example, the sensing electronics may be adapted to detect the change in capacitance at each of the electrodes as the finger passes over the grid. The sensing electronics are generally located on the backside of the circuit board. By way of example, the sensing electronics may include an application specific integrated circuit (ASIC) that is configured to measure the amount of capacitance in each of the electrodes and to compute the position of finger movement based on the capacitance in each of the electrodes. The ASIC may also be configured to report this information to the computing device. Zadesky ’230 at 4:37–49 The present invention relates to touch pads. According to one aspect of the invention, a touch pad is provided on a media player to facilitate user interaction therewith. In one embodiment, the media player is

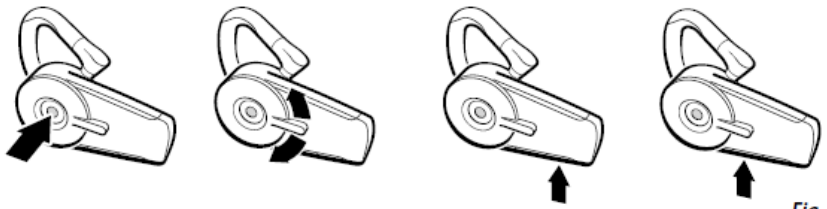
Claims	Prior Art
	a handheld device. According to another aspect of the invention, a touch pad is provided that can sense and resolve angular and/or radial positions of a moving object (e.g., finger) as it is moved in a largely rotational and/or radial manner across the touch pad. In one embodiment, the touch pad that is based on polar coordinates rather than Cartesian coordinates. Other aspects of the invention will become apparent below. In any case, the aspects are not limiting and the various aspects of the invention can be used separately or in combination. Zadesky '230 at 5:61–6:19 The media player 100 also includes a touch pad 110. The touch pad 110 is configured to provide one or more control functions for controlling various applications associated with the media player 100. For example, the touch initiated control function may be used to move an object or perform an action on the display screen 104 or to make selections or issue commands associated with operating the media player 100. In most cases, the touch pad 110 is arranged to receive input from a finger moving across the surface of the touch pad 110 in order to implement the touch initiated control function. The touch pad may be widely varied. For example, the touch pad be a conventional touch pad based on the Cartesian coordinate system, or the touch pad may be a touch pad based on a polar coordinate system (the later will be described in greater detail below). The manner in which the touch pad 110 receives input may be widely varied. In one embodiment, the touch pad 110 is configured receive input from a linear finger motion. In another embodiment, the touch pad 110 is configured receive input from a rotary or swirling finger motion. In yet another embodiment, the touch pad 110 is configured receive input from a radial finger motion. Additionally or alternatively, the touch pad 110 may be arranged to receive input from a finger tapping on the touch pad 100. By way of example, the tapping finger may initiate a control function for playing a song, opening a menu and the like. Zadesky '230 at 6:38–7:5 The direction of scrolling may be widely varied. For example, scrolling may be implemented vertically (up or down) or horizontally (left or right). In the case of vertical scrolling, when a user scrolls down, each new set of data appears at the bottom of the viewing area and all other sets of data move up one position. If the viewing area is full, the top set of data moves out of the viewing area. Similarly, when a user scrolls up, each new set of data appears at the top of the viewing area and all other sets of data move down one position. If the viewing area is full, the bottom set of data moves out of the viewing area. In one implementation, the scrolling feature may be used to move a Graphical User Interface (GUI) vertically (up and down), or horizontally (left and right) in order to bring more data into view on a display screen. By way of example, in the case of an MP3 player, the scrolling feature may be used to help browse

Claims	Prior Art
	through songs stored in the MP3 player. The direction that the finger moves may be arranged to control the direction of scrolling. For example, the touch pad may be arranged to move the GUI vertically up when the finger is moved in a first direction and vertically down when the finger is moved in a second direction To elaborate, the display screen 104, during operation, may display a list of media items (e.g., songs). A user of the media player 100 is able to linearly scroll through the list of media items by moving his or her finger across the touch pad 110. As the finger moves around the touch pad 110, the displayed items from the list of media items are varied such that the user is able to effectively scroll through the list of media items. However, since the list of media items can be rather lengthy, the invention provides the ability for the user to rapidly traverse (or scroll) through the list of media items. In effect, the user is able to accelerate their traversal of the list of media items by moving his or her finger at greater speeds. Zadesky '230 at 8:52–9:21 FIGS. 3A-3C show the media player 100 of FIG. 2 being used by a user 120, in accordance with different embodiments of the invention. In all of these embodiments, the user 120 is linearly scrolling 104 (as shown by arrow 124) through a list of songs 122 displayed on the display screen via a slider bar 123. As shown, the media device 100 is comfortably held by one hand 126 while being comfortably addressed by the other hand 128. This configuration generally allows the user 120 to easily actuate the touch pad 110 with one or more fingers. For example, the thumb 130 and rightmost fingers 131 (or leftmost fingers if left handed) of the first hand 126 are used to grip the sides of the media player 100 while a finger 132 of the opposite hand 128 is used to actuate the touch pad 110. As shown, the entire top surface of the touch pad 110 is accessible to the user's finger 130. Referring to FIG. 3A, and in accordance with one embodiment of the invention, the touch pad 110 can be continuously actuated by a simple swirling motion of the finger 132 as shown by arrow 134. By swirling, it is meant that the finger moves in an arcuate or circular manner. For example, the finger may rotate relative to an imaginary axis. In particular, the finger can be rotated through 360 degrees of rotation without stopping. This form of motion may produce continuous or incremental scrolling on the display screen 104. Referring to FIG. 3B, and in accordance with one embodiment of the invention, the user 120 can slide his or her finger 132 radially between the inner and outer perimeter of the touch pad 110. For example, the touch pad 110 may be actuated radially as shown by arrow 140. Referring to FIG. 3C, and in accordance with one embodiment of the invention, the user 120 can slide his or her finger 132 substantially tangentially from all sides of the touch pad 110. For example, the touch pad 110 may be actuated forwards and backwards as shown by arrows 136 and side to side by arrows 138.

Claims	Prior Art
	Zadesky ’230 at 9:39–61 As shown, the touch pad 202 is divided into several independent and spatially distinct zones 210 that are positioned around the periphery of the touch pad 202. Any number of zones may be used. In one embodiment, each of the zones 210 represents a polar angle that specifies the angular position of the zone in the plane of the touch pad 202. By way of example, the zones 210 may be positioned at 2 degree increments all the way around the touch pad 202. Each of the zones 210 has an associated sensor disposed therein for detecting the presence of an object such as a finger. The sensors may be widely varied. For example, the sensors may be based on resistive sensing, surface acoustic wave sensing, pressure sensing (e.g., strain gauge, pressure plates, piezoelectric transducers or the like), optical sensing, capacitive sensing and the like. In general, when an object approaches a zone 210, and more particularly a sensor, a position signal is generated that informs the media system 200 that the object is at a specific angular position on the touch pad 202. When an object is moved between zones 210 or over multiple zones 210, multiple position signals are generated. These multiple position signals may be used to determine the angular location, direction, speed and acceleration of the object as its moved around the touch pad 202. Zadesky ’230 at 10:34–51 Additionally or alternatively, the system via the touch pad may be configured to transform radial motion an object such as a finger (as shown in FIG. 3B) into translational or linear motion on the display screen. By radial, it is meant that the object moves in a substantially radial direction from the center of the touch pad to an outer perimeter of the touch pad. In one embodiment, the touch pad is arranged to continuously determine the radial position of a finger relative to the planar surface of the touch pad. This allows a user to linearly scroll through a media list on the display screen by moving the object at least partially between the center and outer perimeter of the touch pad. For example, by moving the object between a small and large radius (e.g., 0–3 cm) on the touch pad. This may also allow a user to vary a characteristic of the media player. For example, by moving radially, the user may be able to change the volume of sound being played on the media player (i.e., acts like a potentiometer). Zadesky ’230 at 13:13–27 The various aspects of the invention described above can be used alone or in various combinations. The invention is preferably implemented by a combination of hardware and software, but can also be implemented in hardware or software. The invention can also be embodied as computer readable code on a computer readable medium. The computer readable medium is any data storage device that can store data which can thereafter be read by a computer system. Examples of the computer readable medium include read-only memory, random-access memory, CD-ROMs, DVDs, magnetic tape, optical data

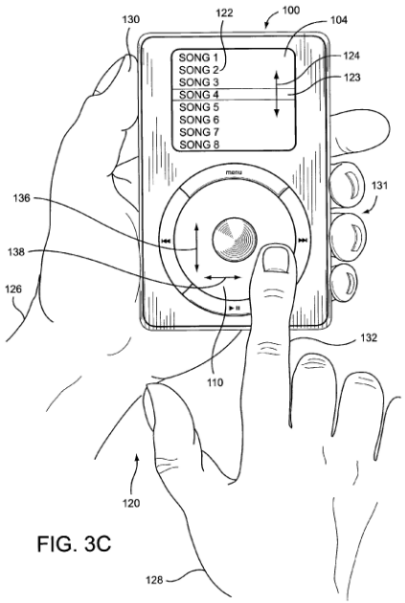
Claims	Prior Art
	storage devices, and carrier waves. The computer readable medium can also be distributed over a network coupled computer systems so that the computer readable code is stored and executed in a distributed fashion. Zadesky ’230 at 13:36–60 The advantages of the invention are numerous. Different embodiments or implementations may yield one or more of the following advantages. It should be noted that this is not an exhaustive list and there may be other advantages which are not described herein. One advantage of the invention is that a user is able to easily and rapidly traverse a lengthy list of media items. Another advantage of the invention is that a substantial portion of the touch pad is accessible to the user, i.e., the touch pad provides a large surface area for manipulation thereof. Another advantage of the invention is that the touch pad can be continuously actuated by a simple swirling motion of a finger, i.e., the finger can be rotated through 360 degrees of rotation without stopping. Another advantage of the invention is that the touch pad provides more range of finger positions. For example, a left handed user may choose to use one portion of the touch pad while a right handed user may choose to use another portion of the touch pad. In essence, the touch pad is more ergonomic. Another advantage of the invention is that the touch pad makes the media player more aesthetically pleasing. Another advantage of the invention is that the touch pad allows an intuitive way to scroll on a display screen. For example, the user can manipulate the his or her finger side to side for horizontal scrolling and the user can manipulate his or her finger backwards and forwards for vertical scrolling. A POSITA would have been motivated to combine the Jabra BT800 with Zadesky ‘230 and the Jabra BT800 with Hollomans ’490, and reasonably expected success in doing so, for the reasons explained above for [1d]. *Supra* [1d]. Both Zadesky ‘230 and Hollomans ’490 explain several advantages of sliding inputs to touch sensitive surfaces, as expalined above for [1d]. *Supra* [1d]. Including, for example, the advantage of scrolling inputs. *E.g.*, Zadesky ‘230, 13:36–60; Hollemans ’490, 8:19–33. To the extent that the Jabra BT800, Zadesky ‘230, and Hollomans ’490 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of Jabra BT800, Zadesky ‘230, and Hollomans ’490, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
6. A system as recited in claim 2, wherein the head-worn personal electronic apparatus is configured	The Jabra BT800, Hollemans ’490, and Zadesky ’230 expressly or inherently disclose “[a] system as recited in claim 2, wherein the head-worn personal electronic apparatus is configured to detect at least a sliding of a finger action with respect to the touch sensitive surface.” For example:

Claims	Prior Art
to detect at least a sliding of a finger action with respect to the touch sensitive surface.	On information and belief, the Jabra BT800 is configured to detect a sliding of a finger action on the "Jog wheel" input, e.g., left or right, as shown in by the arrows in the figures below (example of the claimed head-worn personal electronic apparatus is configured to detect at least a sliding of a finger action with respect to the touch sensitive surface). The following citations show examples of where the Jabra BT800 discloses this limitation. Jabra BT800 User Manual at Page 2 **Jabra BT800 Overview** **1** Display shows caller ID, battery status etc. **2** Answer button **3** End & on/off button **4** Jog wheel – volume and menu control **5** Mute/menu button/blue LED **6** Charging socket **7** Pairing stylus switch **8** Stylus for activating the pairing function  *Fig. 1*

Claims	Prior Art
	Jabra BT800 User Manual at Page 5 **4. Volume control and mute function** • Your Jabra BT800 headset features an automatic volume control that adjusts the volume depending on ambient noise level. You can manually adjust the volume using the volume jog wheel see Fig 5 • During a conversation, press the mute button to mute the call. You un-mute by adjusting the volume level on the volume jog wheel or by tapping on the mute button see Fig 6  *Fig. 5*  *Fig. 6* Jabra BT800 User Manual at Page 6 **2. Access the menu** From the menu, you can adjust your settings according to your preferences. See Fig 7 • Access the menu when your are not receiving or making a call with a press on the mute / menu button • Use the jog wheel to navigate the menu • Select or activate a menu item with a tap on the answer button • Exit / go back in the menu with a tap on the end button   5 *Fig. 7* Hollemans ’490’s “touchpad” or “touch–sensitive area” (example of the claimed touch sensitive surface) can be “used for picking up a gesture made on the area” with a “finger” (example of the claimed head-worn personal electronic apparatus is configured to detect at least a sliding of a finger action with respect to the touch sensitive surface).

Claims	Prior Art
	The following citations show examples of where the Hollemans ’490 discloses this limitation. Hollemans ’490 at 1:10–3:21 A personal audio system as described in the opening paragraph is known from the now ubiquitous mobile audio devices like MP3 players and mobile phones. One particular example of such a system is the iPod MP3 player from Apple as reviewed in c’t 2002 Heft 26, pages 132-141, “Plattenmeister” by Peter Nonhoff-Arps, Sven Hansen, and available with product no. M8737LL/A (see also http://www.apple.com/ipod/). This and similar products typically comprise a set of two earpieces also known as ear buds that can be inserted into the ears of the user. These products typically also include a remote controller for controlling one or more functions of the device. A plug connects both the remote controller and the earpieces with the device, by plugging it into a socket of the device. The remote controller is usually included in the wire somewhere between the earpieces and the plug. As a result, the remote control has no fixed position but is dangling about as part of the wire. Hence, when the user wants to use the remote control for e.g. lowering volume, muting, or skipping an audio track or station, the user first needs to look for the remote controller. Subsequently, the user needs to get hold of the controller. This needs to be done in such a way that the controller has the right orientation for operating it. Finally, after being confident about the orientation of the controller, the user may try to find and operate the tiny button to activate the desired function. This requires considerable time and attention from the user, which may lead to dangerous situations when the user takes part in traffic. It is an object of the present invention to provide a personal audio system as described in the opening paragraph that does not suffer from the above-mentioned drawbacks. 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. The remote controller thus gets a fixed position with respect to the user in or by the human ear. It is easy to find one's ear. This prevents looking for the remote controller. In addition, the user is not tempted to look at the remote controller, because there is nothing relevant to be seen for controlling the device. To avoid having to find tiny buttons, merely touching the remote controller somewhere on its touch-sensitive area operates said remote controller, which detects being touched and subsequently sends the control signal to the device. Also the problem of finding the proper orientation of the remote controller is solved by wearing the remote controller in or by the ear, because its orientation becomes fixed with respect to the user. Advantageously, the controller is arranged to fit substantially in a human ear concha, such that the area is

Claims	Prior Art
	accessible for touching when the controller is fitted substantially in the concha. This fits in with a particularly comfortable and popular shape for the earpieces or ear buds. The shape consists of a thick disc containing a transducer and a protruding part from which a wire extends. When being worn, the protruding part of the earpiece offers a surface area that is easily accessible for touching. Advantageously, the controller is arranged to detect a temporal pattern in the touch-sensitive area being touched, and to send the control signal in response to detecting the temporal pattern. In general, the device offers a plurality of functions and capabilities. Rather than having more buttons on the remote control that may be hard to distinguish, the single touch-sensitive area is used for controlling the plurality of functions. The temporal pattern is a particularly appropriate user interface, because it is easy to create temporal patterns in touching the area rhythmically and because the temporal patterns can constitute a natural and consistent interface. 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. Advantageously, the outer surface has a further touch-sensitive area, such that the further touch-sensitive area is touched substantially by the ear when the controller is substantially worn in or by a human ear, the controller being arranged to send the control signal only if the further touch-sensitive area is touched. This will prevent the accidental remote control of the device when the remote controller is not worn, thus preventing unwanted activation of the device and unnecessary battery exhaustion. Advantageously, the controller is arranged to send a further control signal to the device if the further touch-sensitive area is touched. This makes it, for example, possible for the device to pause playing music as soon as the earpiece is taken out and to resume playing music upon re-insertion. In an embodiment of the personal audio system according to the invention, the system comprises a second controller for remotely controlling the device by sending a further control signal to the device, the second controller having an outer surface with a further touch-sensitive area, the second controller being arranged to be substantially worn in or by a human ear, and the second controller being further arranged to detect a further temporal pattern in the further touch-sensitive area being touched, and to send the further control signal in response to detecting the further temporal pattern. A second controller fits in with the natural symmetry of the human head. It also considerably enhances the user interface for controlling the device. For example, the symmetry can be exploited in such a way that a long tap at the left remote controller decreases the volume, but a long tap at the right controller increases the volume. Hollemans ’490 at 8:19–33 In a third way, the touch-sensitive area is used for picking up a gesture made on the area with e.g. a stylus or a finger. The remote control may be extended for this purpose with means for detecting a gesture, e.g. a laser beetle, a small camera, an IR movement sensor, or a cross-capacitance sensor. The system may be arranged to detect a gesture being made on the area. The gesture detected may be used for controlling a setting of the system. Examples of a setting are a selection of a next or a previous track, a volume, a

Claims	Prior Art
	position of a stereo image, e.g. a panning position, a balance position. The gesture detected may also be used for controlling a mouse pointer, navigating a menu, entering a tapping pattern, scrolling content on display. The 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. The list may contain items like contacts, artists, song titles, etc. The gesture detected may be a user defined gesture for activating a user defined function. The gesture detected may be used for user identification by matching with initials or an autograph. The gesture may extend into two dimensions, e.g. a planar gesture, or it may extend into three dimensions. Zadesky ’230 discloses that its “touch pad 110” is configured to “receive input from a finger moving across the surface of the touch pad 110,” e.g., from a “linear finger motion” (example of the claimed head-worn personal electronic apparatus is configured to detect at least a sliding of a finger action with respect to the touch sensitive surface). The following citations show examples of where the Zadesky ’230 discloses this limitation. Zadesky ’230 at Figure 3C  FIG. 3C Zadesky ’230 at 1:47–65 In portable computing devices such as laptop computers, the input devices are commonly touch pads.

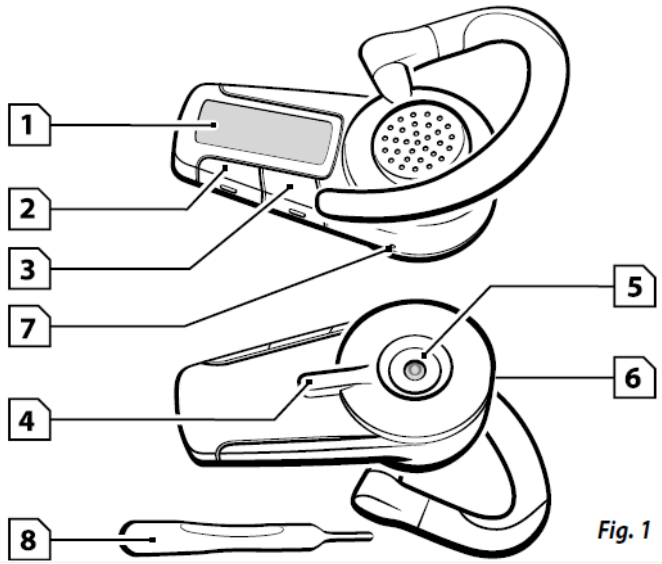
Claims	Prior Art
	With a touch pad, the movement of an input pointer (i.e., cursor) corresponds to the relative movements of the user's finger (or stylus) as the finger is moved along a surface of the touch pad. Touch pads can also make a selection on the display screen when one or more taps are detected on the surface of the touch pad. In some cases, any portion of the touch pad may be tapped, and in other cases a dedicated portion of the touch pad may be tapped. In stationary devices such as desktop computers, the input devices are generally selected from mice and trackballs. With a mouse, the movement of the input pointer corresponds to the relative movements of the mouse as the user moves the mouse along a surface. With a trackball, the movement of the input pointer corresponds to the relative movements of a ball as the user rotates the ball within a housing. Both mice and trackballs generally include one or more buttons for making selections on the display screen. Zadesky ’230 at 2:29–43 To elaborate further, touch pads generally include one or more sensors for detecting the proximity of the finger thereto. By way of example, the sensors may be based on resistive sensing, surface acoustic wave sensing, pressure sensing (e.g., strain gauge), optical sensing, capacitive sensing and the like. The sensors are generally dispersed about the touch pad with each sensor representing an x, y position. In most cases, the sensors are arranged in a grid of columns and rows. Distinct x and y position signals, which control the x, y movement of a pointer device on the display screen, are thus generated when a finger is moved across the grid of sensors within the touch pad. For brevity sake, the remaining discussion will be held to the discussion of capacitive sensing technologies. It should be noted, however, that the other technologies have similar features. Zadesky ’230 at 2:44–3:5 Capacitive sensing touch pads generally contain several layers of material. For example, the touch pad may include a protective shield, one or more electrode layers and a circuit board. The protective shield typically covers the electrode layer(s), and the electrode layer(s) is generally disposed on a front side of the circuit board. As is generally well known, the protective shield is the part of the touch pad that is touched by the user to implement cursor movements on a display screen. The electrode layer(s), on the other hand, is used to interpret the x, y position of the user's finger when the user's finger is resting or moving on the protective shield. The electrode layer (s) typically consists of a plurality of electrodes that are positioned in columns and rows so as to form a grid array. The columns and rows are generally based on the Cartesian coordinate system and thus the rows and columns correspond to the x and y directions. The touch pad may also include sensing electronics for detecting signals associated with the electrodes. For example, the sensing electronics may be adapted to detect the change in capacitance at each of the

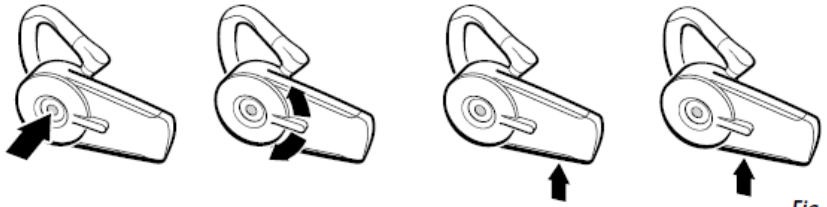
Claims	Prior Art
	electrodes as the finger passes over the grid. The sensing electronics are generally located on the backside of the circuit board. By way of example, the sensing electronics may include an application specific integrated circuit (ASIC) that is configured to measure the amount of capacitance in each of the electrodes and to compute the position of finger movement based on the capacitance in each of the electrodes. The ASIC may also be configured to report this information to the computing device. Zadesky '230 at 4:37–49 The present invention relates to touch pads. According to one aspect of the invention, a touch pad is provided on a media player to facilitate user interaction therewith. In one embodiment, the media player is a handheld device. According to another aspect of the invention, a touch pad is provided that can sense and resolve angular and/or radial positions of a moving object (e.g., finger) as it is moved in a largely rotational and/or radial manner across the touch pad. In one embodiment, the touch pad that is based on polar coordinates rather than Cartesian coordinates. Other aspects of the invention will become apparent below. In any case, the aspects are not limiting and the various aspects of the invention can be used separately or in combination. Zadesky '230 at 5:61–6:19 The media player 100 also includes a touch pad 110. The touch pad 110 is configured to provide one or more control functions for controlling various applications associated with the media player 100. For example, the touch initiated control function may be used to move an object or perform an action on the display screen 104 or to make selections or issue commands associated with operating the media player 100. In most cases, the touch pad 110 is arranged to receive input from a finger moving across the surface of the touch pad 110 in order to implement the touch initiated control function. The touch pad may be widely varied. For example, the touch pad be a conventional touch pad based on the Cartesian coordinate system, or the touch pad may be a touch pad based on a polar coordinate system (the later will be described in greater detail below). The manner in which the touch pad 110 receives input may be widely varied. In one embodiment, the touch pad 110 is configured receive input from a linear finger motion. In another embodiment, the touch pad 110 is configured receive input from a rotary or swirling finger motion. In yet another embodiment, the touch pad 110 is configured receive input from a radial finger motion. Additionally or alternatively, the touch pad 110 may be arranged to receive input from a finger tapping on the touch pad 100. By way of example, the tapping finger may initiate a control function for playing a song, opening a menu and the like. Zadesky '230 at 6:38–7:5 The direction of scrolling may be widely varied. For example, scrolling may be implemented vertically

Claims	Prior Art
	(up or down) or horizontally (left or right). In the case of vertical scrolling, when a user scrolls down, each new set of data appears at the bottom of the viewing area and all other sets of data move up one position. If the viewing area is full, the top set of data moves out of the viewing area. Similarly, when a user scrolls up, each new set of data appears at the top of the viewing area and all other sets of data move down one position. If the viewing area is full, the bottom set of data moves out of the viewing area. In one implementation, the scrolling feature may be used to move a Graphical User Interface (GUI) vertically (up and down), or horizontally (left and right) in order to bring more data into view on a display screen. By way of example, in the case of an MP3 player, the scrolling feature may be used to help browse through songs stored in the MP3 player. The direction that the finger moves may be arranged to control the direction of scrolling. For example, the touch pad may be arranged to move the GUI vertically up when the finger is moved in a first direction and vertically down when the finger is moved in a second direction To elaborate, the display screen 104, during operation, may display a list of media items (e.g., songs). A user of the media player 100 is able to linearly scroll through the list of media items by moving his or her finger across the touch pad 110. As the finger moves around the touch pad 110, the displayed items from the list of media items are varied such that the user is able to effectively scroll through the list of media items. However, since the list of media items can be rather lengthy, the invention provides the ability for the user to rapidly traverse (or scroll) through the list of media items. In effect, the user is able to accelerate their traversal of the list of media items by moving his or her finger at greater speeds. Zadesky ’230 at 8:52–9:21 FIGS. 3A-3C show the media player 100 of FIG. 2 being used by a user 120, in accordance with different embodiments of the invention. In all of these embodiments, the user 120 is linearly scrolling 104 (as shown by arrow 124) through a list of songs 122 displayed on the display screen via a slider bar 123. As shown, the media device 100 is comfortably held by one hand 126 while being comfortably addressed by the other hand 128. This configuration generally allows the user 120 to easily actuate the touch pad 110 with one or more fingers. For example, the thumb 130 and rightmost fingers 131 (or leftmost fingers if left handed) of the first hand 126 are used to grip the sides of the media player 100 while a finger 132 of the opposite hand 128 is used to actuate the touch pad 110. As shown, the entire top surface of the touch pad 110 is accessible to the user's finger 130. Referring to FIG. 3A, and in accordance with one embodiment of the invention, the touch pad 110 can be continuously actuated by a simple swirling motion of the finger 132 as shown by arrow 134. By swirling, it is meant that the finger moves in an arcuate or circular manner. For example, the finger may rotate relative to an imaginary axis. In particular, the finger can be rotated through 360 degrees of rotation without stopping. This form of motion may produce continuous or incremental scrolling on the display screen 104.

Claims	Prior Art
	Referring to FIG. 3B, and in accordance with one embodiment of the invention, the user 120 can slide his or her finger 132 radially between the inner and outer perimeter of the touch pad 110. For example, the touch pad 110 may be actuated radially as shown by arrow 140. Referring to FIG. 3C, and in accordance with one embodiment of the invention, the user 120 can slide his or her finger 132 substantially tangentially from all sides of the touch pad 110. For example, the touch pad 110 may be actuated forwards and backwards as shown by arrows 136 and side to side by arrows 138. Zadesky '230 at 9:39–61 As shown, the touch pad 202 is divided into several independent and spatially distinct zones 210 that are positioned around the periphery of the touch pad 202. Any number of zones may be used. In one embodiment, each of the zones 210 represents a polar angle that specifies the angular position of the zone in the plane of the touch pad 202. By way of example, the zones 210 may be positioned at 2 degree increments all the way around the touch pad 202. Each of the zones 210 has an associated sensor disposed therein for detecting the presence of an object such as a finger. The sensors may be widely varied. For example, the sensors may be based on resistive sensing, surface acoustic wave sensing, pressure sensing (e.g., strain gauge, pressure plates, piezoelectric transducers or the like), optical sensing, capacitive sensing and the like. In general, when an object approaches a zone 210, and more particularly a sensor, a position signal is generated that informs the media system 200 that the object is at a specific angular position on the touch pad 202. When an object is moved between zones 210 or over multiple zones 210, multiple position signals are generated. These multiple position signals may be used to determine the angular location, direction, speed and acceleration of the object as its moved around the touch pad 202. Zadesky '230 at 10:34–51 Additionally or alternatively, the system via the touch pad may be configured to transform radial motion an object such as a finger (as shown in FIG. 3B) into translational or linear motion on the display screen. By radial, it is meant that the object moves in a substantially radial direction from the center of the touch pad to an outer perimeter of the touch pad. In one embodiment, the touch pad is arranged to continuously determine the radial position of a finger relative to the planar surface of the touch pad. This allows a user to linearly scroll through a media list on the display screen by moving the object at least partially between the center and outer perimeter of the touch pad. For example, by moving the object between a small and large radius (e.g., 0–3 cm) on the touch pad. This may also allow a user to vary a characteristic of the media player. For example, by moving radially, the user may be able to change the volume of sound being played on the media player (i.e., acts like a potentiometer).

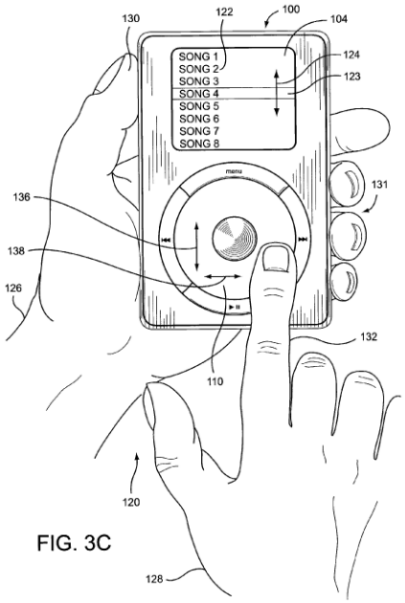
Claims	Prior Art
	Zadesky ’230 at 13:13–27 The various aspects of the invention described above can be used alone or in various combinations. The invention is preferably implemented by a combination of hardware and software, but can also be implemented in hardware or software. The invention can also be embodied as computer readable code on a computer readable medium. The computer readable medium is any data storage device that can store data which can thereafter be read by a computer system. Examples of the computer readable medium include read-only memory, random-access memory, CD-ROMs, DVDs, magnetic tape, optical data storage devices, and carrier waves. The computer readable medium can also be distributed over a network coupled computer systems so that the computer readable code is stored and executed in a distributed fashion. Zadesky ’230 at 13:36–60 The advantages of the invention are numerous. Different embodiments or implementations may yield one or more of the following advantages. It should be noted that this is not an exhaustive list and there may be other advantages which are not described herein. One advantage of the invention is that a user is able to easily and rapidly traverse a lengthy list of media items. Another advantage of the invention is that a substantial portion of the touch pad is accessible to the user, i.e., the touch pad provides a large surface area for manipulation thereof. Another advantage of the invention is that the touch pad can be continuously actuated by a simple swirling motion of a finger, i.e., the finger can be rotated through 360 degrees of rotation without stopping. Another advantage of the invention is that the touch pad provides more range of finger positions. For example, a left handed user may choose to use one portion of the touch pad while a right handed user may choose to use another portion of the touch pad. In essence, the touch pad is more ergonomic. Another advantage of the invention is that the touch pad makes the media player more aesthetically pleasing. Another advantage of the invention is that the touch pad allows an intuitive way to scroll on a display screen. For example, the user can manipulate the his or her finger side to side for horizontal scrolling and the user can manipulate his or her finger backwards and forwards for vertical scrolling. A POSITA would have been motivated to combine the Jabra BT800 with Zadesky ’230 and the Jabra BT800 with Holleman ’490, and reasonably expected success in doing so, for the reasons explained above for claim 5. Supra claim 5. To the extent that Jabra BT800, Hollemans ’490, and Zadesky ’230 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the

Claims	Prior Art
	teachings of Jabra BT800, Hollemans ’490, and Zadesky ’230, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
7. A system as recited in claim 2, wherein the head-worn personal electronic apparatus is configured to facilitate determination at least whether the user input pertains to a forward sliding action or a backward sliding action with respect to the touch sensitive surface.	The Jabra BT800, Hollemans ’490, and Zadesky ’230 expressly or inherently disclose “[a] system as recited in claim 2, wherein the head-worn personal electronic apparatus is configured to facilitate determination at least whether the user input pertains to a forward sliding action or a backward sliding action with respect to the touch sensitive surface.” For example: On information and belief, the Jabra BT800 is configured to detect the back and forth direction of a finger sliding action on the “Jog wheel” input, e.g., left or right, as shown in by the arrows in the figures below (example of the claimed head-worn personal electronic apparatus is configured to facilitate determination at least whether the user input pertains to a forward sliding action or a backward sliding action with respect to the touch sensitive surface). The following citations show examples of where the Jabra BT800 discloses this limitation. Jabra BT800 User Manual at Page 2 **Jabra BT800 Overview** **1** Display shows caller ID, battery status etc. **2** Answer button **3** End & on/off button **4** Jog wheel – volume and menu control **5** Mute/menu button/blue LED **6** Charging socket **7** Pairing stylus switch **8** Stylus for activating the pairing function  *Fig. 1*

Claims	Prior Art
	Jabra BT800 User Manual at Page 5 **4. Volume control and mute function** • Your Jabra BT800 headset features an automatic volume control that adjusts the volume depending on ambient noise level. You can manually adjust the volume using the volume jog wheel see Fig 5 • During a conversation, press the mute button to mute the call. You un-mute by adjusting the volume level on the volume jog wheel or by tapping on the mute button see Fig 6  *Fig. 5*  *Fig. 6* Jabra BT800 User Manual at Page 6 **2. Access the menu** From the menu, you can adjust your settings according to your preferences. See Fig 7 • Access the menu when your are not receiving or making a call with a press on the mute / menu button • Use the jog wheel to navigate the menu • Select or activate a menu item with a tap on the answer button • Exit / go back in the menu with a tap on the end button   5 *Fig. 7* Hollemans ’490’s “touchpad” or “touch–sensitive area” (example of the claimed touch sensitive surface) can be “used for picking up a gesture made on the area” with a “finger” (example of the claimed wherein the head-worn personal electronic apparatus is configured to facilitate determination at least whether the user input pertains to a forward sliding action or a backward sliding action with respect to the touch sensitive surface).

Claims	Prior Art
	The following citations show examples of where the Hollemans ’490 discloses this limitation. Hollemans ’490 at 1:10–3:21 A personal audio system as described in the opening paragraph is known from the now ubiquitous mobile audio devices like MP3 players and mobile phones. One particular example of such a system is the iPod MP3 player from Apple as reviewed in c’t 2002 Heft 26, pages 132-141, “Plattenmeister” by Peter Nonhoff-Arps, Sven Hansen, and available with product no. M8737LL/A (see also http://www.apple.com/ipod/). This and similar products typically comprise a set of two earpieces also known as ear buds that can be inserted into the ears of the user. These products typically also include a remote controller for controlling one or more functions of the device. A plug connects both the remote controller and the earpieces with the device, by plugging it into a socket of the device. The remote controller is usually included in the wire somewhere between the earpieces and the plug. As a result, the remote control has no fixed position but is dangling about as part of the wire. Hence, when the user wants to use the remote control for e.g. lowering volume, muting, or skipping an audio track or station, the user first needs to look for the remote controller. Subsequently, the user needs to get hold of the controller. This needs to be done in such a way that the controller has the right orientation for operating it. Finally, after being confident about the orientation of the controller, the user may try to find and operate the tiny button to activate the desired function. This requires considerable time and attention from the user, which may lead to dangerous situations when the user takes part in traffic. It is an object of the present invention to provide a personal audio system as described in the opening paragraph that does not suffer from the above-mentioned drawbacks. 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. The remote controller thus gets a fixed position with respect to the user in or by the human ear. It is easy to find one's ear. This prevents looking for the remote controller. In addition, the user is not tempted to look at the remote controller, because there is nothing relevant to be seen for controlling the device. To avoid having to find tiny buttons, merely touching the remote controller somewhere on its touch-sensitive area operates said remote controller, which detects being touched and subsequently sends the control signal to the device. Also the problem of finding the proper orientation of the remote controller is solved by wearing the remote controller in or by the ear, because its orientation becomes fixed with respect to the user. Advantageously, the controller is arranged to fit substantially in a human ear concha, such that the area is

Claims	Prior Art
	accessible for touching when the controller is fitted substantially in the concha. This fits in with a particularly comfortable and popular shape for the earpieces or ear buds. The shape consists of a thick disc containing a transducer and a protruding part from which a wire extends. When being worn, the protruding part of the earpiece offers a surface area that is easily accessible for touching. Advantageously, the controller is arranged to detect a temporal pattern in the touch-sensitive area being touched, and to send the control signal in response to detecting the temporal pattern. In general, the device offers a plurality of functions and capabilities. Rather than having more buttons on the remote control that may be hard to distinguish, the single touch-sensitive area is used for controlling the plurality of functions. The temporal pattern is a particularly appropriate user interface, because it is easy to create temporal patterns in touching the area rhythmically and because the temporal patterns can constitute a natural and consistent interface. 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. Advantageously, the outer surface has a further touch-sensitive area, such that the further touch-sensitive area is touched substantially by the ear when the controller is substantially worn in or by a human ear, the controller being arranged to send the control signal only if the further touch-sensitive area is touched. This will prevent the accidental remote control of the device when the remote controller is not worn, thus preventing unwanted activation of the device and unnecessary battery exhaustion. Advantageously, the controller is arranged to send a further control signal to the device if the further touch-sensitive area is touched. This makes it, for example, possible for the device to pause playing music as soon as the earpiece is taken out and to resume playing music upon re-insertion. In an embodiment of the personal audio system according to the invention, the system comprises a second controller for remotely controlling the device by sending a further control signal to the device, the second controller having an outer surface with a further touch-sensitive area, the second controller being arranged to be substantially worn in or by a human ear, and the second controller being further arranged to detect a further temporal pattern in the further touch-sensitive area being touched, and to send the further control signal in response to detecting the further temporal pattern. A second controller fits in with the natural symmetry of the human head. It also considerably enhances the user interface for controlling the device. For example, the symmetry can be exploited in such a way that a long tap at the left remote controller decreases the volume, but a long tap at the right controller increases the volume. Hollemans ’490 at 8:19–33 In a third way, the touch-sensitive area is used for picking up a gesture made on the area with e.g. a stylus or a finger. The remote control may be extended for this purpose with means for detecting a gesture, e.g. a laser beetle, a small camera, an IR movement sensor, or a cross-capacitance sensor. The system may be arranged to detect a gesture being made on the area. The gesture detected may be used for controlling a setting of the system. Examples of a setting are a selection of a next or a previous track, a volume, a

Claims	Prior Art
	position of a stereo image, e.g. a panning position, a balance position. The gesture detected may also be used for controlling a mouse pointer, navigating a menu, entering a tapping pattern, scrolling content on display. The 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. The list may contain items like contacts, artists, song titles, etc. The gesture detected may be a user defined gesture for activating a user defined function. The gesture detected may be used for user identification by matching with initials or an autograph. The gesture may extend into two dimensions, e.g. a planar gesture, or it may extend into three dimensions. Zadesky ’230’s sliding action on the touchpad “may be actuated forwards and backwards” (example of the claimed electronic apparatus is configured to facilitate determination at least whether the user input pertains to a forward sliding action or a backward sliding action with respect to the touch sensitive surface). The following citations show examples of where the Zadesky ’230 discloses this limitation. Zadesky ’230 at Figure 3C  FIG. 3C Zadesky ’230 at 1:47–65 In portable computing devices such as laptop computers, the input devices are commonly touch pads. With a touch pad, the movement of an input pointer (i.e., cursor) corresponds to the relative movements of

Claims	Prior Art
	the user's finger (or stylus) as the finger is moved along a surface of the touch pad. Touch pads can also make a selection on the display screen when one or more taps are detected on the surface of the touch pad. In some cases, any portion of the touch pad may be tapped, and in other cases a dedicated portion of the touch pad may be tapped. In stationary devices such as desktop computers, the input devices are generally selected from mice and trackballs. With a mouse, the movement of the input pointer corresponds to the relative movements of the mouse as the user moves the mouse along a surface. With a trackball, the movement of the input pointer corresponds to the relative movements of a ball as the user rotates the ball within a housing. Both mice and trackballs generally include one or more buttons for making selections on the display screen. Zadesky ’230 at 2:29–43 To elaborate further, touch pads generally include one or more sensors for detecting the proximity of the finger thereto. By way of example, the sensors may be based on resistive sensing, surface acoustic wave sensing, pressure sensing (e.g., strain gauge), optical sensing, capacitive sensing and the like. The sensors are generally dispersed about the touch pad with each sensor representing an x, y position. In most cases, the sensors are arranged in a grid of columns and rows. Distinct x and y position signals, which control the x, y movement of a pointer device on the display screen, are thus generated when a finger is moved across the grid of sensors within the touch pad. For brevity sake, the remaining discussion will be held to the discussion of capacitive sensing technologies. It should be noted, however, that the other technologies have similar features. Zadesky ’230 at 2:44–3:5 Capacitive sensing touch pads generally contain several layers of material. For example, the touch pad may include a protective shield, one or more electrode layers and a circuit board. The protective shield typically covers the electrode layer(s), and the electrode layer(s) is generally disposed on a front side of the circuit board. As is generally well known, the protective shield is the part of the touch pad that is touched by the user to implement cursor movements on a display screen. The electrode layer(s), on the other hand, is used to interpret the x, y position of the user's finger when the user's finger is resting or moving on the protective shield. The electrode layer (s) typically consists of a plurality of electrodes that are positioned in columns and rows so as to form a grid array. The columns and rows are generally based on the Cartesian coordinate system and thus the rows and columns correspond to the x and y directions. The touch pad may also include sensing electronics for detecting signals associated with the electrodes. For example, the sensing electronics may be adapted to detect the change in capacitance at each of the electrodes as the finger passes over the grid. The sensing electronics are generally located on the backside

Claims	Prior Art
	of the circuit board. By way of example, the sensing electronics may include an application specific integrated circuit (ASIC) that is configured to measure the amount of capacitance in each of the electrodes and to compute the position of finger movement based on the capacitance in each of the electrodes. The ASIC may also be configured to report this information to the computing device. Zadesky '230 at 4:37–49 The present invention relates to touch pads. According to one aspect of the invention, a touch pad is provided on a media player to facilitate user interaction therewith. In one embodiment, the media player is a handheld device. According to another aspect of the invention, a touch pad is provided that can sense and resolve angular and/or radial positions of a moving object (e.g., finger) as it is moved in a largely rotational and/or radial manner across the touch pad. In one embodiment, the touch pad that is based on polar coordinates rather than Cartesian coordinates. Other aspects of the invention will become apparent below. In any case, the aspects are not limiting and the various aspects of the invention can be used separately or in combination. Zadesky '230 at 5:61–6:19 The media player 100 also includes a touch pad 110. The touch pad 110 is configured to provide one or more control functions for controlling various applications associated with the media player 100. For example, the touch initiated control function may be used to move an object or perform an action on the display screen 104 or to make selections or issue commands associated with operating the media player 100. In most cases, the touch pad 110 is arranged to receive input from a finger moving across the surface of the touch pad 110 in order to implement the touch initiated control function. The touch pad may be widely varied. For example, the touch pad be a conventional touch pad based on the Cartesian coordinate system, or the touch pad may be a touch pad based on a polar coordinate system (the later will be described in greater detail below). The manner in which the touch pad 110 receives input may be widely varied. In one embodiment, the touch pad 110 is configured receive input from a linear finger motion. In another embodiment, the touch pad 110 is configured receive input from a rotary or swirling finger motion. In yet another embodiment, the touch pad 110 is configured receive input from a radial finger motion. Additionally or alternatively, the touch pad 110 may be arranged to receive input from a finger tapping on the touch pad 100. By way of example, the tapping finger may initiate a control function for playing a song, opening a menu and the like. Zadesky '230 at 6:38–7:5 The direction of scrolling may be widely varied. For example, scrolling may be implemented vertically (up or down) or horizontally (left or right). In the case of vertical scrolling, when a user scrolls down,

Claims	Prior Art
	each new set of data appears at the bottom of the viewing area and all other sets of data move up one position. If the viewing area is full, the top set of data moves out of the viewing area. Similarly, when a user scrolls up, each new set of data appears at the top of the viewing area and all other sets of data move down one position. If the viewing area is full, the bottom set of data moves out of the viewing area. In one implementation, the scrolling feature may be used to move a Graphical User Interface (GUI) vertically (up and down), or horizontally (left and right) in order to bring more data into view on a display screen. By way of example, in the case of an MP3 player, the scrolling feature may be used to help browse through songs stored in the MP3 player. The direction that the finger moves may be arranged to control the direction of scrolling. For example, the touch pad may be arranged to move the GUI vertically up when the finger is moved in a first direction and vertically down when the finger is moved in a second direction To elaborate, the display screen 104, during operation, may display a list of media items (e.g., songs). A user of the media player 100 is able to linearly scroll through the list of media items by moving his or her finger across the touch pad 110. As the finger moves around the touch pad 110, the displayed items from the list of media items are varied such that the user is able to effectively scroll through the list of media items. However, since the list of media items can be rather lengthy, the invention provides the ability for the user to rapidly traverse (or scroll) through the list of media items. In effect, the user is able to accelerate their traversal of the list of media items by moving his or her finger at greater speeds. Zadesky '230 at 8:52–9:21 FIGS. 3A-3C show the media player 100 of FIG. 2 being used by a user 120, in accordance with different embodiments of the invention. In all of these embodiments, the user 120 is linearly scrolling 104 (as shown by arrow 124) through a list of songs 122 displayed on the display screen via a slider bar 123. As shown, the media device 100 is comfortably held by one hand 126 while being comfortably addressed by the other hand 128. This configuration generally allows the user 120 to easily actuate the touch pad 110 with one or more fingers. For example, the thumb 130 and rightmost fingers 131 (or leftmost fingers if left handed) of the first hand 126 are used to grip the sides of the media player 100 while a finger 132 of the opposite hand 128 is used to actuate the touch pad 110. As shown, the entire top surface of the touch pad 110 is accessible to the user's finger 130. Referring to FIG. 3A, and in accordance with one embodiment of the invention, the touch pad 110 can be continuously actuated by a simple swirling motion of the finger 132 as shown by arrow 134. By swirling, it is meant that the finger moves in an arcuate or circular manner. For example, the finger may rotate relative to an imaginary axis. In particular, the finger can be rotated through 360 degrees of rotation without stopping. This form of motion may produce continuous or incremental scrolling on the display screen 104. Referring to FIG. 3B, and in accordance with one embodiment of the invention, the user 120 can slide his

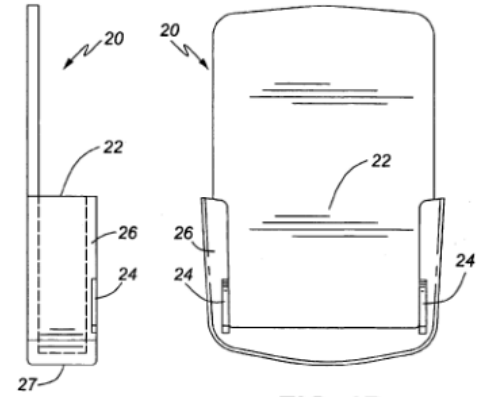
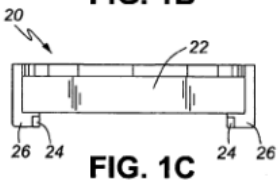
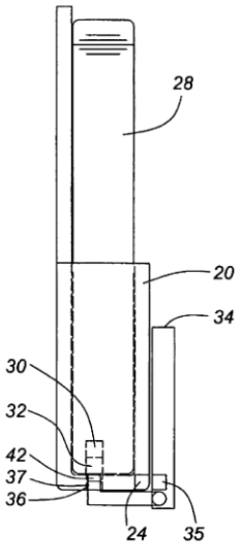
Claims	Prior Art
	or her finger 132 radially between the inner and outer perimeter of the touch pad 110. For example, the touch pad 110 may be actuated radially as shown by arrow 140. Referring to FIG. 3C, and in accordance with one embodiment of the invention, the user 120 can slide his or her finger 132 substantially tangentially from all sides of the touch pad 110. For example, the touch pad 110 may be actuated forwards and backwards as shown by arrows 136 and side to side by arrows 138. Zadesky '230 at 9:39–61 As shown, the touch pad 202 is divided into several independent and spatially distinct zones 210 that are positioned around the periphery of the touch pad 202. Any number of zones may be used. In one embodiment, each of the zones 210 represents a polar angle that specifies the angular position of the zone in the plane of the touch pad 202. By way of example, the zones 210 may be positioned at 2 degree increments all the way around the touch pad 202. Each of the zones 210 has an associated sensor disposed therein for detecting the presence of an object such as a finger. The sensors may be widely varied. For example, the sensors may be based on resistive sensing, surface acoustic wave sensing, pressure sensing (e.g., strain gauge, pressure plates, piezoelectric transducers or the like), optical sensing, capacitive sensing and the like. In general, when an object approaches a zone 210, and more particularly a sensor, a position signal is generated that informs the media system 200 that the object is at a specific angular position on the touch pad 202. When an object is moved between zones 210 or over multiple zones 210, multiple position signals are generated. These multiple position signals may be used to determine the angular location, direction, speed and acceleration of the object as its moved around the touch pad 202. Zadesky '230 at 10:34–51 Additionally or alternatively, the system via the touch pad may be configured to transform radial motion an object such as a finger (as shown in FIG. 3B) into translational or linear motion on the display screen. By radial, it is meant that the object moves in a substantially radial direction from the center of the touch pad to an outer perimeter of the touch pad. In one embodiment, the touch pad is arranged to continuously determine the radial position of a finger relative to the planar surface of the touch pad. This allows a user to linearly scroll through a media list on the display screen by moving the object at least partially between the center and outer perimeter of the touch pad. For example, by moving the object between a small and large radius (e.g., 0–3 cm) on the touch pad. This may also allow a user to vary a characteristic of the media player. For example, by moving radially, the user may be able to change the volume of sound being played on the media player (i.e., acts like a potentiometer). Zadesky '230 at 13:13–27 The various aspects of the invention described above can be used alone or in various combinations. The

Claims	Prior Art
	invention is preferably implemented by a combination of hardware and software, but can also be implemented in hardware or software. The invention can also be embodied as computer readable code on a computer readable medium. The computer readable medium is any data storage device that can store data which can thereafter be read by a computer system. Examples of the computer readable medium include read-only memory, random-access memory, CD-ROMs, DVDs, magnetic tape, optical data storage devices, and carrier waves. The computer readable medium can also be distributed over a network coupled computer systems so that the computer readable code is stored and executed in a distributed fashion. Zadesky '230 at 13:36–60 The advantages of the invention are numerous. Different embodiments or implementations may yield one or more of the following advantages. It should be noted that this is not an exhaustive list and there may be other advantages which are not described herein. One advantage of the invention is that a user is able to easily and rapidly traverse a lengthy list of media items. Another advantage of the invention is that a substantial portion of the touch pad is accessible to the user, i.e., the touch pad provides a large surface area for manipulation thereof. Another advantage of the invention is that the touch pad can be continuously actuated by a simple swirling motion of a finger, i.e., the finger can be rotated through 360 degrees of rotation without stopping. Another advantage of the invention is that the touch pad provides more range of finger positions. For example, a left handed user may choose to use one portion of the touch pad while a right handed user may choose to use another portion of the touch pad. In essence, the touch pad is more ergonomic. Another advantage of the invention is that the touch pad makes the media player more aesthetically pleasing. Another advantage of the invention is that the touch pad allows an intuitive way to scroll on a display screen. For example, the user can manipulate the his or her finger side to side for horizontal scrolling and the user can manipulate his or her finger backwards and forwards for vertical scrolling. A POSITA would have been motivated to combine the Jabra BT800 and Zadesky '230 and the Jabra BT800 with Hollemans '490, and reasonably expected success in doing so, for the reasons explained for claims 5 and 6. *Supra* claims 5–6. To the extent that the Jabra BT800, Hollemans '490, and Zadesky '230 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Hollemans '490, and Zadesky '230, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.

Claims	Prior Art
8. A system as recited in claim 1, wherein the head-worn structure comprises: a physical condition sensor at least partially contained within the head-worn structure and configured to acquire data pertaining to a physical condition of the user, the physical condition sensor being provided at least partially contained within the head-worn structure.	The Jabra BT800, Griffin ’456, and Abreu ’960 expressly or inherently disclose “wherein the head-worn structure comprises: a physical condition sensor at least partially contained within the head-worn structure and configured to acquire data pertaining to a physical condition of the user, the physical condition sensor being provided at least partially contained within the head-worn structure.” For example: Griffin ’456’s “second communication module” (example of the claimed head–worn structure) includes “include sensory circuits for monitoring the communication device user's vital information such as pulse and blood pressure” (example of the claimed a physical condition sensor at least partially contained within the head-worn structure and configured to acquire data pertaining to a physical condition of the user, the physical condition sensor being provided at least partially contained within the head-worn structure). The following citations show examples of where the Griffin ’456 discloses this limitation. Griffin ’456 at [0057] In other embodiments, the communication device 160 may include a camera component for displaying or sending video images to the communication device user, or could include sensory circuits for monitoring the communication device user's vital information such as pulse and blood pressure. In these embodiments a nurse or doctor in a hospital floor could wear the first component, while the second might be in a patient's room monitoring some vital statistics. The short-range communication in this example might reach several hundred feet and several second components might be communicating to a single first component. This information could then be relayed on from the first component worn by the nurse or doctor to a central nursing station for all nurses on duty to see and monitor. The Jabra BT800 expressly teaches the desire for power saving because it includes “standby mode” when a call is not active and that battery life is extended in “standby.” Jabra BT800 User Guide at 3, 7–8, 13. A POSITA would have been motivated to seek other power saving solutions to take advantage of this existing power saving mode. For example, a POSITA would have sought ways to determine that the Jabra BT800 was being worn because that was a common indicator of whether a headset was in use, or whether the headset was not in use such that it could be placed in a power saving standby mode. *See* Irvin ’332 at Abstract. A POSITA would have been motivated to combine the Jabra BT800 and Griffin ’456 to implement a physical condition sensor, such as Griffin ’456’s pulse or blood pressure sensor, in order to determine whether the user was wearing the Jabra BT800. For example, a POSITA would have recognized, as demonstrated by the state of the prior art, the significant advantages of a sensor that could determine whether the Jabra BT800 was being worn to maximize battery life. For example, Irvin teaches that “by detecting a user’s interaction, such as picking up the headset or placing it upon the user’s body, the wireless headset automatically transitions from an inactive state to an active state,” thus allowing it to “maximize battery life” while not being worn.

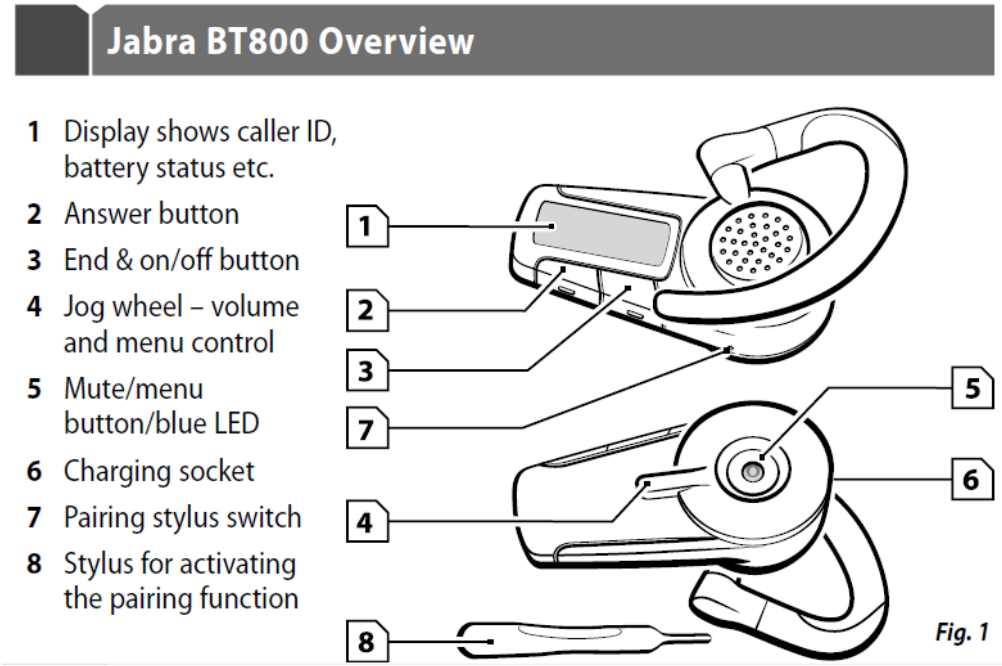
Claims	Prior Art
	Irvin ’332, Abstract. The prior art, including Irvin, teaches that “[h]eadset miniaturization places severe limitations on the physical size of batteries that may be included within the headset,” and “automatically turning on and off, based on user activity” would maximize battery life and convenience when uses “may forget to turn off the wireless headset after usage.” Irvin ’332, 1:13–2:13. And a POSITA further would have recognized that Griffin ’456’s blood pressure sensor measures data, i.e., blood pressure, that would only be present when the device is being worn on the user. As such, a POSITA would have recognized that the blood pressure sensor of Griffin ’456 was a highly reliable type of sensor to determine the Jabra BT800 was being worn by the user to achieve the power saving advantages explained above. Abreu ’960, 15:46–16:4 confirms that pressure sensing would have allowed the Jabra BT800 to detect that it was being worn. A POSITA would have reasonably expected success in combining the Jabra BT800 and Griffin ’456 because they are analogous headsets and pressure sensors where well-known, routine, and conventional components. Thus, using Griffin ’456’s pressure sensor in the Jabra BT800 would have used known features according to their known functions (known pressure sensors), to achieve predictable results (the Jabra BT800 includes a pressure sensor to detect a physical condition of the user like blood pressure). Abreu ’960 also teaches a “pressu[r]e sensing means can be incorporated in the end of the temples to detect if the sunglasses are being worn, and an abrupt drop in the pressure signal indicates glasses were removed.” Abreu ’960, 15:46–16:4. A POSITA would have been motivated to combine the Jabra BT800 and Abreu ’960, and reasonably expected success, for the same reasons discussed above for Griffin ’456. To the extent that the Jabra BT800, Griffin ’456, and Abreu ’960, does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Griffin ’456, and Abreu ’960, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
9. A system as recited in claim 1, wherein the head-worn personal electronic apparatus comprises: at least one magnetic element at least partially contained within the head-worn structure and configured to support a magnetic force that facilitates an electrical connection.	The Jabra BT800, Lowles ’045, and Jakob ’613 expressly or inherently disclose “wherein the head-worn personal electronic apparatus comprises: at least one magnetic element at least partially contained within the head-worn structure and configured to support a magnetic force that facilitates an electrical connection.” For example: Jakob ’613 discloses “glasses” (example of the claimed head–worn personal electronic apparatus) that electrically connects with (example of the claimed facilitates an electrical connection) a wire using “magnetic attraction” (example of the claimed magnetic element supporting a magnetic force). The following citations show examples of where the Jakob ’613 discloses this limitation.

Claims	Prior Art
	Jakob ’613 at [0046]–[0049] FIG. 4 schematically shows a plugging area 22_{LR} according to FIG. 1. If an electronic unit 13 is provided, such plugging-in system may also be provided to contact unit 13 as is shown in FIG. 1 at 22_{13} by the communication link wires 7_W. Thereby at least one end of wire 7_W and/or the respective contact area at one or both of the hearing devices 1_L, 1_R and/or at unit 13 are provided with a magnet arrangement. According to FIG. 4 and as an example the end of the wire 7_W is provided with a magnet arrangement 24. The counterpart mechanical contact pad 26 may thereby be of ferromagnetic material or may be as well a magnet arrangement. Thereby, mechanically, the end of wire 7_W needs only to be brought adjacent to the mechanical contact area 26 to be attracted and positioned in intimate contact therewith by permanent magnet action. Nevertheless, this contacting by magnet/magnet contact or by magnet/ferromagnetic material contact needs not directly establish the electric contact. In some instances electro-conductivity and mutual contacting of magnet/magnet or magnet/ferromagnetic material contacts may not suffice for electric communication purposes. Jakob ’613 at [0057]–[0058] In FIG. 6 both parts to be contacted are provided with respective magnet arrangements 24a and 24b. If both these parts are provided with permanent magnets, as shown in FIG. 6, by selection of the respective direction of polarity P one may prevent that the wire 7_W may be brought into contact at a predetermined contact area, be it of a hearing device and/or of the electronic unit. With the direction of polarities P selected according to FIG. 6 the two parts are attracted, whereas if the polarity P e.g. at the plug 32 of wire 7_W is inverted as shown in dashed lines, it will not be possible to contact the plug 32 to the area as shown in FIG. 6 due to magnetic repulsion. Instead of establishing a capacitive contact to the individual's body BO as was explained before a conductive contact member may directly be applied and thereby e.g. for improving comfort to the individual especially a conductive member of conductive plastic material, especially of conductive polymer. Lowles ’045 discloses “[m]ating structures 24 and 35 provide a secure fastening of peripheral device 34 to holster 20,” which “can be made using a number of known fasteners, including magnetic fastening,” and “[c]harging contact 42 is in electrical contact with charging port 32 of mobile device 28 such that charger 30 can provide an electrical current to peripheral device 34 to recharge the batteries of the peripheral device” (wherein the head-worn personal electronic apparatus comprises: at least one magnetic element at least partially contained within the head-worn structure and configured to support a magnetic force that facilitates an electrical connection).

Claims	Prior Art
	Lowles ’045 at FIGS. 1A–1C  FIG. 1A FIG. 1B  FIG. 1C Lowles ’045 at FIG. 11  FIG. 11

Claims	Prior Art
	Lowles ’045 at [0008]–[0011] The mobile device has a charging port. The peripheral device has a charging contact and a mating structure, such as a groove for connecting with the tongue. Other examples of mating structures include retaining brackets, magnets, tabs, latches, flanges, hooks, clamps, and friction fits. The holster mating structure connects with the peripheral device mating structure to releasably hold the peripheral device. The holster mating structure holds the peripheral device mating structure in such a way so as to permit the mobile device to charge the peripheral device. The charging port is in direct electrical contact with the charging contact. In another embodiment, the charging port is in electrical contact with the charging contact through an adapter which is housed in the holster. In a further embodiment the adapter includes a controller for regulating charging. In another embodiment, the holster includes a base for supporting the mobile device in the sleeve. This base has an aperture for receiving the charging contact and allowing it to make electrical contact with the charging port. Lowles ’045 at [0039] FIG. 1A shows a side view of a holster of the present invention. Holster 20 has a back panel, a base portion 27, and side wall portions 26 which define sleeve 22 designed for receiving a mobile device. Also illustrated in FIG. 1A is a mating structure 24 in side wall 26 to allow a peripheral device to mate with a holster. One skilled in the art will readily appreciate that there are a number of implementations for such a mating device. These may include grooves with bosses or flanges to retain a mobile device after it is slid into place, magnets, or other physical means of engaging a peripheral device. FIG. 1B shows a front view of the holster illustrated in FIG. 1A. Holster 20 has two side walls 26 each having its own mating structure 24, the side walls 26 helping to define the sleeve 22. FIG. 1C illustrates the top view of the holster of the FIGS. 1A and 1B. As can be seen from FIG. 1C holster 20 has a sleeve 22 defined by side walls 26. Each side wall 26 has a mating structure 24. Examples of mating structures include retaining brackets, magnets, tabs, latches, flanges, hooks, clamps, and tongue-and-groove assemblies. Additionally, one skilled in the art will appreciate that in place of mating structure 24 there can be offered a peripheral sleeve adjacent to the sleeve 22 for holding the mobile device. Lowles ’045 at [0050] FIG. 11 illustrates the engagement of peripheral device 34 with holster 20. Mating structures 24 and 35 provide a secure fastening of peripheral device 34 to holster 20. As described above, this attachment can be made using a number of known fasteners, including magnetic fastening. Charging contact 42 is in electrical contact with charging port 32 of mobile device 28 such that charger 30 can provide an electrical current to peripheral device 34 to recharge the batteries of the peripheral device. As discussed above, this provides a

Claims	Prior Art
	longer effective battery life for the peripheral device, while allowing the peripheral device 34 to carry a small capacity battery. A POSITA would have known that magnets were conventional retentions means, and would have looked to other such conventional retention means. A POSITA would have been motivated to combine the Jabra BT800 with Jakob '613's magnetic connection to increase the ease of connecting to a charger. For example, Jakob '613 teaches that "magnetic attraction" "leads to most easily handable plugging" because "[t]he wire with a respective magnetic plug at one or at both of its ends may just be brought adjacent to the respective plug area at the hearing device or at the electronic unit, [and] connection will be practically automatically installed by that wire end being magnetically pulled only said plug area t the respective device." Jakob '613, [0011], [0051] (explaining how "magnetic attraction" "improve[s] ease of plugging–in the wire conductor"). A POSITA would have been motivated to retain the Jabra BT800 from falling out in order to maintain proper connection between the contacts for charging. Jabra BT800 User Guide at 2–4. A POSITA would have known that magnets were conventional retentions means, and would have looked to such conventional retention means. Thus, a POSITA would have reasonably expected success in implementing Jakob's magnetic attachment for electrical contact because it requires no more than the straightforward application of conventional magnetic retention means to the Jabra BT800 to use the magnetic retention means to keep the Jabra BT800 connected and secured to the charger contacts and in the charging case during charging. A POSITA would have been motivated to combine the Jabra BT800 with Lowles '045, and reasonably expected success, for the same reasons explained above for Jakob '613. Specifically, to achieve the same advantages provided by magnetic charging attachment explained for Jakob '613. Jakob '613, [0011], [0051]. POSITA would have recognized that Lowles '045 provides an advantageous fastening means via magnetic fastening to keep the Jabra BT fastened for charging, just like Lowles '045 teaches with its peripheral device and charging holster. Lowles '045, [0006]. A POSITA further would have expected success because Lowles '045 explains that "[o]ne skilled in the art will readily appreciate that there are a number of implementations for such a mating device," including "magnets." Lowles '045, [0039]. Thus, a magnet fastening means would have predictably applied in Griffin '456 because a POSITA would have readily appreciated a magnet as a fastening means. Thus, using Lowles '045's magnetic attachment as the retention means with the Jabra BT800 would have used known features according to their known functions (magnetic attachment to retain), to achieve predictable results (the Jabra BT800 is retained to charging contacts using a magnetic attachment, as taught by Lowles '045).

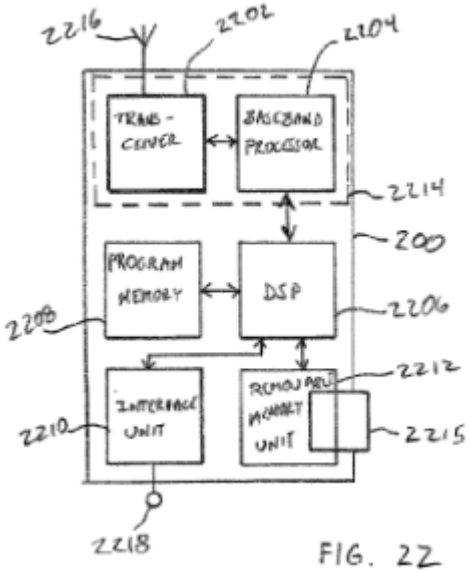
Claims	Prior Art
	To the extent that the Jabra BT800, Lowles '045, and Jakob '613 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Lowles '045, and Jakob '613, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[10a] A system as recited in claim 1, wherein the head-worn personal electronic apparatus comprises: a microphone at least partially contained within the head-worn structure,	The Jabra BT800 expressly or inherently discloses "wherein the head-worn personal electronic apparatus comprises: a microphone at least partially contained within the head-worn structure." For example: On information and belief, the Jabra BT800 includes a microphone to pick up the user's voice, for example, to "record the voice–dialing tag through [the] headset" (example of the claimed wherein the head-worn personal electronic apparatus comprises: a microphone at least partially contained within the head-worn structure). The following citations show examples of where the Jabra BT800 discloses this limitation. Jabra BT800 User Manual at Page 2 

Claims	Prior Art
	Jabra BT800 User Manual at Page 5 **3 Basic usage of your Jabra BT800 headset** The operation of the basic features in the headset is very similar to your mobile phone.  *Fig. 4* 1. **To answer a call** • You answer the call directly on the headset with a tap on the answer button. A simple tap on the headset's answer button will capture and transfer the call to the headset 2. **To end a call** • A tap on the end button terminates the active call • You can also reject an incoming call directly from the headset. Press the end button and the call will be rejected. Depending on the phone settings, the person who called you will either be forwarded to your voice mail or hear a busy signal 3. **To make a call** • If you make a call from the mobile phone, the call will (subject to phone settings) be automatically transferred to the headset • Voice dialing is activated with a tap on the answer button. For further information about using this feature, please consult your phone's user manual. You will get the best results if you record the voice-dialing tag through your headset • Activate last number redial with a press on the answer button on the headset 5 To the extent that the Jabra BT800 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[10b] wherein the head-worn personal electronic apparatus is configured to receive a voice input	The Jabra BT800, Griffin '456, and Miller '585 expressly or inherently disclose "wherein the head-worn personal electronic apparatus is configured to receive a voice input via the microphone, determine or receive a

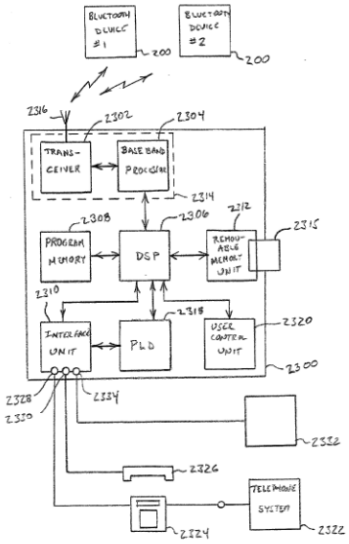
Claims	Prior Art
via the microphone, determine or receive a determination of a requested operation from the voice input using voice recognition, and control an operation by the head-worn personable electronic apparatus based on the requested operation.	determination of a requested operation from the voice input using voice recognition, and control an operation by the head-worn personable electronic apparatus based on the requested operation." For example: On information and belief, the Jabra BT800's microphone is configured to receive a voice input via the microphone (*supra* [10a]), and implement "[v]oice dialing" to "make a call" which will be conducted through the headset (example of the claimed determine or receive a determination of a requested operation from the voice input using voice recognition, and control an operation by the head-worn personable electronic apparatus based on the requested operation). The following citations show examples of where the Jabra BT800 discloses this limitation. Jabra BT800 User Manual at Page 3 **Summary of features** • Operational features: • Answer call • End call • Reject call • Last number redialing • Call list • Automatic volume control • Call waiting • Put call on hold • Mute • Display caller ID • Ringing tones • Call vibrate feature • Supports voice-dialing (subject to phone) • DSP (digital signal processing) for noise cancellation • Rechargeable battery with direct charging option from PC with USB cable • Up to 6 hours talk time and 125 hours standby time • Total weight including battery only 25 grams • Range up to 10 meters (33 feet) • Bluetooth[1] (see Glossary) version 1.2 • Headset and hands-free Bluetooth profiles[2] Your Jabra BT800 is compatible with most Bluetooth mobile phones. You can check whether your phone has Bluetooth capability by visiting your phone manufacturer's web site or Jabra's website (www.jabra.com)

Claims	Prior Art
	Jabra BT800 User Manual at Page 5 **3 Basic usage of your Jabra BT800 headset** The operation of the basic features in the headset is very similar to your mobile phone.  *Fig. 4* 1. **To answer a call** • You answer the call directly on the headset with a tap on the answer button. A simple tap on the headset's answer button will capture and transfer the call to the headset 2. **To end a call** • A tap on the end button terminates the active call • You can also reject an incoming call directly from the headset. Press the end button and the call will be rejected. Depending on the phone settings, the person who called you will either be forwarded to your voice mail or hear a busy signal 3. **To make a call** • If you make a call from the mobile phone, the call will (subject to phone settings) be automatically transferred to the headset • Voice dialing is activated with a tap on the answer button. For further information about using this feature, please consult your phone's user manual. You will get the best results if you record the voice-dialing tag through your headset • Activate last number redial with a press on the answer button on the headset 5 Griffin '456 discloses that the modules (i.e., first and second) can be "adapted for voice control," such that the user can speak into the microphone of the second communication module to "control execution" of functions by the first module. A POSITA would have understood that functions by the first module necessarily alters operation of the second module, such as by enabling the user to "participate in a voice call" by receiving/transmitting audio to the first module (e.g., via the transceiver, microphone, and speaker) (example of the claimed wherein the head-worn personal electronic apparatus is configured to receive a voice input via the microphone, determine or receive a determination of a requested operation from the voice input using

Claims	Prior Art
	voice recognition, and control an operation by the head-worn personable electronic apparatus based on the requested operation). The following citations show examples of where the Griffin ’456 discloses this limitation. Griffin ’456 at [0063] Many different possibilities for inter-module communications features are also possible. For instance, if the first communication module 212 is a cellular telephone, then the second communication module 214 may provide a hands-free means for a user to answer and participate in a voice call received at the cellular telephone. If the modules were adapted for voice control, a cellular user may preferably initiate a telephone call, add a telephone number to a stored number list, cause the telephone to enter a locked mode, or control execution of other functions by the first module by simply speaking into the microphone of the second communication module 214. Miller ’585 discloses “voice recognition software executed by DSP 2206 discriminates between the wearer's voice and other nearby voices” and “command and control software executed by DSP 2206 recognizes a command customized to the wearer (e.g., ‘call home’ to initiate a telephone call to the wearer's home)” (example of the claimed wherein the head-worn personal electronic apparatus is configured to receive a voice input via the microphone, determine or receive a determination of a requested operation from the voice input using voice recognition, and control an operation by the head-worn personable electronic apparatus based on the requested operation). The following citations show examples of where the Miller ’585 discloses this limitation.

Claims	Prior Art
	Miller ’585 at Figure 22  FIG. 22

IngenioSpec EX2017
Apple v. IngenioSpec, IPR2026-00253
Page 142

Claims	Prior Art
	Miller ’585 at Figure 23  FIG. 23 Miller ’585 at [0040] The accompanying drawings are not necessarily to scale. Like numbers in the drawings identify the same or substantially similar elements. Some well known mechanical and electrical components (e.g., hinges, battery or photoelectric power supplies, electrical busses) have been omitted from the drawings so that embodiments may be more clearly shown and described. The embodiments described herein are illustrative and are not limited to the medical field. Skilled artisans will understand that many variations of the described embodiments exist. In addition, the following disclosure describes machine functions such as voice recognition, voice operated command and control, and use of the BLUETOOTH communication protocol. Such functions are well known and skilled artisans will be able to easily modify commercially available software to operate in accordance with this disclosure. Miller ’585 at [0048] To assist picking up the wearer's voice, housing 124 is located on earstem 104 to be close to the wearer's mouth. In other instances, however, housing 124 is located elsewhere on eyeglasses 100 (e.g., on support loop 118, on a frame surrounding one of the lenses (FIG. 4)). In FIG. 1, microphone housing 124 is shown extending from temple portion 116. In other instances in which temple portion 116 is sufficiently large, or

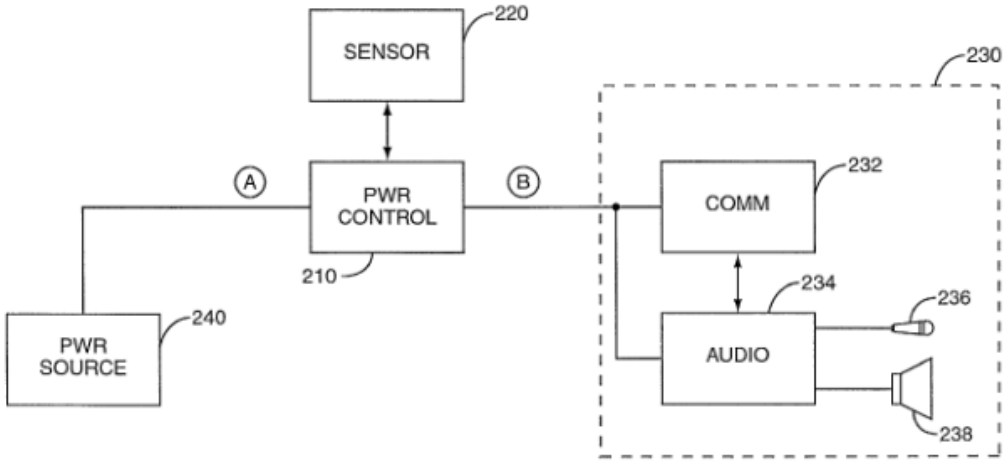
Claims	Prior Art
	the microphone is sufficiently small, housing 124 is coextensive with temple portion 116 so that there is no significant change in the cross section of the earstem in the microphone housing portion. Making the microphone housing coextensive with the shape of the earstem reduces accidental wear on or breakage of the housing. Additional microphones are used in some embodiments to improve sound pickup quality. Such additional microphones are placed in various positions, such as on the same earstem, the opposite earstem, or on a frame supporting the lenses. The use of more than one microphone in various positions to improve sound pickup directionality allows the wearer's voice to be sensed more clearly and extraneous background noises to more easily be canceled. Consequently, enhanced directionality improves performance of, for example, voice recognition software executed by digital signal processors described below, and improves the quality of the wearer's voice for remote conversation or for recording as dictation. Miller ’585 at [0083] Base station 2102 may also be coupled to various equipment 2114 (e.g., medical devices in an operating theater) so as to exchange data and/or control commands. For example, the wearer speaks a voice request for data (e.g., “insuflator, pressure”), the request is relayed to the insuflator which in response outputs pressure data that is passed back to the wearer who receives the data as a synthesized voice (e.g., “insuflator, 200 millimeters of mercury”). In a similar manner, for example, the surgeon may speak a command to control a device (e.g., “insuflator, increase pressure 10 millimeters of mercury”). The controlled device may request confirmation to prevent errors. In still another illustrative command and control example, a surgeon makes a voice command to adjust the white color balance of a monitor displaying an image from a surgical camera (e.g., endoscope). The signal processing required for voice activated data reception and command and control may be carried out using one or more digital signal processors (DSPs) executing software (e.g., conventional voice recognition and synthesis software, which is easily modified for use in specific applications in light of this specification). Miller ’585 at [0089] DSP 2206 processes the BLUETOOTH stack software and applications software such as echo cancellation, voice recognition, command and control, speech compression, and speech synthesis. In one instance DSP 2206 is a Texas Instruments DSP part no. TMS320VC5402PGE100. In some instances DSP 2206 executes noise reduction software (e.g., echo canceling) that improves the sound quality originating at the one or more microphones mounted on the eyewear. Noise cancellation software is commercially available (e.g., from Texas Instruments, Incorporated), and modification of such software for this

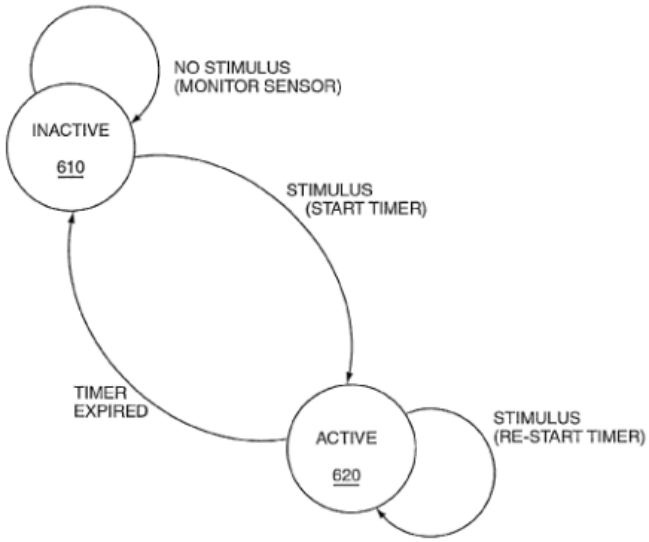
Claims	Prior Art
	application is easily accomplished in light of this disclosure. Miller ’585 at [0090] Positioning DSP 2206 in wearer unit 200 allows the wearer unit to be customized to the wearer. In some instances each wearer unit 200 is programmed with a unique identification code (e.g., BLUETOOTH address). Hence the unique code also identifies a particular wearer associated with the wearer unit. Devices receiving signals from the wearer unit also receive the wearer unit's identification number. Devices sending information to a particular wearer unit address the sent information by using the identification number. In some instances each wearer unit is customized to recognize the wearer's voice and to recognize particular voice commands. For example, voice recognition software executed by DSP 2206 discriminates between the wearer's voice and other nearby voices. In another example, command and control software executed by DSP 2206 recognizes a command customized to the wearer (e.g., “call home” to initiate a telephone call to the wearer's home). In applications in which the number of wearers is limited, however, some of these DSP functions may be carried out by a DSP in a base station, as described below. Miller ’585 at [0098] User control unit 2320 allows a person to route information from any input to any output in base station 2300. For example, in a default setting a call incoming from telephone system 2322 arrives at telephone 2324 (located, for example, in an operating theater). When handset 2326 is lifted and pickup is sensed, the call is routed through ports 2328 and 2330 to handset 2326. The person answering the call (e.g., a nurse) determines the intended recipient and presses a button on control unit 2320 to route the call via radio unit 2314 to the recipient (e.g., a surgeon) who is associated with a particular wearer unit address (e.g., BLUETOOTH address). The wearer then conducts the call using the speakers and microphone in the eyeglasses. Another wearer (e.g., another surgeon) may be switched into the conversation by pressing another control unit 2320 button. An outgoing call may be made using similar actions to associate an eyeglasses wearer with telephone 2324 and then dialing a desired number. In voice-controlled embodiments a wearer may dial a number using voice commands for hands-free dialing (e.g., speaks the command “dial telephone” and then speaks the numbers). In some embodiments the base station is assigned a particular telephone number and the inbound caller is presented with a menu (e.g., synthesized voice) of BLUETOOTH addressees currently communicating with the base station (each BLUETOOTH address being associated with a particular name). The caller selects the called party from the menu. Device 2332 coupled to port 2334 is illustrative of other devices and systems 2110, 2114 described above

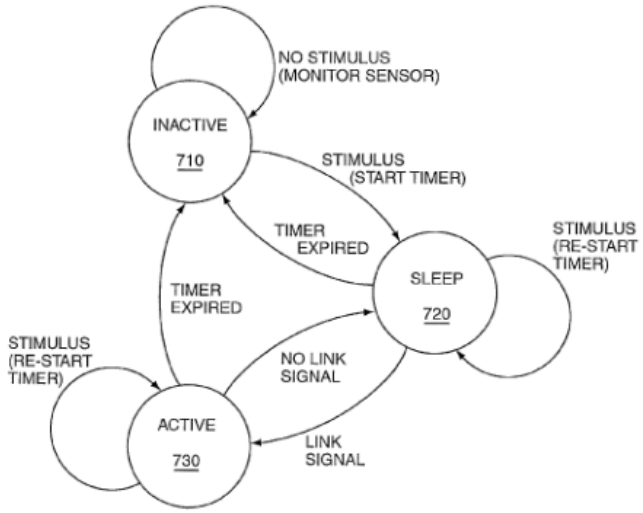
Claims	Prior Art
	with reference to FIG. 21. A POSITA would have recognized that the Jabra BT800 expressly contemplates "[v]oice dialing" to "make a call." Jabra BT800 User Manual at 5. A POSITA would have recognized the increased convenience for a user to simply speak to control the operation or volume of the Jabra BT800, for example, and a POSITA would have been motivated to combine these voice control commands into the Jabra BT800. The other prior art, for example Griffin '456, teaches this increased convenience by explaining that voice control is performed "simply speaking into the microphone of the second communication module 214." Griffin '456, [0063]. A POSITA would have reasonable expected success in making this combination because the Jabra BT800 is already configured for voice dialing. E.g., Jabra BT800 User Manual at 5. Thus, using voice commands to control the Jabra BT800 would have used known features according to their known functions (voice commands and Jabra BT800's existing voice dialing), to achieve predictable results (Jabra BT800 is controlled by the voice commands taught by Griffin '456 and Miller '585). To the extent that Jabra BT800 User Manual, Hollemans '490, Zadesky '230, Irvin '332, Griffin '456, Spitzer '001, and Miller '585 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of Jabra BT800 User Manual, Hollemans '490, Zadesky '230, Irvin '332, Griffin '456, Spitzer '001, and Miller '585, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
11. A system as recited in claim 1, wherein the head-worn structure comprises: a radiation sensor, operatively connected to the rechargeable battery, at least partially contained within the head-worn structure and configured to sense radiation.	The Jabra BT800, Irvin '332, and Iuliis '007 expressly or inherently disclose "wherein the head-worn structure comprises: a radiation sensor, operatively connected to the rechargeable battery, at least partially contained within the head-worn structure and configured to sense radiation." For example: Irvin '332's "wireless headset" (example of the claimed head–worn structure) includes an "active ... IR sensor" (example of the claimed radiation sensor configured to sense radiation) that "provides a connection between power source 240 and the power control circuit 210" (example of the claimed operatively connected to the rechargeable battery). The following citations show examples of where the Irvin '332 discloses this limitation. Irvin '332 at 6:20–33 FIG. 4D illustrates the power control circuit 210 coupled with a proximity sensor 220 not based on mechanical actuation. The proximity sensor 220 may be an active or passive IR sensor, may be a resistive or other type of thermal sensor, or may be an acoustic sensor. As a proximity sensor, sensor 220 provides indication that a user has placed the wireless headset 100 upon their body. As such, any of the foregoing or other presence sensing techniques may be used to implement sensor 220. Preferably, when configured

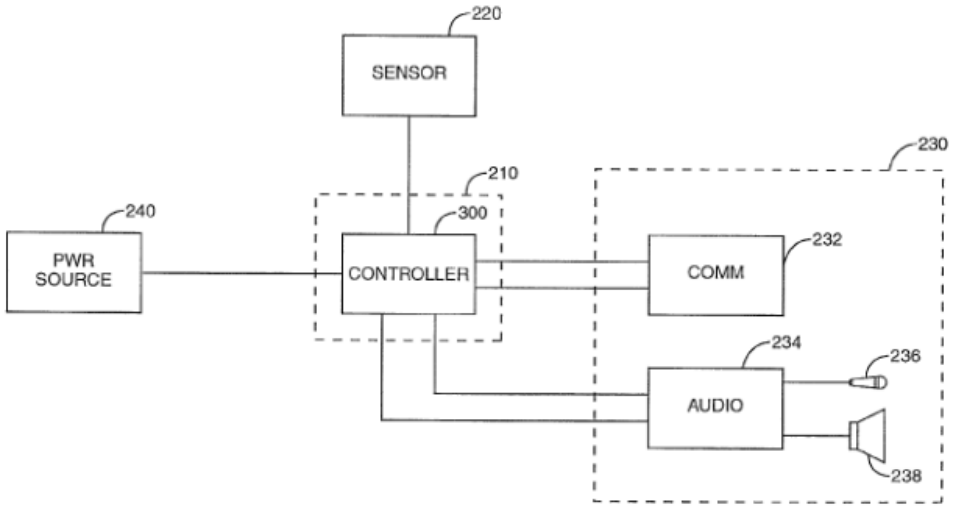
Claims	Prior Art
	as a proximity sensor, sensor 220 requires minimal power and provides a sensor output signal based on proximity to the user's body. Depending upon the sensing technology chosen, the control circuit 210 may be required to periodically stimulate sensor 220 to generate a detection response. Irvin '332 at 6:49–67 FIG. 5 illustrates yet another embodiment of the power control circuit 210 and associated sensor 220 in accordance with the present invention. Here, the sensor 220 in itself functions as a switch and provides a connection between the power source 240 and the power control circuit 210. The power control circuit 210 also includes a switched power output from switch 214 that is commonly connected with the switched power output from sensor 220. A blocking device 219, such as a diode, allows the power control circuit 210 to determine if there is electrical continuity through sensor 220. In the presence of such continuity, the control logic 212 turns on switch 214 thereby providing an independent power connection from the power source 240 to the communications circuit 230. As before, the power control circuit 210 includes the timer 218 that is started when switch 214 is turned on, and restarted based on electrical continuity through sensor 220. If the timer 218 expires due to an absence of electrical continuity through sensor 220, the control logic 212 disables the communications circuit 230. Iuliis '007 discloses a "light sensor" (example of the claimed wherein the head-worn structure comprises: a radiation sensor, operatively connected to the rechargeable battery, at least partially contained within the head-worn structure and configured to sense radiation). The following citations show examples of where Iuliis '007 discloses this limitation. Iuliis '007 at 9:62–10:2 The connector unit 102 may also include sensors such as a heart monitor, light sensor, temperature sensor, motion sensor (e.g., accelerometer), etc. that provide external information about the user or the user's surroundings that can be used by the handheld electronic device. Examples of sensors that can be used may be found in U.S. patent application Ser. Nos. 10/402,311, 10/997,479, 60/658,777, and 60/663,345, which are herein incorporated by reference. A POSITA would have been motivated to combined the IR sensor of Irvin '332 into the Jabra BT800 because active IR sensors are effective and advantageous means for precisely detecting the presence of a user at close range. A POSITA would have been motivated to include an IR emitter in order to implement an active IR sensor, as explained for [44j]–[44k] below. *Infra* [44j]–[44k].

Claims	Prior Art
	A POSITA would have reasonably expected success in implementing the IR sensor of Irvin '332 into the Jabra BT800 because a POSITA would have known that radiation sensors, such as light sensors or IR sensors, were conventional components that would have required no more than straightforward application. A POSITA would have been motivated to combine the Jabra BT800 with Iuliis '007, and reasonably expected success in doing so, for the same reasons discussed above for the other references. To the extent that the Jabra BT800, Irvin '332, and Iuliis '007 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of Jabra BT800, Irvin '332, and Iuliis '007, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
12. A system as recited in claim 1, wherein the head-worn personal electronic apparatus comprises: a sensor at least partially contained within the head-worn structure and configured to sense data indicative of whether the head-worn personal electronic apparatus is being worn by the user.	The Jabra BT800, Irvin '332, and Iuliis '007 expressly or inherently disclose "wherein the head-worn personal electronic apparatus comprises: a sensor at least partially contained within the head-worn structure and configured to sense data indicative of whether the head-worn personal electronic apparatus is being worn by the user." For example: Irvin '332 discloses a "wireless headset" (example of the claimed wireless wearable device) including a number of sensors such as "motion sensors, attitude or position sensors, proximity sensors, and contact sensors" (example of the claimed sensor) to determine "a user picking it up or mounting the wireless headset upon their head" (example of the claimed determine whether the wireless wearable device is being worn based on sensor outputs). The following citations show examples of where the Irvin '332 discloses this limitation. Irvin '332 at Abstract A wireless headset for use with a separate communications device, such as a cellular telephone, includes automatic on/off capabilities to maximize battery life. By detecting a user's interaction, such as picking up the headset or placing it upon the user's body, the wireless headset automatically transitions from an inactive state to an active state. Techniques for automatic headset enabling include but are not limited to motion sensors, attitude or position sensors, proximity sensors, and contact sensors. These techniques may be used individually or in any combination. An internal timer allows the wireless headset to return to its inactive state a defined interval after cessation of movement or removal of the wireless headset. Including an optional sleep state further optimizes battery life. In the sleep state, only a portion of the wireless headset circuitry is enabled. Rather than transitioning from inactive to active, the headset transitions from inactive to sleep. In sleep, the headset periodically monitors for a signal from the separate communications device. Upon detection of such a signal, the wireless headset transitions to its active

Claims	Prior Art
	state, thereby providing full functionality to the user. Irvin ’332 at Figure 2A  *FIG. 2A*

Claims	Prior Art
	Irvin ’332 at Figure 6  FIG. 6

Claims	Prior Art
	Irvin ’332 at Figure 7  FIG. 7

Claims	Prior Art
	Irvin ’332 at Figure 8  *FIG. 8* Irvin ’332 at 2:16–34 The present invention includes both a method and apparatus allowing a wireless headset to automatically control its operating state to minimize power consumption, thereby maximizing the life of its power source, such as a battery. The wireless headset serves as a communication accessory to a base unit, such as a cellular telephone. When not in use, the wireless headset reverts to an inactive state and draws essentially no power. A power control circuit imparts automatic enabling capability to the wireless headset. Preferably, the power control circuit employs a sensor responsive to a natural stimulus associated with a person preparing to use the wireless headset. The wireless headset may sense motion, physical orientation, or user proximity. Sensing techniques include but are not limited to micro-electro-mechanical-systems (MEMS), mercury switches, attitude switches, and IR or acoustic proximity sensors. In some embodiments, the wireless headset transitions from the inactive state to an active state in response to a user picking it up or mounting the wireless headset upon their head. Irvin ’332 at 2:35–50 In a more sophisticated embodiment, the wireless headset may transition from the inactive state to a sleep state, based on user stimulus. In the sleep state, only a portion of the headset circuitry is enabled, thus

Claims	Prior Art
	conserving power. While in the sleep state, the wireless headset monitors for a signal from the base unit, and, when such a signal is received, it transitions from the sleep state to the active state. Further, once active, the wireless headset can continue to monitor for communications link activity. Thus, if communications with the base unit cease, the wireless headset can return to the sleep state and periodically check for resumed communications activity. A timer allows the wireless headset to automatically return to the inactive state subsequent to use. Cessation of movement or detected removal of the wireless headset from the user's head can indicate termination of use and trigger a timed power-down. Irvin '332 at 3:53–4:2 The communications circuit 230 provides wireless headset functionality, including audio input and output and wireless communications with the base unit 102. The communications or headset circuit 230 includes a wireless communications interface 232 providing a wireless communications link for sending and receiving information to and from the base unit 102. The wireless communications interface 232 includes at least a wireless receiver and wireless transmitter. Audio input received via microphone 236 is conditioned by the audio interface 234 and then processed by the communications interface 232 for transmittal to the base unit 102. Audio information received from the base unit 102 is processed by the wireless communications interface 232 and then conditioned in the audio interface 234 for output to a user via speaker 238. With reference to FIG. 1A or 1B, the microphone 236 may be located in microphone pickup 120, and speaker 238 may be located in earpiece 130. Irvin '332 at 4:39–67 FIG. 3A illustrates a preferred embodiment for the wireless headset 100. In FIG. 3A, the power control circuit 210 independently enables the wireless communications interface 232 and audio interface 234. Thus, select portions of communications circuit 230 may be enabled in response to the sensor output signal. Once the wireless communications interface 232 is enabled, it provides a signal, termed a "link active" signal, to the power control circuit 210 based on detecting a wireless signal received from the base unit 102. Based on the assertion of the link active signal, the power control circuit 210 enables the audio interface 234. FIG. 3B provides more functional details regarding the power control circuit 210 of FIG. 3A. Again, the control logic 212 is responsive to a sensor output signal from sensor 220. However, in response to the sensor output signal, the control logic 212 turns on switch 214 while switch 216 remains off, thereby enabling the wireless communications interface 232. As with the previously discussed embodiment, power control circuit 210 includes the timer 218. In a preferred embodiment, control logic 212 starts timer 218 upon enabling the wireless communications interface 232, and resets timer 218 based on subsequent

Claims	Prior Art
	or continued assertion of the sensor output signal. If the wireless communications interface 232 asserts the link active signal, the control logic 212 turns on switch 216, thereby enabling the audio interface 234. If the timer 218 expires, the control logic 212 turns off switches 214 and 216, thereby disabling the wireless communications interface 232 and the audio interface 234. Irvin '332 at 5:1–23 Because the wireless headset 100 of the present invention automatically enables and disables its communication functions based on use, the sensor 220 may be based on a variety of technologies. In general, its purpose is to provide a signal responsive to a natural stimulus associated with use of the headset by a user. Movement or vibration of the wireless headset 100, or placement of the wireless headset 100 upon the user's body indicates usage. Movement may be detected based on vibration or by sensing acceleration, such as with an accelerometer. Mechanical or liquid-based switches represent alternate mechanisms for sensing movement. In such switches, movement causes an electrical connection to be established between contact pairs. Further, the particular sensor 220 employed may be tuned or configured such that only stimulus consistent with actual use actuates the sensor, thus avoiding inadvertent or unintended enabling of the wireless headset 100. In such configurations, the sensor 220 preferably employs output conditioning that prevents assertion of the sensor output signal for stimulus below a defined threshold. Alternatively, the power control circuit 210 may include such conditioning as part of its interface to the sensor 220. FIGS. 4A–4D illustrate possible sensor embodiments. Irvin '332 at 5:25–52 In FIG. 4A, the power control circuit 210 is operatively associated with a MEMS device, with the MEMS device functioning as the sensor 220. Devices based on MEMS technology may be responsive to general vibration or motion, or may be configured to respond only to specific acceleration along defined axes. As MEMS devices may easily include output conditioning electronics, the sensitivity or responsiveness of the sensor 220 incorporating the MEMS device may be tailored such that the sensor output signal is asserted only for motion or vibration above a certain threshold. A typical MEMS employs modified microelectronics fabrication techniques and includes small mechanical elements responsive to movement or vibration, such as cantilever beams formed by selectively etching a silicon wafer. In a preferred embodiment of the present invention, sensor 220 includes a MEMS device simultaneously fulfilling the requirements of low power consumption, relative low-cost, and adequate signal discrimination. In this context, signal discrimination means that the sensor 220 is not prone to nuisance assertions of its sensor output signal caused by minute movement or vibration. Although the body of work associated with MEMS technology is quite comprehensive, significant insight into the basic structures and techniques of MEMS technology may be gained from U.S. Pat. No. 5,659,195 to Kaiser et al., U.S. Pat. No. 5,663,507

Claims	Prior Art
	to Westervelt et al., and U.S. Pat. No. 5,76,480 to Pister, the disclosures of which are incorporated herein by reference. Irvin '332 at 5:53–6:2 FIG. 4B illustrates the power control circuit 210 coupled to a liquid-based switch functioning as the sensor 220. The sensor 220 may be a mercury-filled switch, or may employ other conductive liquids. Depending upon its configuration, the sensor 220, implemented as a liquid-based switch, may function as a motion sensor or as an attitude sensor. As a motion sensor, the sensor 220 includes first and second contacts disposed in a manner such that motion of the contained liquid places the first and second contacts in electrical connection. As an attitude sensor, sensor 220 includes first and second contacts disposed in a manner such that one or more specific physical orientations of the wireless headset 100 causes the contained liquid in sensor 220 to place the first and second contacts in electrical connection. The power control circuit 210 connects to the first and second contacts of sensor 220, and is responsive to the electrical connection completed by the contained liquid. Irvin '332 at 6:20–33 FIG. 4D illustrates the power control circuit 210 coupled with a proximity sensor 220 not based on mechanical actuation. The proximity sensor 220 may be an active or passive IR sensor, may be a resistive or other type of thermal sensor, or may be an acoustic sensor. As a proximity sensor, sensor 220 provides indication that a user has placed the wireless headset 100 upon their body. As such, any of the foregoing or other presence sensing techniques may be used to implement sensor 220. Preferably, when configured as a proximity sensor, sensor 220 requires minimal power and provides a sensor output signal based on proximity to the user's body. Depending upon the sensing technology chosen, the control circuit 210 may be required to periodically stimulate sensor 220 to generate a detection response. Irvin '332 at 7:1–8:3 Note that the foregoing diagrams illustrate various configurations for the present invention, with these configurations allowing the wireless headset 100 to automatically enable and disable select portions of its electronic circuitry based on user stimulus. Enabling and disabling may constitute physical connection and disconnection of power between the power source 240 and the communications or headset circuit 230, or may simply represent the assertion and de-assertion of specific enabling signals. Thus, the foregoing diagrams should not be construed as limiting in any way regarding the specific circuit implementation of the wireless headset 100. FIGS. 2–5 illustrate functional diagrams and these various functions may have corresponding separate circuit elements, or may be included in integrated fashion in

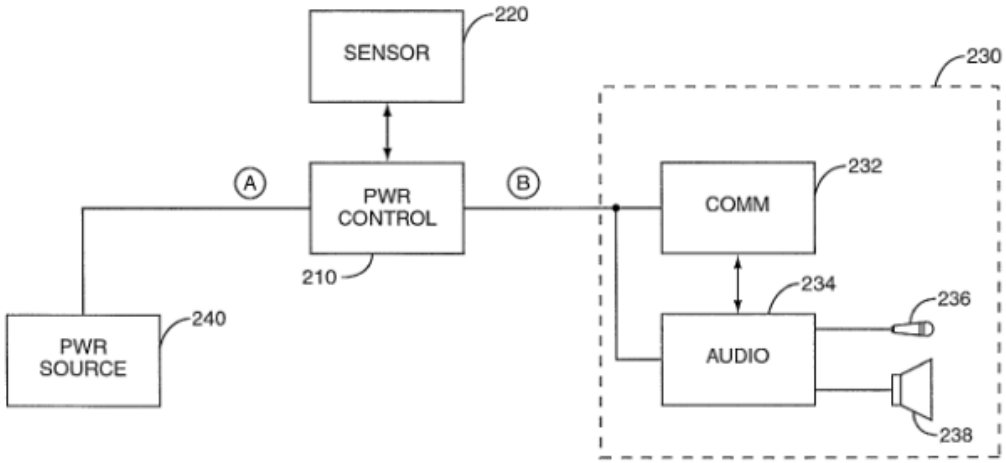
Claims	Prior Art
	one or more devices. For example, a microprocessor in a sleep or halt mode may be directly connected to a battery and configured to wake up in response to an input from the sensor 220. Thus, the microprocessor could serve as the power control circuit 210, as well as providing functions related to the communications interface 232 and audio interface 234. FIGS. 8 and 9, in particular, illustrate an exemplary embodiment of the present invention wherein an integrated controller provides the functionality of the power control circuit 210. In FIG. 8, the power control circuit 210 includes an integrated controller 300. The integrated controller 300 provides power control functionality associated with the timer 218, switches 214 and 216, and control logic 212. In this embodiment, the controller 300 provides both power and control/signal interconnections for the wireless communications interface 232 and audio interface 234. The controller 300 independently enables the wireless communications interface 232 and audio interface 234 in response to the sensor output signal from sensor 220. As with other embodiments, the controller 300 may enable both the wireless communication interface 232 and audio interface 234 in response to the sensor output signal, or may only enable the wireless communications interface 232, or a portion thereof. In this latter, case, the controller 300 enables the audio interface 234 in response to receiving the link signal from the enabled portion of the wireless communications interface 232. FIG. 9 provides more detail regarding the controller 300 shown in FIG. 8. A main power controller 310 provides power/control outputs to power controllers 330 and 340, which, in turn, provide power control outputs to the wireless communications interface 232 and audio interface 234, respectively. The main power controller 310 additionally interfaces with and provides power to a functional controller 350 and a sensor controller 320. The functional controller 350 provides signal and control interfaces with both the wireless communications interface 232 and the audio interface 234. In an exemplary embodiment, the main power controller initially enables only the sensor controller 320. Then, in response to the sensor output signal, the main controller 310 enables power controller 330 at least a portion of the functional controller 350. In response, power controller 330 enables at least a portion of the wireless communications interface 232. Then, in response to receiving the link signal from the wireless communications interface 232—the link signal may be received via the functional controller 350—the main power controller 310 enables the power controller 340 associated with the audio interface 234. The power controllers 330 and 340 may comprise FET switches combined with control logic responsive to control signals asserted by the main power controller 310, the functional controller 350, and/or the wireless communications interface 232. Irvin ’332 at 8:11–50 FIGS. 6 and 7 illustrate operation of the wireless headset 100. FIG. 6 is a state diagram for one exemplary embodiment of the present invention. When the wireless headset 100 is not in use, it automatically enters an inactive state (610). As explained, this inactive state may constitute disconnecting the communications

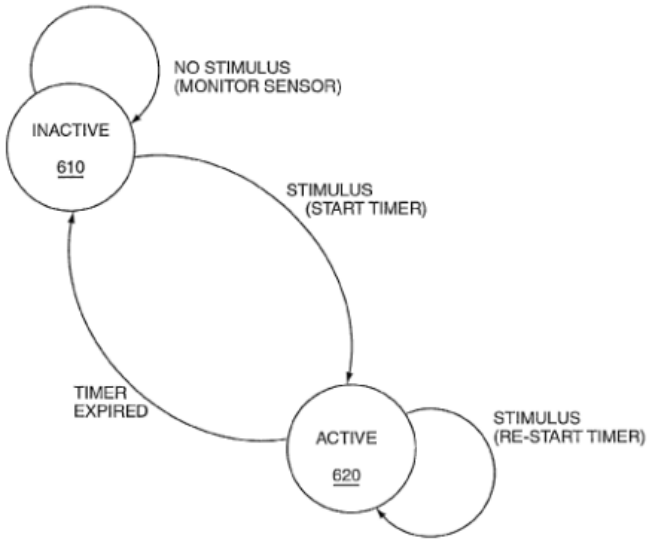
Claims	Prior Art
	circuit 230 from the power source 240, or may simply represent placing the communications circuit 230 in a non-functional, low-power condition. Absent user stimulus, such as motion of the wireless headset 100 or placement of the wireless headset 100 upon the user's body, the wireless headset 100 remains in the inactive state (610). In response to user stimulus, as detected by sensor 220, the power control circuit 210 enables the communications circuit 230, with this enabling representing a transition from the inactive state to an active state (620). Upon entering the active state, the power control circuit 210 initializes and starts the timer 218. The timer 218 incrementally counts from a starting value to an ending value, with the progression from starting to ending values representing a defined interval of time. Upon expiration of the timer 218, the power control circuit 210 disables the communications circuit 230. This interval of time may be preprogrammed to a convenient value, or may be selectable based on input from the base unit 102. For example, a timeout interval of five minutes may provide a reasonable compromise between user convenience and battery life. While in the active state (620), the power control circuit 210 resets the timer 218 based on the reassertion or continued assertion of the sensor output signal from sensor 220. Such resetting prevents expiration of the timer 218 and, as such, causes the power control circuit 210 to leave the communications or headset circuit 230 enabled. Thus, the power control circuit 210 is designed to leave the wireless headset 100 in the active state (620) while the wireless headset is in use by a user. Absent user stimulus, the timer 218 of power control circuit 210 expires, thereby causing the wireless headset 100 to transition from the active state (620) to the inactive state (610) based on the power control circuit 210 disabling the communications circuit 230. Irvin ’332 at 8:51–9:12 FIG. 7 is a state diagram for a preferred embodiment of the present invention. Operation of the wireless headset 100 illustrated in FIG. 7 is distinguished from that shown in FIG. 6 by inclusion of an additional state, denoted as the sleep state (720). Inclusion of the sleep state provides an additional opportunity to control the power consumption of wireless headset 100 based on specific operating conditions. As before, the wireless headset 100 remains in the inactive state (710) absent user stimulus. Upon detecting user stimulus, the wireless headset 100 transitions from the inactive state (710) to the sleep state (720). In this state, the power control circuit 210 enables only a portion of the communications circuit 230. Specifically, the power control circuit 210 enables the wireless communications interface 232 or a portion thereof. Then, using a signal output from the wireless communications interface 232, the power control circuit 210 determines if the base unit 102 is active, or if the base unit 102 is attempting to communicate with the wireless headset 100. In some embodiments, the wireless headset 100 infers activity by detecting, via its wireless communications interface, a carrier signal from the base unit 102. In other embodiments, the wireless headset detects activity based on receiving a “wake-up” signal from the base unit 102. Note that monitoring for the base unit carrier signal may be performed continuously by the wireless headset 100

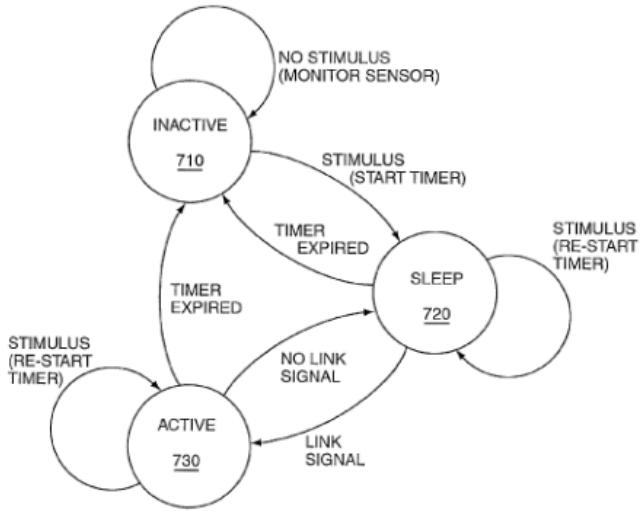
Claims	Prior Art
	while in the sleep state, or may be performed periodically; thereby further reducing sleep state power consumption. For periodic carrier monitoring, the wireless headset 100 may employ an exemplary monitoring interval of 0.5 seconds. Irvin '332 at 9:13–65 Upon detecting the carrier signal or wake-up signal from the base unit 102, as indicated by the link signal shown in FIG. 7, the wireless headset 100 transitions from the sleep state (720) to the active state (730). To further reduce power consumption, the wireless headset 100 may only monitor for the external signal on a periodic basis. If the wireless headset 100 is configured to monitor for the external signal on a periodic basis and the base unit 102 is configured to emit a periodic wake-up signal, the periodic monitoring of the wireless headset 100 is set such that its monitoring frequency is not an integer multiple of the wake-up signal frequency. Upon causing the wireless headset 100 to transition from the inactive state (710) to the sleep state (720), the power control circuit 210 initializes and starts the timer 218. While in the sleep state (720), subsequent or continued assertion of the sensor output signal from the sensor 220 causes the power control circuit 210 to reset its timer 218. Absent such user stimulus, the timer 218 expires and the power control circuit 210 disables the communications circuit 230. After transitioning from the sleep state (720) to the active state (730), based on detection of the signal from the base unit 102, the power control circuit 210 continues resetting its timer 218 based on user stimulus, as done in the sleep state (720). Thus, continued user stimulus causes the power control circuit 210 to leave the wireless headset 100 fully functional in the active state (730). The present invention provides methods and apparatus allowing the wireless headset 100 to conveniently transition from a non-functional inactive state to a fully functional active state, based on its detection of certain user stimulus. In a preferred embodiment, the wireless headset 100 transitions from the inactive state to the intermediate sleep state, thereby conserving power. Upon detection of the carrier or the wake-up signal from the base unit 102, the wireless headset 100 transitions from the sleep state to the fully functional active state. The wireless headset 100 includes a sensor 220 for detecting the user stimulus. As the sensor 220 may be a motion sensor, a vibration sensor, an attitude sensor, or a proximity sensor, the specific user stimulus may include the user moving and/or placing the wireless headset 100 upon their body. The operation of the wireless headset 100 in accordance with the present invention admits tremendous flexibility with respect to implementation. As noted, many different circuit implementations may provide the inventive features of the present invention. These implementations may include hardware and software, and can reflect varying degrees of integration between the functional circuit blocks discussed. Indeed, all such variations for providing a wireless headset 100 that automatically controls its

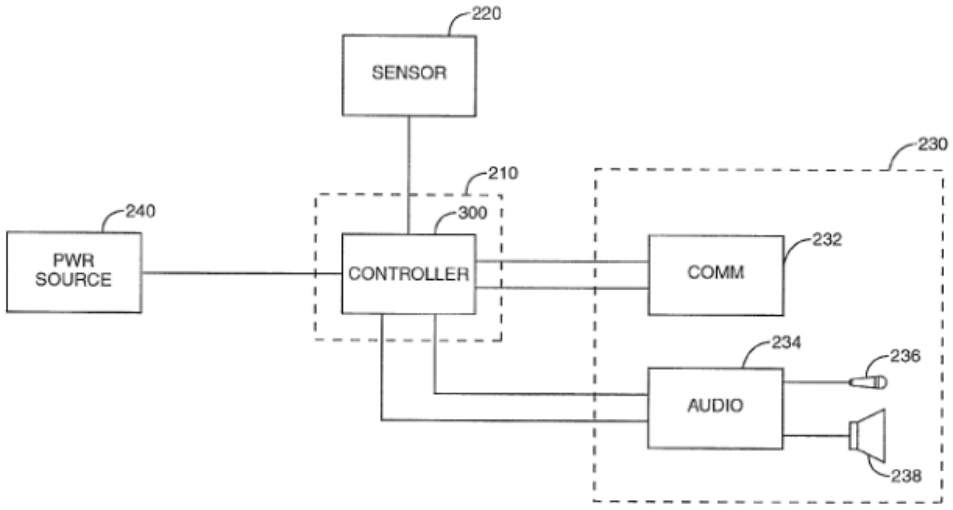
Claims	Prior Art
	power consumption or operating state based on detection of a user stimulus are within the scope of the present invention. Iuliis '007 discloses "connector unit 102 may also include sensors such as a heart monitor, light sensor, temperature sensor, motion sensor (e.g., accelerometer), etc. that provide external information about the user" (example of the claimed wherein the head-worn personal electronic apparatus comprises: a sensor at least partially contained within the head-worn structure and configured to sense data indicative of whether the head-worn personal electronic apparatus is being worn by the user). Iuliis '007 at 9:62–10:2 The connector unit 102 may also include sensors such as a heart monitor, light sensor, temperature sensor, motion sensor (e.g., accelerometer), etc. that provide external information about the user or the user's surroundings that can be used by the handheld electronic device. Examples of sensors that can be used may be found in U.S. patent application Ser. Nos. 10/402,311, 10/997,479, 60/658,777, and 60/663,345, which are herein incorporated by reference. The Jabra BT800 expressly teaches the desire for power saving because it includes "standby mode" when a call is not active and that battery life is extended in "standby." Jabra BT800 User Guide at 3, 7–8, 13. A POSITA thus would have been motivated to seek other power saving solutions to take advantage of this existing power saving mode. A POSITA would have been motivated to combine the being worn sensors of Irvin '322 into the Jabra BT800 to advantageously allow it to determine when it is not being worn so that it can can conserve battery. For example, Irvin teaches that "by detecting a user's interaction, such as picking up the headset or placing it upon the user's body, the wireless headset automatically transitions from an inactive state to an active state," thus allowing it to "maximize battery life" while not being worn. Irvin '332, Abstract. Irvin teaches that "[h]eadset miniaturization places severe limitations on the physical size of batteries that may be included within the headset," and "automatically turning on and off, based on user activity" would maximize battery life and convenience when uses "may forget to turn off the wireless headset after usage." Irvin '332, 1:13–2:13. A POSITA would have known that the sensors proposed by Irvin, e.g., motion, accelerometer, IR, and temperature were well–known, routine, and conventional components. Thus, using Irvin '332's being worn sensors in the Jabra BT800 would have used known features according to their known functions (known data sensors from Irvin), to achieve predictable results (the Jabra BT800 includes sensors that detect data indicating that it is being worn).

Claims	Prior Art
	A POSITA would have been motivated to combine the Jabra BT800 with Iuliis '007, and reasonably expected success in doing so, for the same reasons discussed above for the other references. To the extent that the Jabra BT800, Irvin '332, and Iuliis '007 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Irvin '332, and Iuliis '007 those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
13. A system as recited in claim 12, wherein the sensor is electrically connected to the electronic circuitry, and wherein the electronic circuitry contained within the head-worn structure of the head-worn personal electronic apparatus is configured to at least alter operation of the head-worn personal electronic apparatus based at least in part on the sensed data from the sensor.	The Jabra BT800 and Irvin '332 expressly or inherently disclose "[a] system as recited in claim 12, wherein the sensor is electrically connected to the electronic circuitry, and wherein the electronic circuitry contained within the head-worn structure of the head-worn personal electronic apparatus is configured to at least alter operation of the head-worn personal electronic apparatus based at least in part on the sensed data from the sensor." For example: Irvin '332 discloses a "wireless headset" (example of the claimed wireless wearable device) including a number of sensors such as "motion sensors, attitude or position sensors, proximity sensors, and contact sensors" (example of the claimed sensor) to determine "a user picking it up or mounting the wireless headset upon their head" (example of the claimed determine whether the wireless wearable device is being worn based on sensor outputs). Irvin '332 further discloses that "[b]y detecting a user's interaction, such as picking up the headset or placing it upon the user's body" (example of the claimed based at least in part on the sensed data from the sensor) "the wireless headset automatically transitions from an inactive state to an active state" (example of the claimed electronic circuitry contained within the head-worn structure of the head-worn personal electronic apparatus is configured to at least alter operation of the head-worn personal electronic apparatus). The following citations show examples of where the Irvin '332 discloses this limitation. Irvin '332 at Abstract A wireless headset for use with a separate communications device, such as a cellular telephone, includes automatic on/off capabilities to maximize battery life. By detecting a user's interaction, such as picking up the headset or placing it upon the user's body, the wireless headset automatically transitions from an inactive state to an active state. Techniques for automatic headset enabling include but are not limited to motion sensors, attitude or position sensors, proximity sensors, and contact sensors. These techniques may be used individually or in any combination. An internal timer allows the wireless headset to return to its inactive state a defined interval after cessation of movement or removal of the wireless headset. Including an optional sleep state further optimizes battery life. In the sleep state, only a portion of the wireless headset circuitry is enabled. Rather than transitioning from inactive to active, the headset transitions from

Claims	Prior Art
	inactive to sleep. In sleep, the headset periodically monitors for a signal from the separate communications device. Upon detection of such a signal, the wireless headset transitions to its active state, thereby providing full functionality to the user. Irvin '332 at Figure 2A  *FIG. 2A*

Claims	Prior Art
	Irvin ’332 at Figure 6  FIG. 6

Claims	Prior Art
	Irvin ’332 at Figure 7  *FIG. 7*

Claims	Prior Art
	Irvin ’332 at Figure 8  *FIG. 8* Irvin ’332 at 2:16–34 The present invention includes both a method and apparatus allowing a wireless headset to automatically control its operating state to minimize power consumption, thereby maximizing the life of its power source, such as a battery. The wireless headset serves as a communication accessory to a base unit, such as a cellular telephone. When not in use, the wireless headset reverts to an inactive state and draws essentially no power. A power control circuit imparts automatic enabling capability to the wireless headset. Preferably, the power control circuit employs a sensor responsive to a natural stimulus associated with a person preparing to use the wireless headset. The wireless headset may sense motion, physical orientation, or user proximity. Sensing techniques include but are not limited to micro-electro-mechanical-systems (MEMS), mercury switches, attitude switches, and IR or acoustic proximity sensors. In some embodiments, the wireless headset transitions from the inactive state to an active state in response to a user picking it up or mounting the wireless headset upon their head. Irvin ’332 at 2:35–50 In a more sophisticated embodiment, the wireless headset may transition from the inactive state to a sleep state, based on user stimulus. In the sleep state, only a portion of the headset circuitry is enabled, thus

Claims	Prior Art
	conserving power. While in the sleep state, the wireless headset monitors for a signal from the base unit, and, when such a signal is received, it transitions from the sleep state to the active state. Further, once active, the wireless headset can continue to monitor for communications link activity. Thus, if communications with the base unit cease, the wireless headset can return to the sleep state and periodically check for resumed communications activity. A timer allows the wireless headset to automatically return to the inactive state subsequent to use. Cessation of movement or detected removal of the wireless headset from the user's head can indicate termination of use and trigger a timed power-down. Irvin '332 at 3:53–4:2 The communications circuit 230 provides wireless headset functionality, including audio input and output and wireless communications with the base unit 102. The communications or headset circuit 230 includes a wireless communications interface 232 providing a wireless communications link for sending and receiving information to and from the base unit 102. The wireless communications interface 232 includes at least a wireless receiver and wireless transmitter. Audio input received via microphone 236 is conditioned by the audio interface 234 and then processed by the communications interface 232 for transmittal to the base unit 102. Audio information received from the base unit 102 is processed by the wireless communications interface 232 and then conditioned in the audio interface 234 for output to a user via speaker 238. With reference to FIG. 1A or 1B, the microphone 236 may be located in microphone pickup 120, and speaker 238 may be located in earpiece 130. Irvin '332 at 4:39–67 FIG. 3A illustrates a preferred embodiment for the wireless headset 100. In FIG. 3A, the power control circuit 210 independently enables the wireless communications interface 232 and audio interface 234. Thus, select portions of communications circuit 230 may be enabled in response to the sensor output signal. Once the wireless communications interface 232 is enabled, it provides a signal, termed a "link active" signal, to the power control circuit 210 based on detecting a wireless signal received from the base unit 102. Based on the assertion of the link active signal, the power control circuit 210 enables the audio interface 234. FIG. 3B provides more functional details regarding the power control circuit 210 of FIG. 3A. Again, the control logic 212 is responsive to a sensor output signal from sensor 220. However, in response to the sensor output signal, the control logic 212 turns on switch 214 while switch 216 remains off, thereby enabling the wireless communications interface 232. As with the previously discussed embodiment, power control circuit 210 includes the timer 218. In a preferred embodiment, control logic 212 starts timer 218 upon enabling the wireless communications interface 232, and resets timer 218 based on subsequent

Claims	Prior Art
	or continued assertion of the sensor output signal. If the wireless communications interface 232 asserts the link active signal, the control logic 212 turns on switch 216, thereby enabling the audio interface 234. If the timer 218 expires, the control logic 212 turns off switches 214 and 216, thereby disabling the wireless communications interface 232 and the audio interface 234. Irvin '332 at 5:1–23 Because the wireless headset 100 of the present invention automatically enables and disables its communication functions based on use, the sensor 220 may be based on a variety of technologies. In general, its purpose is to provide a signal responsive to a natural stimulus associated with use of the headset by a user. Movement or vibration of the wireless headset 100, or placement of the wireless headset 100 upon the user's body indicates usage. Movement may be detected based on vibration or by sensing acceleration, such as with an accelerometer. Mechanical or liquid-based switches represent alternate mechanisms for sensing movement. In such switches, movement causes an electrical connection to be established between contact pairs. Further, the particular sensor 220 employed may be tuned or configured such that only stimulus consistent with actual use actuates the sensor, thus avoiding inadvertent or unintended enabling of the wireless headset 100. In such configurations, the sensor 220 preferably employs output conditioning that prevents assertion of the sensor output signal for stimulus below a defined threshold. Alternatively, the power control circuit 210 may include such conditioning as part of its interface to the sensor 220. FIGS. 4A–4D illustrate possible sensor embodiments. Irvin '332 at 5:25–52 In FIG. 4A, the power control circuit 210 is operatively associated with a MEMS device, with the MEMS device functioning as the sensor 220. Devices based on MEMS technology may be responsive to general vibration or motion, or may be configured to respond only to specific acceleration along defined axes. As MEMS devices may easily include output conditioning electronics, the sensitivity or responsiveness of the sensor 220 incorporating the MEMS device may be tailored such that the sensor output signal is asserted only for motion or vibration above a certain threshold. A typical MEMS employs modified microelectronics fabrication techniques and includes small mechanical elements responsive to movement or vibration, such as cantilever beams formed by selectively etching a silicon wafer. In a preferred embodiment of the present invention, sensor 220 includes a MEMS device simultaneously fulfilling the requirements of low power consumption, relative low-cost, and adequate signal discrimination. In this context, signal discrimination means that the sensor 220 is not prone to nuisance assertions of its sensor output signal caused by minute movement or vibration. Although the body of work associated with MEMS technology is quite comprehensive, significant insight into the basic structures and techniques of MEMS technology may be gained from U.S. Pat. No. 5,659,195 to Kaiser et al., U.S. Pat. No. 5,663,507

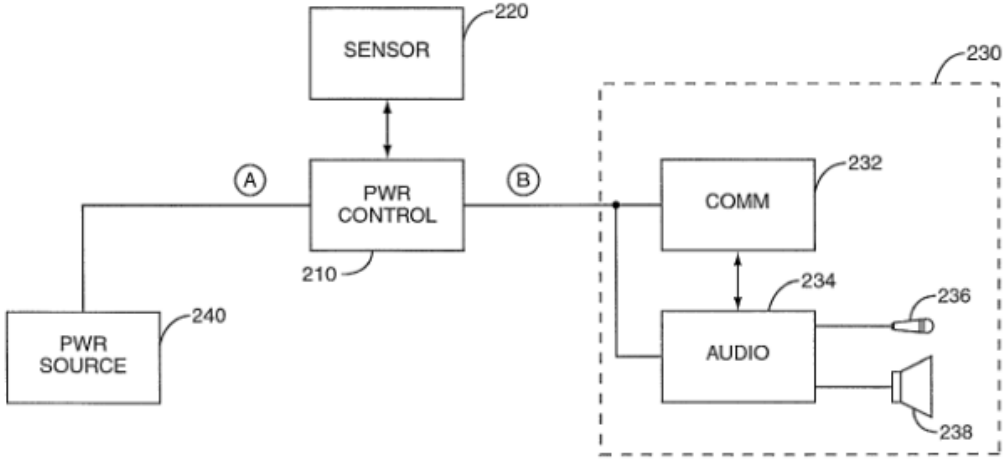
Claims	Prior Art
	to Westervelt et al., and U.S. Pat. No. 5,76,480 to Pister, the disclosures of which are incorporated herein by reference. Irvin '332 at 5:53–6:2 FIG. 4B illustrates the power control circuit 210 coupled to a liquid-based switch functioning as the sensor 220. The sensor 220 may be a mercury-filled switch, or may employ other conductive liquids. Depending upon its configuration, the sensor 220, implemented as a liquid-based switch, may function as a motion sensor or as an attitude sensor. As a motion sensor, the sensor 220 includes first and second contacts disposed in a manner such that motion of the contained liquid places the first and second contacts in electrical connection. As an attitude sensor, sensor 220 includes first and second contacts disposed in a manner such that one or more specific physical orientations of the wireless headset 100 causes the contained liquid in sensor 220 to place the first and second contacts in electrical connection. The power control circuit 210 connects to the first and second contacts of sensor 220, and is responsive to the electrical connection completed by the contained liquid. Irvin '332 at 6:20–33 FIG. 4D illustrates the power control circuit 210 coupled with a proximity sensor 220 not based on mechanical actuation. The proximity sensor 220 may be an active or passive IR sensor, may be a resistive or other type of thermal sensor, or may be an acoustic sensor. As a proximity sensor, sensor 220 provides indication that a user has placed the wireless headset 100 upon their body. As such, any of the foregoing or other presence sensing techniques may be used to implement sensor 220. Preferably, when configured as a proximity sensor, sensor 220 requires minimal power and provides a sensor output signal based on proximity to the user's body. Depending upon the sensing technology chosen, the control circuit 210 may be required to periodically stimulate sensor 220 to generate a detection response. Irvin '332 at 7:1–8:3 Note that the foregoing diagrams illustrate various configurations for the present invention, with these configurations allowing the wireless headset 100 to automatically enable and disable select portions of its electronic circuitry based on user stimulus. Enabling and disabling may constitute physical connection and disconnection of power between the power source 240 and the communications or headset circuit 230, or may simply represent the assertion and de-assertion of specific enabling signals. Thus, the foregoing diagrams should not be construed as limiting in any way regarding the specific circuit implementation of the wireless headset 100. FIGS. 2–5 illustrate functional diagrams and these various functions may have corresponding separate circuit elements, or may be included in integrated fashion in

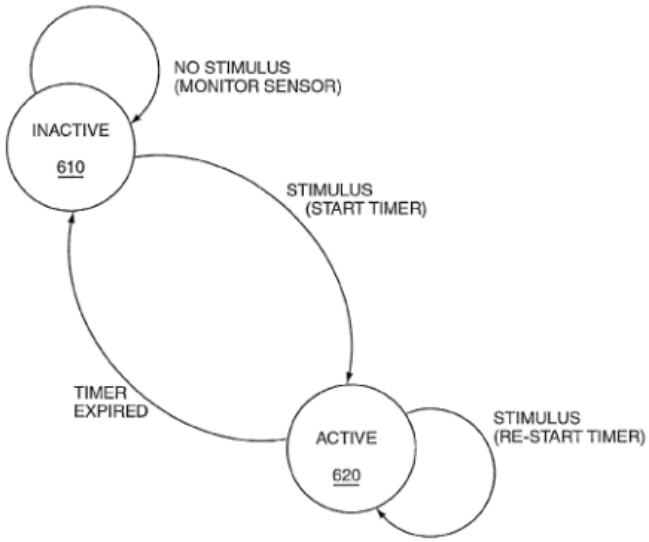
Claims	Prior Art
	one or more devices. For example, a microprocessor in a sleep or halt mode may be directly connected to a battery and configured to wake up in response to an input from the sensor 220. Thus, the microprocessor could serve as the power control circuit 210, as well as providing functions related to the communications interface 232 and audio interface 234. FIGS. 8 and 9, in particular, illustrate an exemplary embodiment of the present invention wherein an integrated controller provides the functionality of the power control circuit 210. In FIG. 8, the power control circuit 210 includes an integrated controller 300. The integrated controller 300 provides power control functionality associated with the timer 218, switches 214 and 216, and control logic 212. In this embodiment, the controller 300 provides both power and control/signal interconnections for the wireless communications interface 232 and audio interface 234. The controller 300 independently enables the wireless communications interface 232 and audio interface 234 in response to the sensor output signal from sensor 220. As with other embodiments, the controller 300 may enable both the wireless communication interface 232 and audio interface 234 in response to the sensor output signal, or may only enable the wireless communications interface 232, or a portion thereof. In this latter, case, the controller 300 enables the audio interface 234 in response to receiving the link signal from the enabled portion of the wireless communications interface 232. FIG. 9 provides more detail regarding the controller 300 shown in FIG. 8. A main power controller 310 provides power/control outputs to power controllers 330 and 340, which, in turn, provide power control outputs to the wireless communications interface 232 and audio interface 234, respectively. The main power controller 310 additionally interfaces with and provides power to a functional controller 350 and a sensor controller 320. The functional controller 350 provides signal and control interfaces with both the wireless communications interface 232 and the audio interface 234. In an exemplary embodiment, the main power controller initially enables only the sensor controller 320. Then, in response to the sensor output signal, the main controller 310 enables power controller 330 at least a portion of the functional controller 350. In response, power controller 330 enables at least a portion of the wireless communications interface 232. Then, in response to receiving the link signal from the wireless communications interface 232—the link signal may be received via the functional controller 350—the main power controller 310 enables the power controller 340 associated with the audio interface 234. The power controllers 330 and 340 may comprise FET switches combined with control logic responsive to control signals asserted by the main power controller 310, the functional controller 350, and/or the wireless communications interface 232. Irvin ’332 at 8:11–50 FIGS. 6 and 7 illustrate operation of the wireless headset 100. FIG. 6 is a state diagram for one exemplary embodiment of the present invention. When the wireless headset 100 is not in use, it automatically enters an inactive state (610). As explained, this inactive state may constitute disconnecting the communications

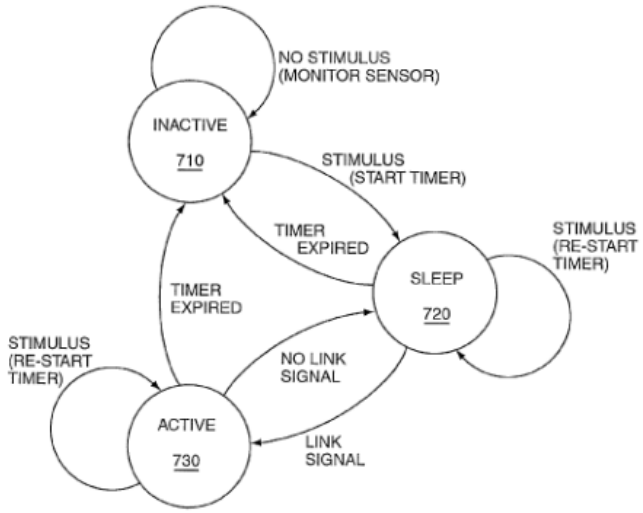
Claims	Prior Art
	circuit 230 from the power source 240, or may simply represent placing the communications circuit 230 in a non-functional, low-power condition. Absent user stimulus, such as motion of the wireless headset 100 or placement of the wireless headset 100 upon the user's body, the wireless headset 100 remains in the inactive state (610). In response to user stimulus, as detected by sensor 220, the power control circuit 210 enables the communications circuit 230, with this enabling representing a transition from the inactive state to an active state (620). Upon entering the active state, the power control circuit 210 initializes and starts the timer 218. The timer 218 incrementally counts from a starting value to an ending value, with the progression from starting to ending values representing a defined interval of time. Upon expiration of the timer 218, the power control circuit 210 disables the communications circuit 230. This interval of time may be preprogrammed to a convenient value, or may be selectable based on input from the base unit 102. For example, a timeout interval of five minutes may provide a reasonable compromise between user convenience and battery life. While in the active state (620), the power control circuit 210 resets the timer 218 based on the reassertion or continued assertion of the sensor output signal from sensor 220. Such resetting prevents expiration of the timer 218 and, as such, causes the power control circuit 210 to leave the communications or headset circuit 230 enabled. Thus, the power control circuit 210 is designed to leave the wireless headset 100 in the active state (620) while the wireless headset is in use by a user. Absent user stimulus, the timer 218 of power control circuit 210 expires, thereby causing the wireless headset 100 to transition from the active state (620) to the inactive state (610) based on the power control circuit 210 disabling the communications circuit 230. Irvin ’332 at 8:51–9:12 FIG. 7 is a state diagram for a preferred embodiment of the present invention. Operation of the wireless headset 100 illustrated in FIG. 7 is distinguished from that shown in FIG. 6 by inclusion of an additional state, denoted as the sleep state (720). Inclusion of the sleep state provides an additional opportunity to control the power consumption of wireless headset 100 based on specific operating conditions. As before, the wireless headset 100 remains in the inactive state (710) absent user stimulus. Upon detecting user stimulus, the wireless headset 100 transitions from the inactive state (710) to the sleep state (720). In this state, the power control circuit 210 enables only a portion of the communications circuit 230. Specifically, the power control circuit 210 enables the wireless communications interface 232 or a portion thereof. Then, using a signal output from the wireless communications interface 232, the power control circuit 210 determines if the base unit 102 is active, or if the base unit 102 is attempting to communicate with the wireless headset 100. In some embodiments, the wireless headset 100 infers activity by detecting, via its wireless communications interface, a carrier signal from the base unit 102. In other embodiments, the wireless headset detects activity based on receiving a “wake-up” signal from the base unit 102. Note that monitoring for the base unit carrier signal may be performed continuously by the wireless headset 100

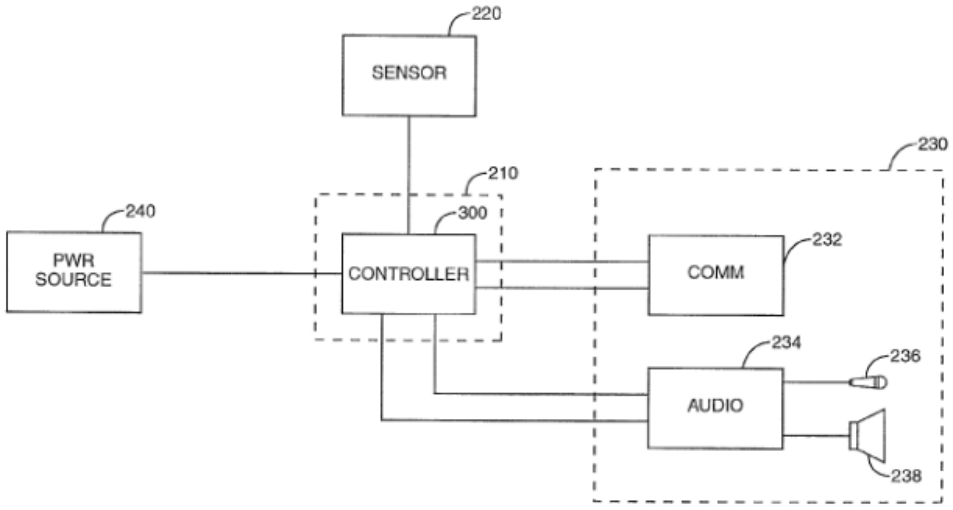
Claims	Prior Art
	while in the sleep state, or may be performed periodically; thereby further reducing sleep state power consumption. For periodic carrier monitoring, the wireless headset 100 may employ an exemplary monitoring interval of 0.5 seconds. Irvin '332 at 9:13–65 Upon detecting the carrier signal or wake-up signal from the base unit 102, as indicated by the link signal shown in FIG. 7, the wireless headset 100 transitions from the sleep state (720) to the active state (730). To further reduce power consumption, the wireless headset 100 may only monitor for the external signal on a periodic basis. If the wireless headset 100 is configured to monitor for the external signal on a periodic basis and the base unit 102 is configured to emit a periodic wake-up signal, the periodic monitoring of the wireless headset 100 is set such that its monitoring frequency is not an integer multiple of the wake-up signal frequency. Upon causing the wireless headset 100 to transition from the inactive state (710) to the sleep state (720), the power control circuit 210 initializes and starts the timer 218. While in the sleep state (720), subsequent or continued assertion of the sensor output signal from the sensor 220 causes the power control circuit 210 to reset its timer 218. Absent such user stimulus, the timer 218 expires and the power control circuit 210 disables the communications circuit 230. After transitioning from the sleep state (720) to the active state (730), based on detection of the signal from the base unit 102, the power control circuit 210 continues resetting its timer 218 based on user stimulus, as done in the sleep state (720). Thus, continued user stimulus causes the power control circuit 210 to leave the wireless headset 100 fully functional in the active state (730). The present invention provides methods and apparatus allowing the wireless headset 100 to conveniently transition from a non-functional inactive state to a fully functional active state, based on its detection of certain user stimulus. In a preferred embodiment, the wireless headset 100 transitions from the inactive state to the intermediate sleep state, thereby conserving power. Upon detection of the carrier or the wake-up signal from the base unit 102, the wireless headset 100 transitions from the sleep state to the fully functional active state. The wireless headset 100 includes a sensor 220 for detecting the user stimulus. As the sensor 220 may be a motion sensor, a vibration sensor, an attitude sensor, or a proximity sensor, the specific user stimulus may include the user moving and/or placing the wireless headset 100 upon their body. The operation of the wireless headset 100 in accordance with the present invention admits tremendous flexibility with respect to implementation. As noted, many different circuit implementations may provide the inventive features of the present invention. These implementations may include hardware and software, and can reflect varying degrees of integration between the functional circuit blocks discussed. Indeed, all such variations for providing a wireless headset 100 that automatically controls its

Claims	Prior Art
	power consumption or operating state based on detection of a user stimulus are within the scope of the present invention. POSITA would have been motivated to combine the Jabra BT800 and Irvin '332, and reasonably expected success in doing so, for the same reasons discussed above for claim 12, for example, to maximize battery life. *Supra* claim 12; Irvin '332, Abstract. To the extent that the Jabra BT800 and Irvin '332 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800 and Irvin '332, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[14a] A system as recited in claim 13, wherein the head-worn personal electronic apparatus is configured to support audio output to the user via the speaker, and	The Jabra BT800 expressly or inherently discloses "[a] system as recited in claim 13, wherein the head-worn personal electronic apparatus is configured to support audio output to the user via the speaker." For example: *See* above at claim 4[a]. To the extent that the Jabra BT800 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[14b] wherein the operation of the head-worn personal electronic apparatus being altered concerns control of the audio output being provided to the user.	The Jabra BT800 and Irvin '332 expressly or inherently disclose "wherein the operation of the head-worn personal electronic apparatus being altered concerns control of the audio output being provided to the user." For example: Irvin '332 "wireless headset" includes "audio interface 234" which conditions audio "for output to a user via speaker 238" (example of the claimed control of the audio output being provide to the user) and "the controller 300 independently enables the ... audio interface 234 in response to the sensor output signal from the sensor 220" (example of the claimed operation of the head–worn personal electronic apparatus being altered). The following citations show examples of where the Irvin '332 discloses this limitation. Irvin '332 at Abstract A wireless headset for use with a separate communications device, such as a cellular telephone, includes automatic on/off capabilities to maximize battery life. By detecting a user's interaction, such as picking up the headset or placing it upon the user's body, the wireless headset automatically transitions from an inactive state to an active state. Techniques for automatic headset enabling include but are not limited to motion sensors, attitude or position sensors, proximity sensors, and contact sensors. These techniques may be used individually or in any combination. An internal timer allows the wireless headset to return to its

Claims	Prior Art
	inactive state a defined interval after cessation of movement or removal of the wireless headset. Including an optional sleep state further optimizes battery life. In the sleep state, only a portion of the wireless headset circuitry is enabled. Rather than transitioning from inactive to active, the headset transitions from inactive to sleep. In sleep, the headset periodically monitors for a signal from the separate communications device. Upon detection of such a signal, the wireless headset transitions to its active state, thereby providing full functionality to the user. Irvin '332 at Figure 2A  *FIG. 2A*

Claims	Prior Art
	Irvin ’332 at Figure 6  *FIG. 6*

Claims	Prior Art
	Irvin ’332 at Figure 7  FIG. 7

Claims	Prior Art
	Irvin ’332 at Figure 8  *FIG. 8* Irvin ’332 at 2:16–34 The present invention includes both a method and apparatus allowing a wireless headset to automatically control its operating state to minimize power consumption, thereby maximizing the life of its power source, such as a battery. The wireless headset serves as a communication accessory to a base unit, such as a cellular telephone. When not in use, the wireless headset reverts to an inactive state and draws essentially no power. A power control circuit imparts automatic enabling capability to the wireless headset. Preferably, the power control circuit employs a sensor responsive to a natural stimulus associated with a person preparing to use the wireless headset. The wireless headset may sense motion, physical orientation, or user proximity. Sensing techniques include but are not limited to micro-electro-mechanical-systems (MEMS), mercury switches, attitude switches, and IR or acoustic proximity sensors. In some embodiments, the wireless headset transitions from the inactive state to an active state in response to a user picking it up or mounting the wireless headset upon their head. Irvin ’332 at 2:35–50 In a more sophisticated embodiment, the wireless headset may transition from the inactive state to a sleep state, based on user stimulus. In the sleep state, only a portion of the headset circuitry is enabled, thus

Claims	Prior Art
	conserving power. While in the sleep state, the wireless headset monitors for a signal from the base unit, and, when such a signal is received, it transitions from the sleep state to the active state. Further, once active, the wireless headset can continue to monitor for communications link activity. Thus, if communications with the base unit cease, the wireless headset can return to the sleep state and periodically check for resumed communications activity. A timer allows the wireless headset to automatically return to the inactive state subsequent to use. Cessation of movement or detected removal of the wireless headset from the user's head can indicate termination of use and trigger a timed power-down. Irvin '332 at 3:53–4:2 The communications circuit 230 provides wireless headset functionality, including audio input and output and wireless communications with the base unit 102. The communications or headset circuit 230 includes a wireless communications interface 232 providing a wireless communications link for sending and receiving information to and from the base unit 102. The wireless communications interface 232 includes at least a wireless receiver and wireless transmitter. Audio input received via microphone 236 is conditioned by the audio interface 234 and then processed by the communications interface 232 for transmittal to the base unit 102. Audio information received from the base unit 102 is processed by the wireless communications interface 232 and then conditioned in the audio interface 234 for output to a user via speaker 238. With reference to FIG. 1A or 1B, the microphone 236 may be located in microphone pickup 120, and speaker 238 may be located in earpiece 130. Irvin '332 at 4:39–67 FIG. 3A illustrates a preferred embodiment for the wireless headset 100. In FIG. 3A, the power control circuit 210 independently enables the wireless communications interface 232 and audio interface 234. Thus, select portions of communications circuit 230 may be enabled in response to the sensor output signal. Once the wireless communications interface 232 is enabled, it provides a signal, termed a "link active" signal, to the power control circuit 210 based on detecting a wireless signal received from the base unit 102. Based on the assertion of the link active signal, the power control circuit 210 enables the audio interface 234. FIG. 3B provides more functional details regarding the power control circuit 210 of FIG. 3A. Again, the control logic 212 is responsive to a sensor output signal from sensor 220. However, in response to the sensor output signal, the control logic 212 turns on switch 214 while switch 216 remains off, thereby enabling the wireless communications interface 232. As with the previously discussed embodiment, power control circuit 210 includes the timer 218. In a preferred embodiment, control logic 212 starts timer 218 upon enabling the wireless communications interface 232, and resets timer 218 based on subsequent

Claims	Prior Art
	or continued assertion of the sensor output signal. If the wireless communications interface 232 asserts the link active signal, the control logic 212 turns on switch 216, thereby enabling the audio interface 234. If the timer 218 expires, the control logic 212 turns off switches 214 and 216, thereby disabling the wireless communications interface 232 and the audio interface 234. Irvin '332 at 5:1–23 Because the wireless headset 100 of the present invention automatically enables and disables its communication functions based on use, the sensor 220 may be based on a variety of technologies. In general, its purpose is to provide a signal responsive to a natural stimulus associated with use of the headset by a user. Movement or vibration of the wireless headset 100, or placement of the wireless headset 100 upon the user's body indicates usage. Movement may be detected based on vibration or by sensing acceleration, such as with an accelerometer. Mechanical or liquid-based switches represent alternate mechanisms for sensing movement. In such switches, movement causes an electrical connection to be established between contact pairs. Further, the particular sensor 220 employed may be tuned or configured such that only stimulus consistent with actual use actuates the sensor, thus avoiding inadvertent or unintended enabling of the wireless headset 100. In such configurations, the sensor 220 preferably employs output conditioning that prevents assertion of the sensor output signal for stimulus below a defined threshold. Alternatively, the power control circuit 210 may include such conditioning as part of its interface to the sensor 220. FIGS. 4A–4D illustrate possible sensor embodiments. Irvin '332 at 5:25–52 In FIG. 4A, the power control circuit 210 is operatively associated with a MEMS device, with the MEMS device functioning as the sensor 220. Devices based on MEMS technology may be responsive to general vibration or motion, or may be configured to respond only to specific acceleration along defined axes. As MEMS devices may easily include output conditioning electronics, the sensitivity or responsiveness of the sensor 220 incorporating the MEMS device may be tailored such that the sensor output signal is asserted only for motion or vibration above a certain threshold. A typical MEMS employs modified microelectronics fabrication techniques and includes small mechanical elements responsive to movement or vibration, such as cantilever beams formed by selectively etching a silicon wafer. In a preferred embodiment of the present invention, sensor 220 includes a MEMS device simultaneously fulfilling the requirements of low power consumption, relative low-cost, and adequate signal discrimination. In this context, signal discrimination means that the sensor 220 is not prone to nuisance assertions of its sensor output signal caused by minute movement or vibration. Although the body of work associated with MEMS technology is quite comprehensive, significant insight into the basic structures and techniques of MEMS technology may be gained from U.S. Pat. No. 5,659,195 to Kaiser et al., U.S. Pat. No. 5,663,507

Claims	Prior Art
	to Westervelt et al., and U.S. Pat. No. 5,76,480 to Pister, the disclosures of which are incorporated herein by reference. Irvin ’332 at 5:53–6:2 FIG. 4B illustrates the power control circuit 210 coupled to a liquid-based switch functioning as the sensor 220. The sensor 220 may be a mercury-filled switch, or may employ other conductive liquids. Depending upon its configuration, the sensor 220, implemented as a liquid-based switch, may function as a motion sensor or as an attitude sensor. As a motion sensor, the sensor 220 includes first and second contacts disposed in a manner such that motion of the contained liquid places the first and second contacts in electrical connection. As an attitude sensor, sensor 220 includes first and second contacts disposed in a manner such that one or more specific physical orientations of the wireless headset 100 causes the contained liquid in sensor 220 to place the first and second contacts in electrical connection. The power control circuit 210 connects to the first and second contacts of sensor 220, and is responsive to the electrical connection completed by the contained liquid. Irvin ’332 at 6:20–33 FIG. 4D illustrates the power control circuit 210 coupled with a proximity sensor 220 not based on mechanical actuation. The proximity sensor 220 may be an active or passive IR sensor, may be a resistive or other type of thermal sensor, or may be an acoustic sensor. As a proximity sensor, sensor 220 provides indication that a user has placed the wireless headset 100 upon their body. As such, any of the foregoing or other presence sensing techniques may be used to implement sensor 220. Preferably, when configured as a proximity sensor, sensor 220 requires minimal power and provides a sensor output signal based on proximity to the user's body. Depending upon the sensing technology chosen, the control circuit 210 may be required to periodically stimulate sensor 220 to generate a detection response. Irvin ’332 at 7:1–8:3 Note that the foregoing diagrams illustrate various configurations for the present invention, with these configurations allowing the wireless headset 100 to automatically enable and disable select portions of its electronic circuitry based on user stimulus. Enabling and disabling may constitute physical connection and disconnection of power between the power source 240 and the communications or headset circuit 230, or may simply represent the assertion and de-assertion of specific enabling signals. Thus, the foregoing diagrams should not be construed as limiting in any way regarding the specific circuit implementation of the wireless headset 100. FIGS. 2–5 illustrate functional diagrams and these various functions may have corresponding separate circuit elements, or may be included in integrated fashion in

Claims	Prior Art
	one or more devices. For example, a microprocessor in a sleep or halt mode may be directly connected to a battery and configured to wake up in response to an input from the sensor 220. Thus, the microprocessor could serve as the power control circuit 210, as well as providing functions related to the communications interface 232 and audio interface 234. FIGS. 8 and 9, in particular, illustrate an exemplary embodiment of the present invention wherein an integrated controller provides the functionality of the power control circuit 210. In FIG. 8, the power control circuit 210 includes an integrated controller 300. The integrated controller 300 provides power control functionality associated with the timer 218, switches 214 and 216, and control logic 212. In this embodiment, the controller 300 provides both power and control/signal interconnections for the wireless communications interface 232 and audio interface 234. The controller 300 independently enables the wireless communications interface 232 and audio interface 234 in response to the sensor output signal from sensor 220. As with other embodiments, the controller 300 may enable both the wireless communication interface 232 and audio interface 234 in response to the sensor output signal, or may only enable the wireless communications interface 232, or a portion thereof. In this latter, case, the controller 300 enables the audio interface 234 in response to receiving the link signal from the enabled portion of the wireless communications interface 232. FIG. 9 provides more detail regarding the controller 300 shown in FIG. 8. A main power controller 310 provides power/control outputs to power controllers 330 and 340, which, in turn, provide power control outputs to the wireless communications interface 232 and audio interface 234, respectively. The main power controller 310 additionally interfaces with and provides power to a functional controller 350 and a sensor controller 320. The functional controller 350 provides signal and control interfaces with both the wireless communications interface 232 and the audio interface 234. In an exemplary embodiment, the main power controller initially enables only the sensor controller 320. Then, in response to the sensor output signal, the main controller 310 enables power controller 330 at least a portion of the functional controller 350. In response, power controller 330 enables at least a portion of the wireless communications interface 232. Then, in response to receiving the link signal from the wireless communications interface 232—the link signal may be received via the functional controller 350—the main power controller 310 enables the power controller 340 associated with the audio interface 234. The power controllers 330 and 340 may comprise FET switches combined with control logic responsive to control signals asserted by the main power controller 310, the functional controller 350, and/or the wireless communications interface 232. Irvin ’332 at 8:11–50 FIGS. 6 and 7 illustrate operation of the wireless headset 100. FIG. 6 is a state diagram for one exemplary embodiment of the present invention. When the wireless headset 100 is not in use, it automatically enters an inactive state (610). As explained, this inactive state may constitute disconnecting the communications

Claims	Prior Art
	circuit 230 from the power source 240, or may simply represent placing the communications circuit 230 in a non-functional, low-power condition. Absent user stimulus, such as motion of the wireless headset 100 or placement of the wireless headset 100 upon the user's body, the wireless headset 100 remains in the inactive state (610). In response to user stimulus, as detected by sensor 220, the power control circuit 210 enables the communications circuit 230, with this enabling representing a transition from the inactive state to an active state (620). Upon entering the active state, the power control circuit 210 initializes and starts the timer 218. The timer 218 incrementally counts from a starting value to an ending value, with the progression from starting to ending values representing a defined interval of time. Upon expiration of the timer 218, the power control circuit 210 disables the communications circuit 230. This interval of time may be preprogrammed to a convenient value, or may be selectable based on input from the base unit 102. For example, a timeout interval of five minutes may provide a reasonable compromise between user convenience and battery life. While in the active state (620), the power control circuit 210 resets the timer 218 based on the reassertion or continued assertion of the sensor output signal from sensor 220. Such resetting prevents expiration of the timer 218 and, as such, causes the power control circuit 210 to leave the communications or headset circuit 230 enabled. Thus, the power control circuit 210 is designed to leave the wireless headset 100 in the active state (620) while the wireless headset is in use by a user. Absent user stimulus, the timer 218 of power control circuit 210 expires, thereby causing the wireless headset 100 to transition from the active state (620) to the inactive state (610) based on the power control circuit 210 disabling the communications circuit 230. Irvin ’332 at 8:51–9:12 FIG. 7 is a state diagram for a preferred embodiment of the present invention. Operation of the wireless headset 100 illustrated in FIG. 7 is distinguished from that shown in FIG. 6 by inclusion of an additional state, denoted as the sleep state (720). Inclusion of the sleep state provides an additional opportunity to control the power consumption of wireless headset 100 based on specific operating conditions. As before, the wireless headset 100 remains in the inactive state (710) absent user stimulus. Upon detecting user stimulus, the wireless headset 100 transitions from the inactive state (710) to the sleep state (720). In this state, the power control circuit 210 enables only a portion of the communications circuit 230. Specifically, the power control circuit 210 enables the wireless communications interface 232 or a portion thereof. Then, using a signal output from the wireless communications interface 232, the power control circuit 210 determines if the base unit 102 is active, or if the base unit 102 is attempting to communicate with the wireless headset 100. In some embodiments, the wireless headset 100 infers activity by detecting, via its wireless communications interface, a carrier signal from the base unit 102. In other embodiments, the wireless headset detects activity based on receiving a “wake-up” signal from the base unit 102. Note that monitoring for the base unit carrier signal may be performed continuously by the wireless headset 100

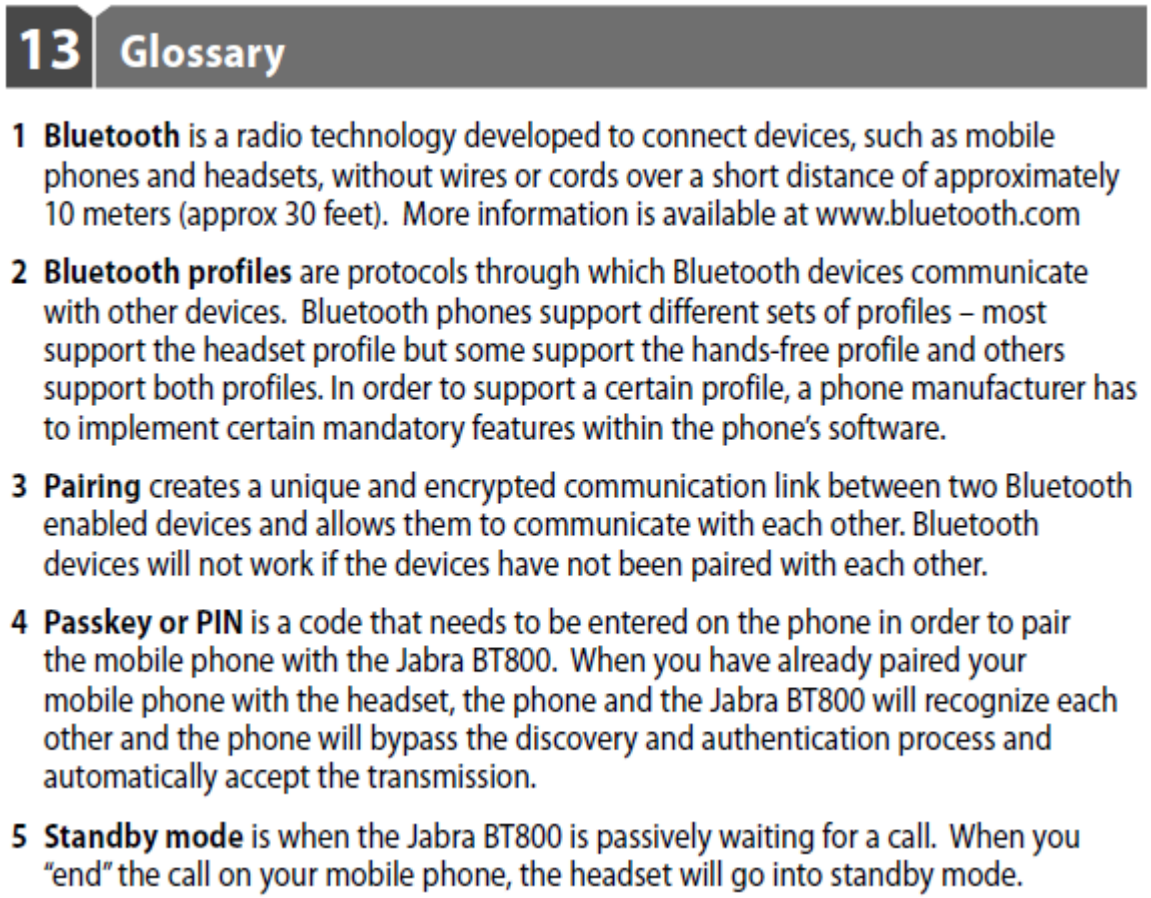
Claims	Prior Art
	while in the sleep state, or may be performed periodically; thereby further reducing sleep state power consumption. For periodic carrier monitoring, the wireless headset 100 may employ an exemplary monitoring interval of 0.5 seconds. Irvin '332 at 9:13–65 Upon detecting the carrier signal or wake-up signal from the base unit 102, as indicated by the link signal shown in FIG. 7, the wireless headset 100 transitions from the sleep state (720) to the active state (730). To further reduce power consumption, the wireless headset 100 may only monitor for the external signal on a periodic basis. If the wireless headset 100 is configured to monitor for the external signal on a periodic basis and the base unit 102 is configured to emit a periodic wake-up signal, the periodic monitoring of the wireless headset 100 is set such that its monitoring frequency is not an integer multiple of the wake-up signal frequency. Upon causing the wireless headset 100 to transition from the inactive state (710) to the sleep state (720), the power control circuit 210 initializes and starts the timer 218. While in the sleep state (720), subsequent or continued assertion of the sensor output signal from the sensor 220 causes the power control circuit 210 to reset its timer 218. Absent such user stimulus, the timer 218 expires and the power control circuit 210 disables the communications circuit 230. After transitioning from the sleep state (720) to the active state (730), based on detection of the signal from the base unit 102, the power control circuit 210 continues resetting its timer 218 based on user stimulus, as done in the sleep state (720). Thus, continued user stimulus causes the power control circuit 210 to leave the wireless headset 100 fully functional in the active state (730). The present invention provides methods and apparatus allowing the wireless headset 100 to conveniently transition from a non-functional inactive state to a fully functional active state, based on its detection of certain user stimulus. In a preferred embodiment, the wireless headset 100 transitions from the inactive state to the intermediate sleep state, thereby conserving power. Upon detection of the carrier or the wake-up signal from the base unit 102, the wireless headset 100 transitions from the sleep state to the fully functional active state. The wireless headset 100 includes a sensor 220 for detecting the user stimulus. As the sensor 220 may be a motion sensor, a vibration sensor, an attitude sensor, or a proximity sensor, the specific user stimulus may include the user moving and/or placing the wireless headset 100 upon their body. The operation of the wireless headset 100 in accordance with the present invention admits tremendous flexibility with respect to implementation. As noted, many different circuit implementations may provide the inventive features of the present invention. These implementations may include hardware and software, and can reflect varying degrees of integration between the functional circuit blocks discussed. Indeed, all such variations for providing a wireless headset 100 that automatically controls its

Claims	Prior Art
	power consumption or operating state based on detection of a user stimulus are within the scope of the present invention. A POSITA would have been motivated to combine Irvin '332's being worn determination into the Jabra BT800, and reasonably expected success in doing so, for the same reasons discussed above for claims 12–13, for example, to maximize battery life. *Supra* claim 12–13; Irvin '332, Abstract. Indeed, a POSITA would have recognized the outputting audio via the speakers consumed electricity, and a POSITA Would have sought solutions for how to minimize this power loss when a user forgot to pause the audio but is not wearing the headset, as taught by Irvin. Irvin '332, 1:61–2:7; *supra* claim 12. The Jabra BT800 expressly recognizes this advantages, for example, because it includes a "standby mode" when a call is not active and that battery life is extended in "standby." Jabra BT800 User Guide at 3, 7–8, 13. A POSITA thus would have been motivated to seek other power saving solutions. To the extent that the Jabra BT800 and Irvin '332 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800 and Irvin '332, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[15a]. A system as recited in claim 13, wherein the head-worn personal electronic apparatus is configured to support a low power operational mode, and	The Jabra BT800 and Irvin '332 expressly or inherently disclose "[a] system as recited in claim 13, wherein the head-worn personal electronic apparatus is configured to support a low power operational mode." For example: The Jabra BT800 includes a "standby mode" that consumes less power than when the Jabra BT800 is in a call (example of the claimed head-worn personal electronic apparatus is configured to support a low power operational mode). The following citations show examples of where the Jabra BT800 discloses this limitation.

Claims	Prior Art
	Jabra BT800 User Manual at Page 3 **Summary of features** • Operational features: • Answer call • End call • Reject call • Last number redialing • Call list • Automatic volume control • Supports voice-dialing (subject to phone) • DSP (digital signal processing) for noise cancellation • Call waiting • Put call on hold • Mute • Display caller ID • Ringing tones • Call vibrate feature • Rechargeable battery with direct charging option from PC with USB cable • Up to 6 hours talk time and 125 hours standby time • Total weight including battery only 25 grams • Range up to 10 meters (33 feet) • Bluetooth[1] (see Glossary) version 1.2 • Headset and hands-free Bluetooth profiles[2] Your Jabra BT800 is compatible with most Bluetooth mobile phones. You can check whether your phone has Bluetooth capability by visiting your phone manufacturer's web site or Jabra's website (www.jabra.com) Jabra BT800 User Manual at Page 7 **Adjust light** • You can decide if you want the LED in the mute button at the center of the jog wheel, to flash or not. When activated, the LED will flash every second during a conversation or every three seconds when the headset is in standby mode.

Claims	Prior Art
	Jabra BT800 User Manual at Page 8 **Making/answering a call when using the Jabra A210** • When you make a call from your mobile phone, the call will be automatically transferred to the headset (if it is on) • You can answer a call on your headset or your mobile phone. If your headset is in standby mode, the call will be transferred immediately to the headset with a tap on the headset's answer/end button

Claims	Prior Art
	Jabra BT800 User Manual at Page 13



13 Glossary

1 **Bluetooth** is a radio technology developed to connect devices, such as mobile phones and headsets, without wires or cords over a short distance of approximately 10 meters (approx 30 feet). More information is available at www.bluetooth.com

2 **Bluetooth profiles** are protocols through which Bluetooth devices communicate with other devices. Bluetooth phones support different sets of profiles – most support the headset profile but some support the hands-free profile and others support both profiles. In order to support a certain profile, a phone manufacturer has to implement certain mandatory features within the phone's software.

3 **Pairing** creates a unique and encrypted communication link between two Bluetooth enabled devices and allows them to communicate with each other. Bluetooth devices will not work if the devices have not been paired with each other.

4 **Passkey or PIN** is a code that needs to be entered on the phone in order to pair the mobile phone with the Jabra BT800. When you have already paired your mobile phone with the headset, the phone and the Jabra BT800 will recognize each other and the phone will bypass the discovery and authentication process and automatically accept the transmission.

5 **Standby mode** is when the Jabra BT800 is passively waiting for a call. When you "end" the call on your mobile phone, the headset will go into standby mode.

Irvin '332 discloses "wireless headset 100" (example of the claimed head-worn personal electronic apparatus) can operate in an "inactive state" or a "low-power condition" (example of the claimed configured to support a low power operational mode).

The following citations show examples of where the Irvin '332 discloses this limitation.

Irvin '332 at 5:1–23

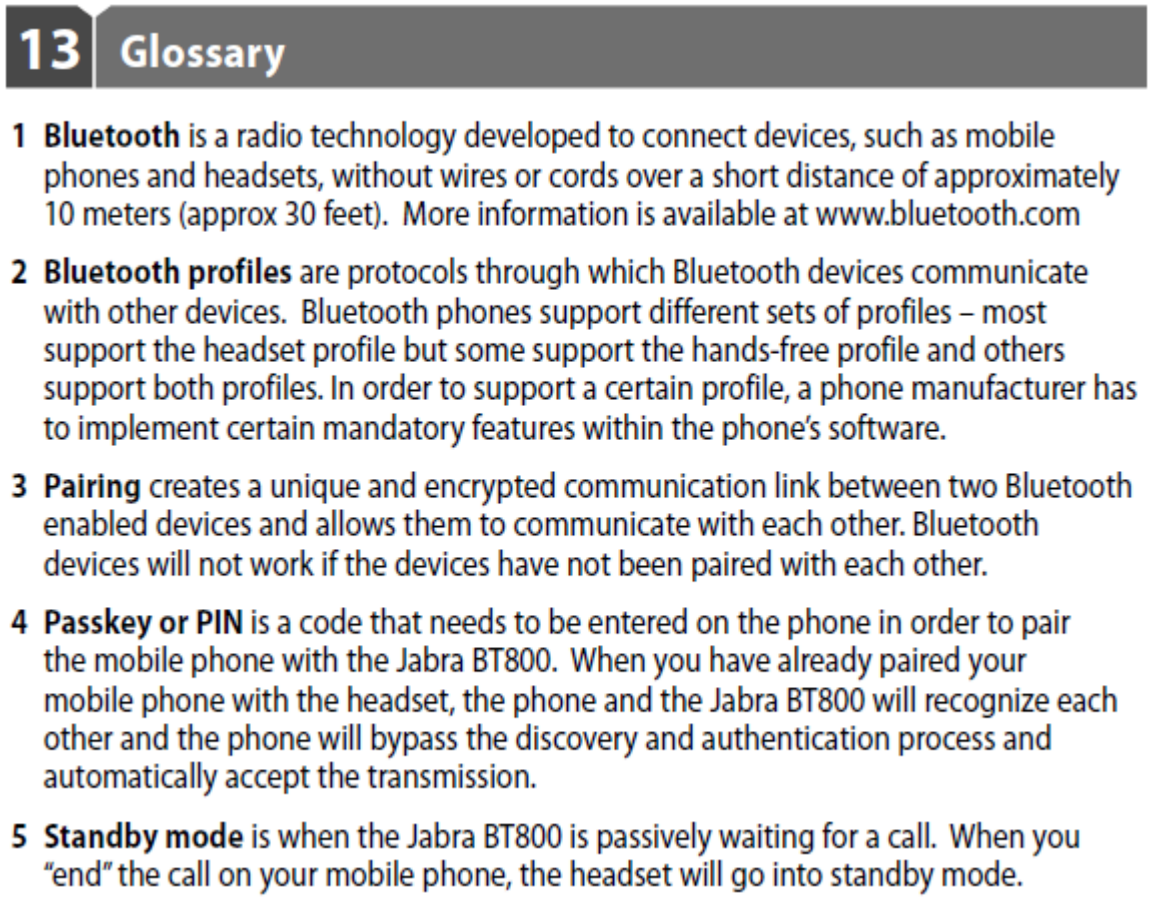
> Because the wireless headset 100 of the present invention automatically enables and disables its communication functions based on use, the sensor 220 may be based on a variety of technologies. In

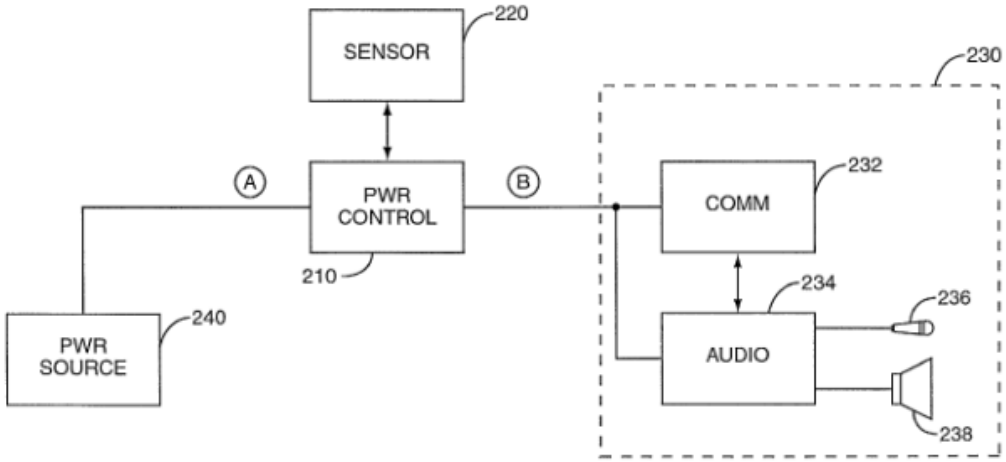
Claims	Prior Art
	general, its purpose is to provide a signal responsive to a natural stimulus associated with use of the headset by a user. Movement or vibration of the wireless headset 100, or placement of the wireless headset 100 upon the user's body indicates usage. Movement may be detected based on vibration or by sensing acceleration, such as with an accelerometer. Mechanical or liquid-based switches represent alternate mechanisms for sensing movement. In such switches, movement causes an electrical connection to be established between contact pairs. Further, the particular sensor 220 employed may be tuned or configured such that only stimulus consistent with actual use actuates the sensor, thus avoiding inadvertent or unintended enabling of the wireless headset 100. In such configurations, the sensor 220 preferably employs output conditioning that prevents assertion of the sensor output signal for stimulus below a defined threshold. Alternatively, the power control circuit 210 may include such conditioning as part of its interface to the sensor 220. FIGS. 4A–4D illustrate possible sensor embodiments. Irvin '332 at 8:11–50 FIGS. 6 and 7 illustrate operation of the wireless headset 100. FIG. 6 is a state diagram for one exemplary embodiment of the present invention. When the wireless headset 100 is not in use, it automatically enters an inactive state (610). As explained, this inactive state may constitute disconnecting the communications circuit 230 from the power source 240, or may simply represent placing the communications circuit 230 in a non-functional, low-power condition. Absent user stimulus, such as motion of the wireless headset 100 or placement of the wireless headset 100 upon the user's body, the wireless headset 100 remains in the inactive state (610). In response to user stimulus, as detected by sensor 220, the power control circuit 210 enables the communications circuit 230, with this enabling representing a transition from the inactive state to an active state (620). Upon entering the active state, the power control circuit 210 initializes and starts the timer 218. The timer 218 incrementally counts from a starting value to an ending value, with the progression from starting to ending values representing a defined interval of time. Upon expiration of the timer 218, the power control circuit 210 disables the communications circuit 230. This interval of time may be preprogrammed to a convenient value, or may be selectable based on input from the base unit 102. For example, a timeout interval of five minutes may provide a reasonable compromise between user convenience and battery life. While in the active state (620), the power control circuit 210 resets the timer 218 based on the reassertion or continued assertion of the sensor output signal from sensor 220. Such resetting prevents expiration of the timer 218 and, as such, causes the power control circuit 210 to leave the communications or headset circuit 230 enabled. Thus, the power control circuit 210 is designed to leave the wireless headset 100 in the active state (620) while the wireless headset is in use by a user. Absent user stimulus, the timer 218 of power control circuit 210 expires, thereby causing the wireless

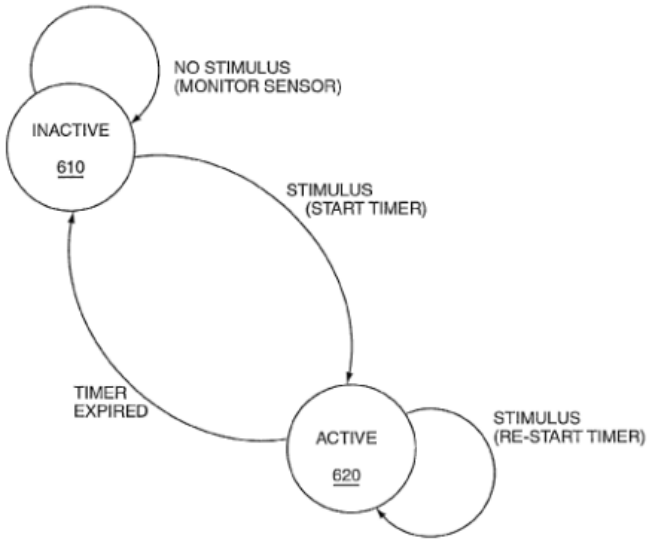
Claims	Prior Art
	headset 100 to transition from the active state (620) to the inactive state (610) based on the power control circuit 210 disabling the communications circuit 230. Irvin ’332 at 8:51–9:12 FIG. 7 is a state diagram for a preferred embodiment of the present invention. Operation of the wireless headset 100 illustrated in FIG. 7 is distinguished from that shown in FIG. 6 by inclusion of an additional state, denoted as the sleep state (720). Inclusion of the sleep state provides an additional opportunity to control the power consumption of wireless headset 100 based on specific operating conditions. As before, the wireless headset 100 remains in the inactive state (710) absent user stimulus. Upon detecting user stimulus, the wireless headset 100 transitions from the inactive state (710) to the sleep state (720). In this state, the power control circuit 210 enables only a portion of the communications circuit 230. Specifically, the power control circuit 210 enables the wireless communications interface 232 or a portion thereof. Then, using a signal output from the wireless communications interface 232, the power control circuit 210 determines if the base unit 102 is active, or if the base unit 102 is attempting to communicate with the wireless headset 100. In some embodiments, the wireless headset 100 infers activity by detecting, via its wireless communications interface, a carrier signal from the base unit 102. In other embodiments, the wireless headset detects activity based on receiving a “wake-up” signal from the base unit 102. Note that monitoring for the base unit carrier signal may be performed continuously by the wireless headset 100 while in the sleep state, or may be performed periodically; thereby further reducing sleep state power consumption. For periodic carrier monitoring, the wireless headset 100 may employ an exemplary monitoring interval of 0.5 seconds. A POSITA would have been motivated to combine the Jabra BT800 with Irvin ’332, and reasonably expected success in doing so, for the reasons explained above for claims 12 and 14. *Supra* claims 12, 14. For example, a this would have achieved the power saving advantages taught by Irvin ’332. *Supra* claims 12, 14. Moreover, a POSITA would have been motivated to combine the low power mode of Irvin ’332 into the Jabra BT800 to conserve power when the Jabra BT800 is not in use. The Jabra BT800 expressly teaches a desire to enter a “standby mode” when a call is not active. E.g., Jabra BT800 User Manual at , 3, 7–8, 13. And a POSITA would have been motivated to seek other low power mode solutions. To the extent that the Jabra BT800 and Irvin ’332 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800 and Irvin ’332, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.

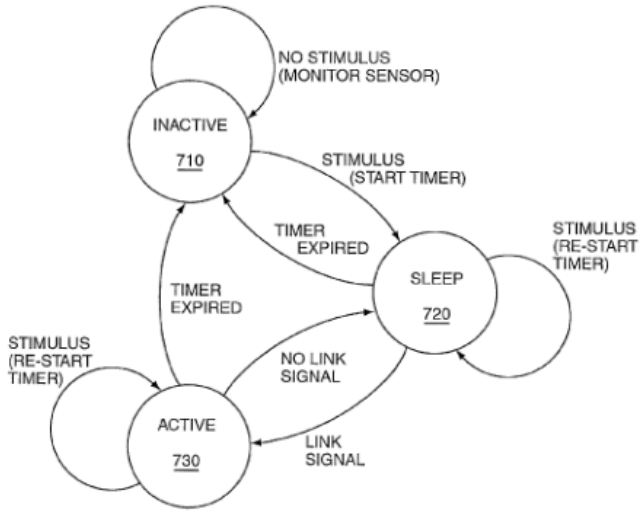
Claims	Prior Art
[15b] wherein the operation of the head-worn personal electronic apparatus being altered concerns operation of the head-worn personal electronic apparatus in the low power operational mode.	The Jabra BT800 and Irvin '332 expressly or inherently disclose "wherein the operation of the head-worn personal electronic apparatus being altered concerns operation of the head-worn personal electronic apparatus in the low power operational mode." For example: The Jabra BT800 discloses that "the headset will go into standby mode" when a call is ended (example of the claimed operation of the head-worn personal electronic apparatus being altered concerns operation of the head-worn personal electronic apparatus in the low power operational mode). The following citations show examples of where the Jabra BT800 discloses this limitation. Jabra BT800 User Manual at Page 3 **Summary of features** • Operational features: • Answer call • End call • Reject call • Last number redialing • Call list • Automatic volume control • Call waiting • Put call on hold • Mute • Display caller ID • Ringing tones • Call vibrate feature • Supports voice-dialing (subject to phone) • DSP (digital signal processing) for noise cancellation • Rechargeable battery with direct charging option from PC with USB cable • Up to 6 hours talk time and 125 hours standby time • Total weight including battery only 25 grams • Range up to 10 meters (33 feet) • Bluetooth[1] (see Glossary) version 1.2 • Headset and hands-free Bluetooth profiles[2] Your Jabra BT800 is compatible with most Bluetooth mobile phones. You can check whether your phone has Bluetooth capability by visiting your phone manufacturer's web site or Jabra's website (www.jabra.com)

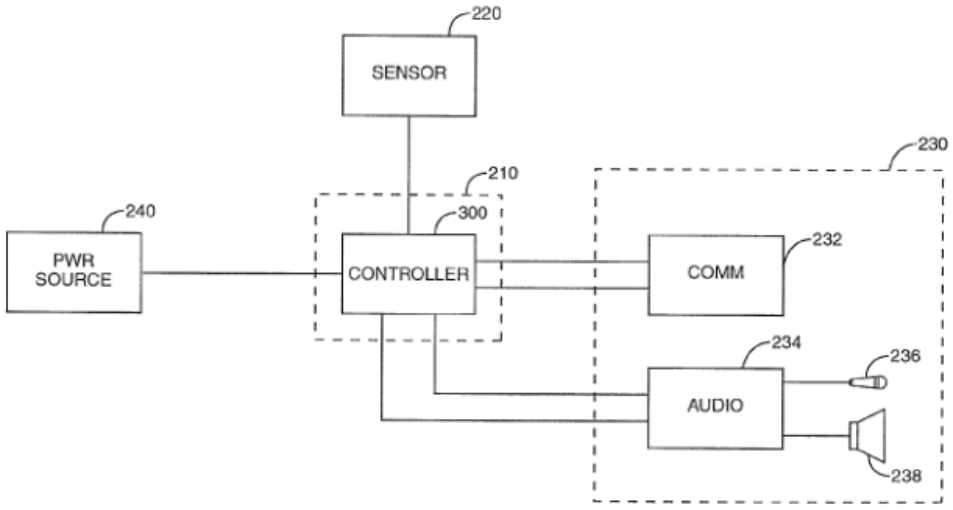
Claims	Prior Art
	Jabra BT800 User Manual at Page 7 **Adjust light** • You can decide if you want the LED in the mute button at the center of the jog wheel, to flash or not. When activated, the LED will flash every second during a conversation or every three seconds when the headset is in standby mode. Jabra BT800 User Manual at Page 8 **Making/answering a call when using the Jabra A210** • When you make a call from your mobile phone, the call will be automatically transferred to the headset (if it is on) • You can answer a call on your headset or your mobile phone. If your headset is in standby mode, the call will be transferred immediately to the headset with a tap on the headset's answer/end button

Claims	Prior Art
	Jabra BT800 User Manual at Page 13  13 Glossary 1 **Bluetooth** is a radio technology developed to connect devices, such as mobile phones and headsets, without wires or cords over a short distance of approximately 10 meters (approx 30 feet). More information is available at www.bluetooth.com 2 **Bluetooth profiles** are protocols through which Bluetooth devices communicate with other devices. Bluetooth phones support different sets of profiles – most support the headset profile but some support the hands-free profile and others support both profiles. In order to support a certain profile, a phone manufacturer has to implement certain mandatory features within the phone's software. 3 **Pairing** creates a unique and encrypted communication link between two Bluetooth enabled devices and allows them to communicate with each other. Bluetooth devices will not work if the devices have not been paired with each other. 4 **Passkey or PIN** is a code that needs to be entered on the phone in order to pair the mobile phone with the Jabra BT800. When you have already paired your mobile phone with the headset, the phone and the Jabra BT800 will recognize each other and the phone will bypass the discovery and authentication process and automatically accept the transmission. 5 **Standby mode** is when the Jabra BT800 is passively waiting for a call. When you "end" the call on your mobile phone, the headset will go into standby mode. Irvin '332 discloses remaining in an "inactive state" or "a non-functional, low-power condition" "[a]bsent user stimulus, such as motion of the wireless headset 100 or placement of the wireless headset 100 upon the user's body" (example of the claimed wherein the operation of the head-worn personal electronic apparatus being altered concerns operation of the head-worn personal electronic apparatus in the low power operational mode). The following citations show examples of where the Irvin '332 discloses this limitation.

Claims	Prior Art
	Irvin ’332 at Abstract A wireless headset for use with a separate communications device, such as a cellular telephone, includes automatic on/off capabilities to maximize battery life. By detecting a user's interaction, such as picking up the headset or placing it upon the user's body, the wireless headset automatically transitions from an inactive state to an active state. Techniques for automatic headset enabling include but are not limited to motion sensors, attitude or position sensors, proximity sensors, and contact sensors. These techniques may be used individually or in any combination. An internal timer allows the wireless headset to return to its inactive state a defined interval after cessation of movement or removal of the wireless headset. Including an optional sleep state further optimizes battery life. In the sleep state, only a portion of the wireless headset circuitry is enabled. Rather than transitioning from inactive to active, the headset transitions from inactive to sleep. In sleep, the headset periodically monitors for a signal from the separate communications device. Upon detection of such a signal, the wireless headset transitions to its active state, thereby providing full functionality to the user. Irvin ’332 at Figure 2A  *FIG. 2A*

Claims	Prior Art
	Irvin ’332 at Figure 6  FIG. 6

Claims	Prior Art
	Irvin ’332 at Figure 7  FIG. 7

Claims	Prior Art
	Irvin ’332 at Figure 8  *FIG. 8* Irvin ’332 at 2:16–34 The present invention includes both a method and apparatus allowing a wireless headset to automatically control its operating state to minimize power consumption, thereby maximizing the life of its power source, such as a battery. The wireless headset serves as a communication accessory to a base unit, such as a cellular telephone. When not in use, the wireless headset reverts to an inactive state and draws essentially no power. A power control circuit imparts automatic enabling capability to the wireless headset. Preferably, the power control circuit employs a sensor responsive to a natural stimulus associated with a person preparing to use the wireless headset. The wireless headset may sense motion, physical orientation, or user proximity. Sensing techniques include but are not limited to micro-electro-mechanical-systems (MEMS), mercury switches, attitude switches, and IR or acoustic proximity sensors. In some embodiments, the wireless headset transitions from the inactive state to an active state in response to a user picking it up or mounting the wireless headset upon their head. Irvin ’332 at 2:35–50 In a more sophisticated embodiment, the wireless headset may transition from the inactive state to a sleep state, based on user stimulus. In the sleep state, only a portion of the headset circuitry is enabled, thus

Claims	Prior Art
	conserving power. While in the sleep state, the wireless headset monitors for a signal from the base unit, and, when such a signal is received, it transitions from the sleep state to the active state. Further, once active, the wireless headset can continue to monitor for communications link activity. Thus, if communications with the base unit cease, the wireless headset can return to the sleep state and periodically check for resumed communications activity. A timer allows the wireless headset to automatically return to the inactive state subsequent to use. Cessation of movement or detected removal of the wireless headset from the user's head can indicate termination of use and trigger a timed power-down. Irvin '332 at 3:53–4:2 The communications circuit 230 provides wireless headset functionality, including audio input and output and wireless communications with the base unit 102. The communications or headset circuit 230 includes a wireless communications interface 232 providing a wireless communications link for sending and receiving information to and from the base unit 102. The wireless communications interface 232 includes at least a wireless receiver and wireless transmitter. Audio input received via microphone 236 is conditioned by the audio interface 234 and then processed by the communications interface 232 for transmittal to the base unit 102. Audio information received from the base unit 102 is processed by the wireless communications interface 232 and then conditioned in the audio interface 234 for output to a user via speaker 238. With reference to FIG. 1A or 1B, the microphone 236 may be located in microphone pickup 120, and speaker 238 may be located in earpiece 130. Irvin '332 at 4:39–67 FIG. 3A illustrates a preferred embodiment for the wireless headset 100. In FIG. 3A, the power control circuit 210 independently enables the wireless communications interface 232 and audio interface 234. Thus, select portions of communications circuit 230 may be enabled in response to the sensor output signal. Once the wireless communications interface 232 is enabled, it provides a signal, termed a "link active" signal, to the power control circuit 210 based on detecting a wireless signal received from the base unit 102. Based on the assertion of the link active signal, the power control circuit 210 enables the audio interface 234. FIG. 3B provides more functional details regarding the power control circuit 210 of FIG. 3A. Again, the control logic 212 is responsive to a sensor output signal from sensor 220. However, in response to the sensor output signal, the control logic 212 turns on switch 214 while switch 216 remains off, thereby enabling the wireless communications interface 232. As with the previously discussed embodiment, power control circuit 210 includes the timer 218. In a preferred embodiment, control logic 212 starts timer 218 upon enabling the wireless communications interface 232, and resets timer 218 based on subsequent

Claims	Prior Art
	or continued assertion of the sensor output signal. If the wireless communications interface 232 asserts the link active signal, the control logic 212 turns on switch 216, thereby enabling the audio interface 234. If the timer 218 expires, the control logic 212 turns off switches 214 and 216, thereby disabling the wireless communications interface 232 and the audio interface 234. Irvin '332 at 5:1–23 Because the wireless headset 100 of the present invention automatically enables and disables its communication functions based on use, the sensor 220 may be based on a variety of technologies. In general, its purpose is to provide a signal responsive to a natural stimulus associated with use of the headset by a user. Movement or vibration of the wireless headset 100, or placement of the wireless headset 100 upon the user's body indicates usage. Movement may be detected based on vibration or by sensing acceleration, such as with an accelerometer. Mechanical or liquid-based switches represent alternate mechanisms for sensing movement. In such switches, movement causes an electrical connection to be established between contact pairs. Further, the particular sensor 220 employed may be tuned or configured such that only stimulus consistent with actual use actuates the sensor, thus avoiding inadvertent or unintended enabling of the wireless headset 100. In such configurations, the sensor 220 preferably employs output conditioning that prevents assertion of the sensor output signal for stimulus below a defined threshold. Alternatively, the power control circuit 210 may include such conditioning as part of its interface to the sensor 220. FIGS. 4A–4D illustrate possible sensor embodiments. Irvin '332 at 5:25–52 In FIG. 4A, the power control circuit 210 is operatively associated with a MEMS device, with the MEMS device functioning as the sensor 220. Devices based on MEMS technology may be responsive to general vibration or motion, or may be configured to respond only to specific acceleration along defined axes. As MEMS devices may easily include output conditioning electronics, the sensitivity or responsiveness of the sensor 220 incorporating the MEMS device may be tailored such that the sensor output signal is asserted only for motion or vibration above a certain threshold. A typical MEMS employs modified microelectronics fabrication techniques and includes small mechanical elements responsive to movement or vibration, such as cantilever beams formed by selectively etching a silicon wafer. In a preferred embodiment of the present invention, sensor 220 includes a MEMS device simultaneously fulfilling the requirements of low power consumption, relative low-cost, and adequate signal discrimination. In this context, signal discrimination means that the sensor 220 is not prone to nuisance assertions of its sensor output signal caused by minute movement or vibration. Although the body of work associated with MEMS technology is quite comprehensive, significant insight into the basic structures and techniques of MEMS technology may be gained from U.S. Pat. No. 5,659,195 to Kaiser et al., U.S. Pat. No. 5,663,507

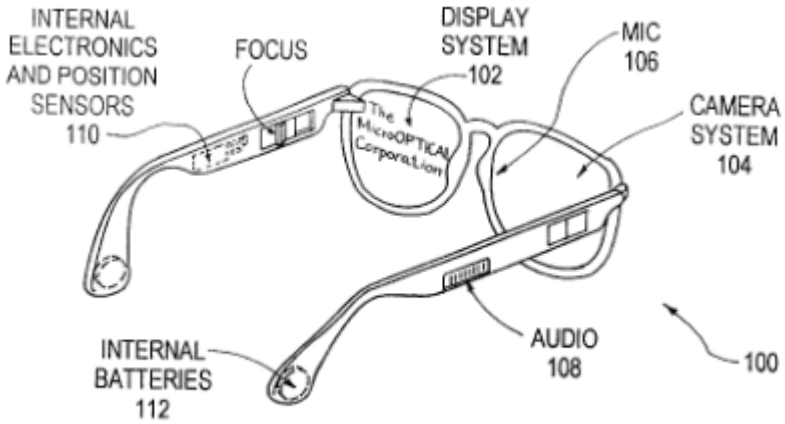
Claims	Prior Art
	to Westervelt et al., and U.S. Pat. No. 5,76,480 to Pister, the disclosures of which are incorporated herein by reference. Irvin '332 at 5:53–6:2 FIG. 4B illustrates the power control circuit 210 coupled to a liquid-based switch functioning as the sensor 220. The sensor 220 may be a mercury-filled switch, or may employ other conductive liquids. Depending upon its configuration, the sensor 220, implemented as a liquid-based switch, may function as a motion sensor or as an attitude sensor. As a motion sensor, the sensor 220 includes first and second contacts disposed in a manner such that motion of the contained liquid places the first and second contacts in electrical connection. As an attitude sensor, sensor 220 includes first and second contacts disposed in a manner such that one or more specific physical orientations of the wireless headset 100 causes the contained liquid in sensor 220 to place the first and second contacts in electrical connection. The power control circuit 210 connects to the first and second contacts of sensor 220, and is responsive to the electrical connection completed by the contained liquid. Irvin '332 at 6:20–33 FIG. 4D illustrates the power control circuit 210 coupled with a proximity sensor 220 not based on mechanical actuation. The proximity sensor 220 may be an active or passive IR sensor, may be a resistive or other type of thermal sensor, or may be an acoustic sensor. As a proximity sensor, sensor 220 provides indication that a user has placed the wireless headset 100 upon their body. As such, any of the foregoing or other presence sensing techniques may be used to implement sensor 220. Preferably, when configured as a proximity sensor, sensor 220 requires minimal power and provides a sensor output signal based on proximity to the user's body. Depending upon the sensing technology chosen, the control circuit 210 may be required to periodically stimulate sensor 220 to generate a detection response. Irvin '332 at 7:1–8:3 Note that the foregoing diagrams illustrate various configurations for the present invention, with these configurations allowing the wireless headset 100 to automatically enable and disable select portions of its electronic circuitry based on user stimulus. Enabling and disabling may constitute physical connection and disconnection of power between the power source 240 and the communications or headset circuit 230, or may simply represent the assertion and de-assertion of specific enabling signals. Thus, the foregoing diagrams should not be construed as limiting in any way regarding the specific circuit implementation of the wireless headset 100. FIGS. 2–5 illustrate functional diagrams and these various functions may have corresponding separate circuit elements, or may be included in integrated fashion in

Claims	Prior Art
	one or more devices. For example, a microprocessor in a sleep or halt mode may be directly connected to a battery and configured to wake up in response to an input from the sensor 220. Thus, the microprocessor could serve as the power control circuit 210, as well as providing functions related to the communications interface 232 and audio interface 234. FIGS. 8 and 9, in particular, illustrate an exemplary embodiment of the present invention wherein an integrated controller provides the functionality of the power control circuit 210. In FIG. 8, the power control circuit 210 includes an integrated controller 300. The integrated controller 300 provides power control functionality associated with the timer 218, switches 214 and 216, and control logic 212. In this embodiment, the controller 300 provides both power and control/signal interconnections for the wireless communications interface 232 and audio interface 234. The controller 300 independently enables the wireless communications interface 232 and audio interface 234 in response to the sensor output signal from sensor 220. As with other embodiments, the controller 300 may enable both the wireless communication interface 232 and audio interface 234 in response to the sensor output signal, or may only enable the wireless communications interface 232, or a portion thereof. In this latter, case, the controller 300 enables the audio interface 234 in response to receiving the link signal from the enabled portion of the wireless communications interface 232. FIG. 9 provides more detail regarding the controller 300 shown in FIG. 8. A main power controller 310 provides power/control outputs to power controllers 330 and 340, which, in turn, provide power control outputs to the wireless communications interface 232 and audio interface 234, respectively. The main power controller 310 additionally interfaces with and provides power to a functional controller 350 and a sensor controller 320. The functional controller 350 provides signal and control interfaces with both the wireless communications interface 232 and the audio interface 234. In an exemplary embodiment, the main power controller initially enables only the sensor controller 320. Then, in response to the sensor output signal, the main controller 310 enables power controller 330 at least a portion of the functional controller 350. In response, power controller 330 enables at least a portion of the wireless communications interface 232. Then, in response to receiving the link signal from the wireless communications interface 232—the link signal may be received via the functional controller 350—the main power controller 310 enables the power controller 340 associated with the audio interface 234. The power controllers 330 and 340 may comprise FET switches combined with control logic responsive to control signals asserted by the main power controller 310, the functional controller 350, and/or the wireless communications interface 232. Irvin ’332 at 8:11–50 FIGS. 6 and 7 illustrate operation of the wireless headset 100. FIG. 6 is a state diagram for one exemplary embodiment of the present invention. When the wireless headset 100 is not in use, it automatically enters an inactive state (610). As explained, this inactive state may constitute disconnecting the communications

Claims	Prior Art
	circuit 230 from the power source 240, or may simply represent placing the communications circuit 230 in a non-functional, low-power condition. Absent user stimulus, such as motion of the wireless headset 100 or placement of the wireless headset 100 upon the user's body, the wireless headset 100 remains in the inactive state (610). In response to user stimulus, as detected by sensor 220, the power control circuit 210 enables the communications circuit 230, with this enabling representing a transition from the inactive state to an active state (620). Upon entering the active state, the power control circuit 210 initializes and starts the timer 218. The timer 218 incrementally counts from a starting value to an ending value, with the progression from starting to ending values representing a defined interval of time. Upon expiration of the timer 218, the power control circuit 210 disables the communications circuit 230. This interval of time may be preprogrammed to a convenient value, or may be selectable based on input from the base unit 102. For example, a timeout interval of five minutes may provide a reasonable compromise between user convenience and battery life. While in the active state (620), the power control circuit 210 resets the timer 218 based on the reassertion or continued assertion of the sensor output signal from sensor 220. Such resetting prevents expiration of the timer 218 and, as such, causes the power control circuit 210 to leave the communications or headset circuit 230 enabled. Thus, the power control circuit 210 is designed to leave the wireless headset 100 in the active state (620) while the wireless headset is in use by a user. Absent user stimulus, the timer 218 of power control circuit 210 expires, thereby causing the wireless headset 100 to transition from the active state (620) to the inactive state (610) based on the power control circuit 210 disabling the communications circuit 230. Irvin ’332 at 8:51–9:12 FIG. 7 is a state diagram for a preferred embodiment of the present invention. Operation of the wireless headset 100 illustrated in FIG. 7 is distinguished from that shown in FIG. 6 by inclusion of an additional state, denoted as the sleep state (720). Inclusion of the sleep state provides an additional opportunity to control the power consumption of wireless headset 100 based on specific operating conditions. As before, the wireless headset 100 remains in the inactive state (710) absent user stimulus. Upon detecting user stimulus, the wireless headset 100 transitions from the inactive state (710) to the sleep state (720). In this state, the power control circuit 210 enables only a portion of the communications circuit 230. Specifically, the power control circuit 210 enables the wireless communications interface 232 or a portion thereof. Then, using a signal output from the wireless communications interface 232, the power control circuit 210 determines if the base unit 102 is active, or if the base unit 102 is attempting to communicate with the wireless headset 100. In some embodiments, the wireless headset 100 infers activity by detecting, via its wireless communications interface, a carrier signal from the base unit 102. In other embodiments, the wireless headset detects activity based on receiving a “wake-up” signal from the base unit 102. Note that monitoring for the base unit carrier signal may be performed continuously by the wireless headset 100

Claims	Prior Art
	while in the sleep state, or may be performed periodically; thereby further reducing sleep state power consumption. For periodic carrier monitoring, the wireless headset 100 may employ an exemplary monitoring interval of 0.5 seconds. Irvin '332 at 9:13–65 Upon detecting the carrier signal or wake-up signal from the base unit 102, as indicated by the link signal shown in FIG. 7, the wireless headset 100 transitions from the sleep state (720) to the active state (730). To further reduce power consumption, the wireless headset 100 may only monitor for the external signal on a periodic basis. If the wireless headset 100 is configured to monitor for the external signal on a periodic basis and the base unit 102 is configured to emit a periodic wake-up signal, the periodic monitoring of the wireless headset 100 is set such that its monitoring frequency is not an integer multiple of the wake-up signal frequency. Upon causing the wireless headset 100 to transition from the inactive state (710) to the sleep state (720), the power control circuit 210 initializes and starts the timer 218. While in the sleep state (720), subsequent or continued assertion of the sensor output signal from the sensor 220 causes the power control circuit 210 to reset its timer 218. Absent such user stimulus, the timer 218 expires and the power control circuit 210 disables the communications circuit 230. After transitioning from the sleep state (720) to the active state (730), based on detection of the signal from the base unit 102, the power control circuit 210 continues resetting its timer 218 based on user stimulus, as done in the sleep state (720). Thus, continued user stimulus causes the power control circuit 210 to leave the wireless headset 100 fully functional in the active state (730). The present invention provides methods and apparatus allowing the wireless headset 100 to conveniently transition from a non-functional inactive state to a fully functional active state, based on its detection of certain user stimulus. In a preferred embodiment, the wireless headset 100 transitions from the inactive state to the intermediate sleep state, thereby conserving power. Upon detection of the carrier or the wake-up signal from the base unit 102, the wireless headset 100 transitions from the sleep state to the fully functional active state. The wireless headset 100 includes a sensor 220 for detecting the user stimulus. As the sensor 220 may be a motion sensor, a vibration sensor, an attitude sensor, or a proximity sensor, the specific user stimulus may include the user moving and/or placing the wireless headset 100 upon their body. The operation of the wireless headset 100 in accordance with the present invention admits tremendous flexibility with respect to implementation. As noted, many different circuit implementations may provide the inventive features of the present invention. These implementations may include hardware and software, and can reflect varying degrees of integration between the functional circuit blocks discussed. Indeed, all such variations for providing a wireless headset 100 that automatically controls its

Claims	Prior Art
	power consumption or operating state based on detection of a user stimulus are within the scope of the present invention. A POSITA would have been motivated to combine the Jabra BT800 and Irvin '332 with reasonable expectation of success to meet the claim limitation as described for claims 12–14, [15a]. *Supra* claims 12–14, [15a]. A POSITA would have been motivated to combine the low power mode of Irvin '332 into the Jabra BT800 to conserve power when the Jabra BT800 is not in use. The Jabra BT800 expressly teaches a desire to enter a "standby mode" when a call is not active. E.g., Jabra BT800 User Manual at , 3, 7–8, 13. And a POSITA would have been motivated to seek other low power mode solutions. A POSITA would have been motivated to seek solutions for furthering the Jabra BT800's goal by implementing a low power mode (*supra* [15a]) and identifying the best situations to enter that mode to ensure power saving. *Supra* claims 12–14. Irvin '332 teaches examples of when entering a lower power mode would be advantageous. For example, Irvin '332 teaches switching from an "inactive state" or "low–power condition" based on "user stimulus, such a motion of the wireless headset 100 or placement of the wireless headset upon the user's body." Irvin '322, 8:11–22. Based on these teaches, a POSITA would have been motivated to implement switching between a low–power mode in the Jabra BT800 based on a user stimulus such as sensor data. To the extent that the Jabra BT800 and Irvin '332 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800 and Irvin '332, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
16. A system as recited in claim 1, wherein the system comprises: a Hall effect detector configured to capture data associated with a magnetic characteristic.	The Jabra BT800, Spitzer '001, Ritter '100 expressly or inherently disclose "a Hall effect detector configured to capture data associated with a magnetic characteristic." For example: Spitzer '001 discloses an "eyeglass interface system" (example of the claimed head–worn personal electronic apparatus) including a "magnetic sensor … based on the Hall effect" (example of the claimed a Hall effect detector configured to capture data associated with a magnetic characteristic). The following citations show examples of where the Spitzer '001 discloses this limitation. Spitzer '001 at Abstract An eyeglass interface system is provided which integrates interface systems within eyewear. The system includes a display assembly and one or more audio and/or video assemblies mounted to an eyeglass frame. The display assembly is mounted to one temple and provides an image which can be viewed by the user. The audio or video assembly is mounted to the other temple and is in communication with the display assembly. The audio or video assembly may comprise a camera assembly and/or an audio input or

Claims	Prior Art
	output assembly, such as a microphone and/or speakers. The camera assembly is placed on the temple to record the visual field observed by the user. A head-tracking assembly may be provided to track the position of the user's head. A number of applications can be provided with the present system, such as a telephone system, pager system, or surveillance system. The present eyeglass interface system is compact, offers the user hands-free operation, and provides an attractive appearance due to concealment of the assemblies within the eyeglass frame and lenses. Spitzer '001 at Figure 1  *FIG. 1* Spitzer '001 at 4:12–23 FIG. 1 illustrates an eyeglass interface system 100 according to the present invention. Within one half of the eyeglass system is mounted a display assembly 102, and within the other half is mounted a camera assembly 104. The display assembly, as well as some aspects of a camera assembly, are described in U.S. Pat. No. 5,886,822. Additional subsystems or assemblies include an audio output subsystem 108, an audio input subsystem 106 such as a microphone, an interconnection subsystem 110, and a power subsystem 112, such as internal batteries. Any number or all of these subsystems may be integrated to form an eyeglass interface system according to the present invention. Spitzer '001 at 11:11–23 The head tracking module is useful for augmented reality applications in which information displayed by the interface system is superimposed on the user's field of view by the optical system. For example,

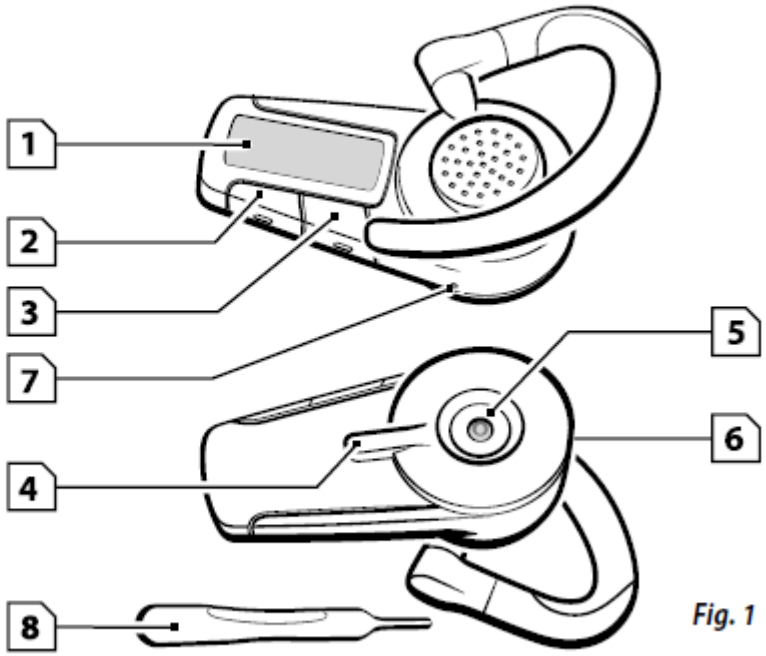
Claims	Prior Art
	computers are used to calculate position from global positioning satellites to provide navigation information to a user. If the system also has information on the direction of gaze of the user, by virtue of a head-tracker sensor, symbols may be provided that are registered to the field of view, such as street names. When the user looks toward a side street, the computer may calculate the position of the intersection of the streets and present the name of the crossing street to the user. Many other applications of augmented reality are possible. Spitzer ’001 at 11:24–41 The tracking sensors may comprise either magnetic and gravity sensors that determine position from the earth's magnetic and gravitational fields, or from other artificial magnetic fields. Sensors may be mounted in module 1001 if it is held against the head or alternatively within the eyeglass frame. The magnetic sensor may be based on the Hall effect or may use flux gate magnetometers. Any sensor that detects magnetic field strength and direction may be used in this application, provided the sensor is small enough to fit within an eyeglass frame or module. An alternative is to position magnetic sensors within module 1001 which is worn upon the shoulders of the user, and to place small magnets within the glasses frame. In this way the magnetic sensors can determine the user's head position. Many other types of sensors may be used for the head tracking system, including miniature gyroscopic or other inertial sensors, ultrasonic sensors, and even systems that use images from the camera system to detect head movement. Ritter ’100 discloses “[a] communications station for use in a distributed audio system having two Hall-effect integrated circuits mounted on a printed circuit hook switch board, the hook switch board mounted within a handset cradle of the communications station,” “if a handset containing a magnet is in the cradle, and the applied magnetic flux is greater than the predetermined flux necessary to affect the Hall-effect integrated circuit, the communications station will go on-hook,” and “[w]hen the handset and the resultant flux is removed from the cradle, the Hall-effect integrated circuit will change state and the communications station will go off-hook” (wherein the system comprises: a Hall effect detector configured to capture data associated with a magnetic characteristic). The following citations show examples of where Ritter ’100 discloses this limitation. Ritter ’100 at Abstract A communications station for use in a distributed audio system having two Hall-effect integrated circuits mounted on a printed circuit hook switch board, the hook switch board mounted within a handset cradle of the communications station. The Hall-effect integrated circuits place the communications station on-hook or off-hook, depending on the amount of ambient magnetic flux. The ambient magnetic flux varies with the presence or absence of a handset in the cradle. Thus, if a handset containing a magnet is in the

Claims	Prior Art
	cradle, and the applied magnetic flux is greater than the predetermined flux necessary to affect the Hall-effect integrated circuit, the communications station will go on-hook. When the handset and the resultant flux is removed from the cradle, the Hall-effect integrated circuit will change state and the communications station will go off-hook. Two unipolar Hall-effect integrated circuits are opposedly attached to the switch hook board in order for one of the circuits to change state when a magnetic flux of sufficient level is applied. Ritter '100 at 2:30–3:6 In accordance with another aspect of the present invention, a communications station comprises a Hall-effect integrated circuit for on-hook and off-hook switching. A printed circuit board equipped with the Hall-effect device, HED, is mounted inside the communications station, or more specifically the handset cradle, in order to protect it from environmental effects. Additionally, the HED, and optionally the associated printed circuit board, can be coated or otherwise encapsulated in a protective material, for example, a solithane or a sealed plastic sheathing, for protection from harsh environmental conditions. Two HEDs are mounted on the printed circuit board for redundancy. Alternatively, two HEDs can be mounted on the printed circuit board so as to be inverted relative to each other. Each HED is directional. By utilizing inverted placement, a communications handset containing a magnet of unknown polarity can still reliably achieve on-hook/off-hook switching when placed near the HEDs. In accordance with yet another aspect of the present invention, a field telephone is provided for use in a distributed audio system. The field telephone comprises a handset connected to a main telephone body. The handset generates a magnetic field caused by leakage flux from a magnet. A handset support cradle is attached to the telephone body and comprises a hook-switch board having a Hall-effect integrated circuit which reacts with the magnetic field when the handset is placed in the handset support cradle. The magnetic field affects the Hall-effect integrated circuit to place the field telephone in an on-hook state. Similarly, when the handset is removed from the handset support cradle, the magnetic field is removed from the Hall-effect integrated circuit, and the field telephone enters an off-hook state. The magnet can be a component of a receiver contained within the handset, or a separate component attached to the handset. The distributed audio system includes a plurality of telephone lines, including a page line pair and a party line pair. Means are included in the telephone for selecting a telephone line pair and transmitting audio signals over the selected line pair to a receiving station. Each handset acts as a means for transmitting user audio signals to another connected telephone, and for receiving audio signals transmitted from another telephone. The Hall-effect integrated circuit performs the on-hook/off-hook switching of any selected and connected telephone line.

Claims	Prior Art
	Ritter ’100 at 3:34–48 FIGS. 1 and 2 illustrate a communications station 10 in accordance with an embodiment of the present invention. For illustrative purposes, the communications station 10 is a field telephone assembly for use in a distributed audio system. It is to be understood, however, that the aspect of the present invention relating to a Hall-effect integrated circuit for on-hook/off-hook switching can be implemented in other types of telephones or base stations. Examples of distributed audio systems without Hall-effect integrated circuits are described in U.S. Pat. Nos. 4,847,888 and 5,014,347, incorporated herein by reference. Distributed audio systems, which are also known as intraplant voice communications systems, and unitized or baseband audio systems, are characterized as having no operational relationship or connection to a central office or subscriber loop. Ritter ’100 at 4:39–60 In accordance with the present invention, a Hall-effect printed circuit hook switch board 44 having at least one Hall-effect device (HED) 46 is provided behind the front panel 30 of the telephone body 12 and in the vicinity of the handset support cradle 28 is. The HED 46 places the telephone assembly 10 on-hook or off-hook, respectively, when the magnetic field generated about the handset 14 by the magnet 22 is present or absent with respect to the handset support cradle 28. In the preferred embodiment, two HEDs 46,48 are provided on the printed circuit hook switch board 44. Each HED 46,48 has a predetermined polarity, and consequently are inverted with respect to each other so that one of the HEDs 46,48 will activate when the handset 14, and therefore the magnet 22, is present in the handset support cradle 28. Inversion of the two HEDs 46,48 allows for situations where the polarity of the magnet 22 is not known. The HEDs 46,48 are preferably attached to the printed circuit hook switch board 44 so that they are optimally positioned, that is, the HEDs 46,48 are positioned relative to the expected location of the magnetic flux generated by the speaker/receiver 20 such that one of the HEDs 46,48 is affected by the flux from the magnet 22. Ritter ’100 at 5:4–33 The Hall-effect IC is preferably unipolar, with the magnetic south pole on the branded side, or top, of the package. The output of the Hall-effect IC preferably is low when an applied magnetic flux is greater than 77 gauss. In accordance with the present invention, one Hall-effect IC is mounted facing upward on the printed circuit hook switch board 44, while a second Hall-effect IC is mounted facing downward on the printed circuit hook switch board 44, allowing for a magnet 22 with unknown polarity to generate a magnetic flux capable of affecting one of the HEDs 46,48. Similarly, the output of the Hall-effect IC turns high when the magnetic field is removed, or the magnetic field is reduced to below 21 gauss. The output high/low gaussian levels of the Hall-effect IC can be selected for the environment where the field

Claims	Prior Art
	telephone assembly 10 is to be employed. Thus, that is, the sensitivity levels described above (i.e., 21 to 77 gauss) characterize the most sensitive Hall-effect device that is presently commercially available. The desired high and low levels of a selected range for magnetic flux density can be other selected levels and are a function of the magnet 22 in the handset 14, or of the ambient magnetic flux in the environment where the field telephone assembly 10 is being used. For example, it may be desirable to have sensitivity levels that differ by plus or minus 50 gauss, so long as there is a clear threshold between output high and output low levels. Other makes and models of Hall-effect ICs may be used in the present invention. Thus, the selected HEDs 46,48 preferably have magnetic flux density sensitivities maximized to the environment where they are used, minimizing the effects of stray or otherwise ambient magnetic flux. Ritter '100 at 5:55–62 The HEDs 46 and 48 are advantageous for use in the field telephone assemblies of a distributed audio system because they can facilitate on-hook/off-hook switching at the field telephone stations. This represents an advantage for intraplant voice communications systems which do not employ central office monitoring of off-hook conditions as in a conventional public switched telephone network. A POSITA also would have realized that Hall effect sensors were advantageous for use in battery power headsets because of their low power nature. A POSITA would have recognized that the Jabra BT800 expressly teaches switching to a "standby mode" when not in use. Jabra BT800 User Guide at 3, 7–8, 13. A POSITA would have sought other fallback ways to determine when the JabraBT800 could be put in standby mode. For example, a POSITA would have recognized that Hall effect detectors were a well-known, routine, and conventional way to determine whether a headset was placed in a cradle or case. For example, Ritter '001 teaches that Hall effect detectors are "advantageous" to facilitate "on-hook/off-hook switching." Ritter '100 at 5:55–62. This would have allowed the Jabra BT800 to determine whether it placed in a charging cradle (as in claim [1j] with the Jabra FreeSpeak) and thus not in use. A POSITA would have reasonably expected success because a POSITA would have known that Hall effect detectors were well-known, routine, and conventional components. Thus, using Ritter '001's Hall effect sensor in the Jabra BT800 would have used known features according to their known functions (known Hall effect detectors), to achieve predictable results (Jabra BT800 includes a Hall effect detector to determine when it is in a charging cradle or case). A POSITA would have been motivated to combine the Jabra BT800 and Spizter '001, and reasonably expected success, for the same reasons explained above.

Claims	Prior Art
	To the extent that the Jabra BT800, Spitzer '001, and Ritter '100 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of Jabra BT800, Spitzer '001, and Ritter '100 those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
18[pre]. A system, comprising:	The Jabra BT800 expressly or inherently discloses "[a] system." For example: *See* above at claim 1[pre]. To the extent that the Jabra BT800 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[18a] a head-worn personal electronic apparatus, including at least:	The Jabra BT800 expressly or inherently discloses "a head-worn personal electronic apparatus, including at least." For example: *See* above at claim [1a]. To the extent that the Jabra BT800 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[18b] a head-worn structure configured to be worn by a user;	The Jabra BT800 expressly or inherently discloses "a head-worn structure configured to be worn by a user." For example: *See* above at claim [1b]. To the extent that the Jabra BT800 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[18c] a speaker at least partially contained within the head-worn structure, the speaker being configured to be at or adjacent to an ear of the user when the head-worn structure is being worn by the user;	The Jabra BT800 expressly or inherently discloses "a speaker at least partially contained within the head-worn structure, the speaker being configured to be at or adjacent to an ear of the user when the head-worn structure is being worn by the user." For example: *See* above at claim [1c]. To the extent that the Jabra BT800 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.

Claims	Prior Art
[18d] a first microphone at least partially contained within the head-worn structure, the first microphone being positioned to pick up at least audio input from at least the user;	The Jabra BT800, the Phonak Perseo, Griffin '456, and Miller '585 expressly or inherently disclose "a first microphone at least partially contained within the head-worn structure, the first microphone being positioned to pick up at least audio input from at least the user." For example: On information and belief, the Jabra BT800 includes first microphone being positioned to pick up at least audio input from at least the use, for example, for the user to speak into for "Voice dialing" (example of the claimed a first microphone at least partially contained within the head-worn structure, the first microphone being positioned to pick up at least audio input from at least the user). The following citations show examples of where the Jabra BT800 discloses this limitation. Jabra BT800 User Manual at Page 2 **Jabra BT800 Overview** 1 Display shows caller ID, battery status etc. 2 Answer button 3 End & on/off button 4 Jog wheel – volume and menu control 5 Mute/menu button/blue LED 6 Charging socket 7 Pairing stylus switch 8 Stylus for activating the pairing function  *Fig. 1* 2

Claims	Prior Art
	Jabra BT800 User Manual at Page 5

3 Basic usage of your Jabra BT800 headset

The operation of the basic features in the headset is very similar to your mobile phone.

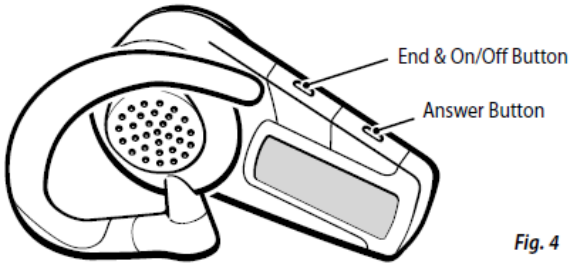


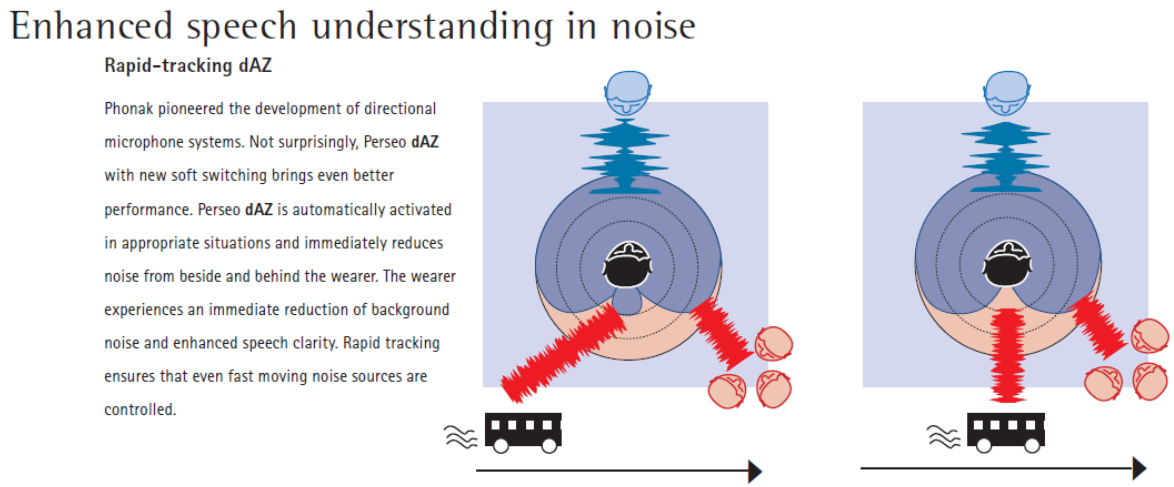
Fig. 4

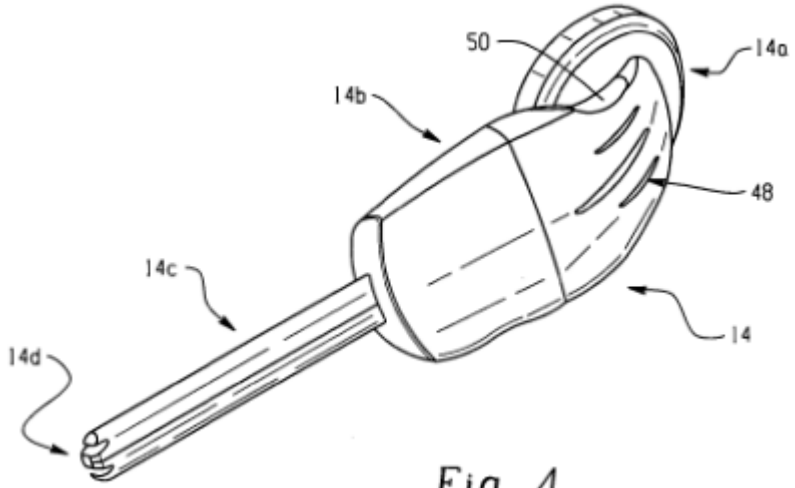
1. **To answer a call**
   - You answer the call directly on the headset with a tap on the answer button. A simple tap on the headset's answer button will capture and transfer the call to the headset
2. **To end a call**
   - A tap on the end button terminates the active call
   - You can also reject an incoming call directly from the headset. Press the end button and the call will be rejected. Depending on the phone settings, the person who called you will either be forwarded to your voice mail or hear a busy signal
3. **To make a call**
   - If you make a call from the mobile phone, the call will (subject to phone settings) be automatically transferred to the headset
   - Voice dialing is activated with a tap on the answer button. For further information about using this feature, please consult your phone's user manual. You will get the best results if you record the voice-dialing tag through your headset
   - Activate last number redial with a press on the answer button on the headset

5

On information and belief, the Phonak Perseo includes first microphone being positioned to pick up at least audio input from at least the user because it uses "directional microphone systems" for "reduction of background noise and enhanced speech clarity" (example of the claimed a first microphone at least partially contained within the head-worn structure, the first microphone being positioned to pick up at least audio input from at least the user).

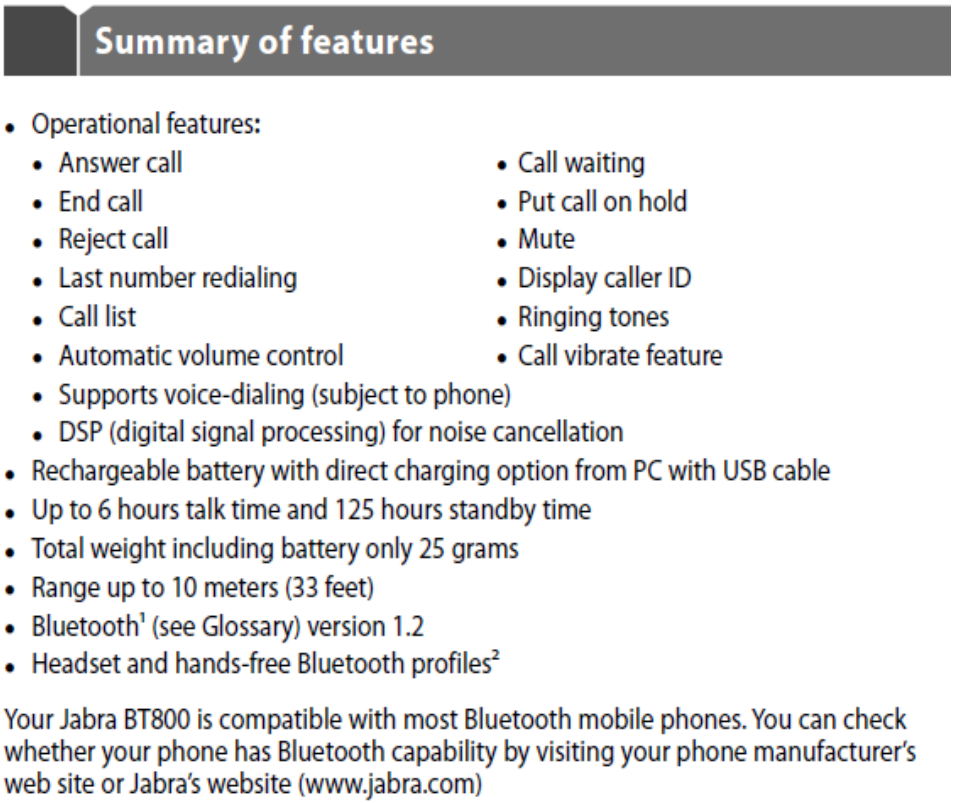
The following citations show examples of where the Phonak Perseo discloses this limitation.

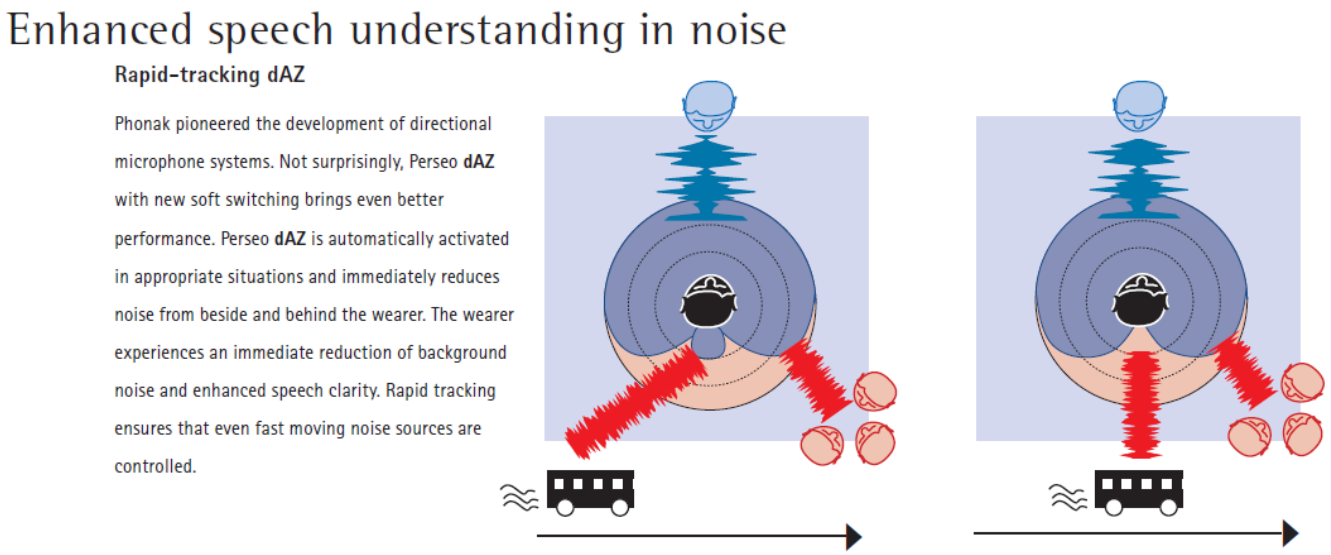
Claims	Prior Art
	Phonak Perseo Brochure at 14.  Griffin ’456’s “second communication module” (example of the claimed head–worn structure) includes a microphone, such as “microphone 14d” for example (example of the claimed microphone), which “is located in the proximity of the communication device user's mouth” (example of the claimed the first microphone being positioned to pick up at least audio input from at least the user). The following citations show examples of where the Griffin ’456 discloses this limitation.

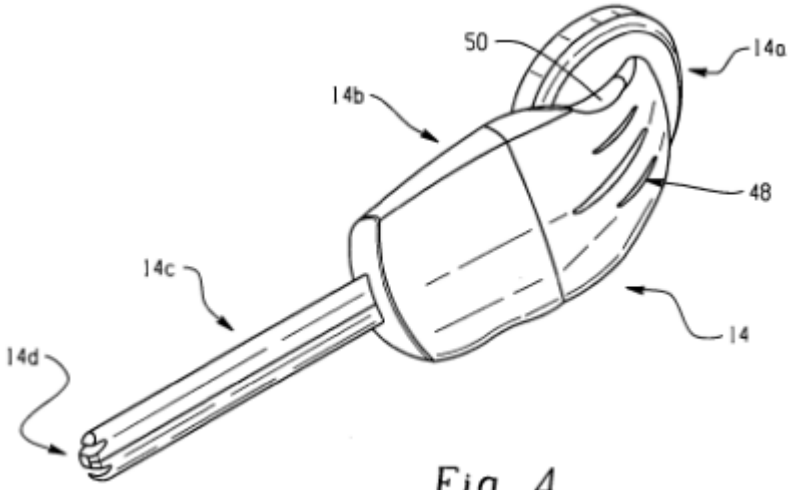
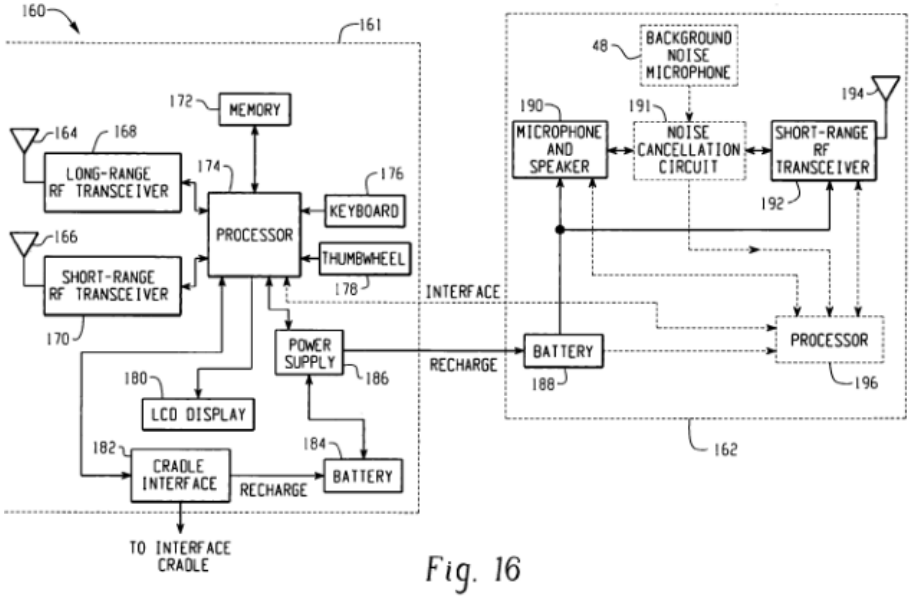
Claims	Prior Art
	Griffin ’456 at Figure 4  Fig. 4 Griffin ’456 at [0032]–[0033] FIG. 4 is a top perspective view of the second communication module 14 shown in FIGS. 1 and 2. The second communication module 14 is preferably a voice communication device that includes a speaker 14a, a main body 14b, a boom 14c and a microphone 14d. Operationally, the speaker 14a is placed in the ear of a communication device user with the boom 14c extending towards the user's mouth. To avoid rotational movement of the second communication module 14 while the speaker 14a is in the user's ear, the center of gravity of the module 14 should preferably be as close to the speaker 14a as possible. Thus, any relatively heavy components located inside the main body portion 14b should preferably be located adjacent the speaker 14a. In this manner, moments about the speaker are minimized, and the second communication module 14 should remain substantially stationary while the speaker is in the communication device user's ear. Optimally, the length of the boom portion 14c should be maximized such that the microphone 14d is located in the proximity of the communication device user's mouth when the module 14 is in use. The moment about the speaker 14a, however, increases in proportion to the length of the boom 14c. Thus, in order to maintain stability, the length of the boom 14c may not be sufficient to position the microphone 14d adjacent to a user's mouth. The microphone 14d will, therefore, likely receive not only a user's speech, but also undesired noise signals from a multitude of sources, such as other speakers in the vicinity or car engine noise. In order to reduce this background noise, the second communication module preferably includes a noise cancellation circuit with a background noise microphone 48 as shown in FIG.

Claims	Prior Art
	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 '456 at [0052] Like the second communication modules described above, the alternative module 120 communicates via a wireless link with an associated first communication module and is designed to provide for hands-free operation. The speaker 120a is placed in a user's ear such that body section 120c and thus microphone 120d extend toward the user's mouth. Extension of the upper and lower main body sections 120b and 120c on opposite sides of the speaker 120a allows for effective weight balancing. A further feature of the alternative second communication module 120 involves a raised portion 128 that overlies the upper and lower main body sections 120b and 120c. The raised portion 128 is preferably a removable cover member that provides simple access to manufacturer-selected internal components, such as a single-use replaceable battery, for service or installation by a user. Miller '585 discloses a "microphone" to "pick up the user's voce" (example of the claimed a first microphone at least partially contained within the head-worn structure, the first microphone being positioned to pick up at least audio input from at least the user). The following citations show examples of where the Miller '585 discloses this limitation. Miller '585 at [0011] The microphone is mounted in the earstem or in a frame supporting one or more lenses in the eye protection portion. In some cases the microphone is directional and is oriented to selectively pick up the wearer's voice. Multiple microphones provide enhanced directional pickup. A POSITA would have recognized that the Jabra BT800 includes "DSP digital signal processing for noise cancellation." Jabra BT800 User Manual at 3. A POSITA thus would have sought solutions for improved noise cancelation to further the noise cancelation goal expressly taught by the Jabra BT800. A POSITA thus would have been motivated to apply Griffin '456's positioning of the microphones to the Jabra BT800, in order to realize and improve the noise canceling goal. A POSITA would have reasonably expected success in combining Griffin '456's noise canceling solution into the Jabra BT800 because noise–cancellation was a well understood technology and the Jabra BT800 already includes analogous "DSP digital signal processing for noise cancellation." Jabra BT800 User Manual at 3. Thus, using Griffin '456's microphone placement in the Jabra BT800 would have used known features according to their known functions (microphone placement and noise–cancellation), to achieve predictable

Claims	Prior Art
	results (Jabra BT800 includes microphones positioned at points that enable optimize noise–cancellation, as taught by Griffin). A POSITA would have been motivated to combine the Jabra BT800 with Miller ’585 and Jabra BT800 with the Phonak Perseo, and reasonably expected success in doing so, for the same reasons explained above for Griffin ’456 and the Jabra BT800. To the extent that the Jabra BT800, Phonak Perseo, Griffin ’456, and Miller ’585 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Phonak Perseo, Griffin ’456, and Miller ’585, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[18e] a second microphone at least partially contained within the head-worn structure, the second microphone being positioned to pick up at least environmental audio input associated with an environment around the head-worn personal electronic apparatus;	The Jabra BT800, Phonak Perseo, Griffin ’456, and Miller ’585 expressly or inherently disclose “a second microphone at least partially contained within the head-worn structure, the second microphone being positioned to pick up at least environmental audio input associated with an environment around the head-worn personal electronic apparatus.” For example: On information and belief, the Jabra BT800 includes a second microphone at least partially contained within the head-worn structure, the second microphone being positioned to pick up at least environmental audio input associated with an environment around the head-worn personal electronic apparatus because it includes “DSP digital signal processing for noise cancellation.” The following citations show examples of where the Jabra BT800 discloses this limitation.

Claims	Prior Art
	Jabra BT800 User Manual at Page 3  **Summary of features** • Operational features: • Answer call • End call • Reject call • Last number redialing • Call list • Automatic volume control • Call waiting • Put call on hold • Mute • Display caller ID • Ringing tones • Call vibrate feature • Supports voice-dialing (subject to phone) • DSP (digital signal processing) for noise cancellation • Rechargeable battery with direct charging option from PC with USB cable • Up to 6 hours talk time and 125 hours standby time • Total weight including battery only 25 grams • Range up to 10 meters (33 feet) • Bluetooth[1] (see Glossary) version 1.2 • Headset and hands-free Bluetooth profiles[2] Your Jabra BT800 is compatible with most Bluetooth mobile phones. You can check whether your phone has Bluetooth capability by visiting your phone manufacturer's web site or Jabra's website (www.jabra.com) On information and belief, the Phonak Perseo includes a second microphone at least partially contained within the head-worn structure, the second microphone being positioned to pick up at least environmental audio input associated with an environment around the head-worn personal electronic apparatus because it includes "directional microphone systems" for "reduction of background noise and enhanced speech clarity." The following citations show examples of where the Phonak Perseo discloses this limitation. Phonak Perseo Brochure at 14.

Claims	Prior Art
	 Griffin '456's "second communication module 162 may also include a background noise microphone 48" (example of the claimed another microphone) which captures "background noise" (example of the claimed positioned to pick up at least environmental audio input associated with an environment around the head-worn personal electronic apparatus). The following citations show examples of where the Griffin '456 discloses this limitation.

Claims	Prior Art
	Griffin ’456 at Figure 4  Fig. 4 Griffin ’456 at Figure 16  Fig. 16

Claims	Prior Art
	Griffin ’456 at [0032]–[0033] FIG. 4 is a top perspective view of the second communication module 14 shown in FIGS. 1 and 2. The second communication module 14 is preferably a voice communication device that includes a speaker 14a, a main body 14b, a boom 14c and a microphone 14d. Operationally, the speaker 14a is placed in the ear of a communication device user with the boom 14c extending towards the user's mouth. To avoid rotational movement of the second communication module 14 while the speaker 14a is in the user's ear, the center of gravity of the module 14 should preferably be as close to the speaker 14a as possible. Thus, any relatively heavy components located inside the main body portion 14b should preferably be located adjacent the speaker 14a. In this manner, moments about the speaker are minimized, and the second communication module 14 should remain substantially stationary while the speaker is in the communication device user's ear. Optimally, the length of the boom portion 14c should be maximized such that the microphone 14d is located in the proximity of the communication device user's mouth when the module 14 is in use. The moment about the speaker 14a, however, increases in proportion to the length of the boom 14c. Thus, in order to maintain stability, the length of the boom 14c may not be sufficient to position the microphone 14d adjacent to a user's mouth. The microphone 14d will, therefore, likely receive not only a user's speech, but also undesired noise signals from a multitude of sources, such as other speakers in the vicinity or car engine noise. In order to reduce this background noise, the second communication module preferably 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 ’456 at [0034] FIG. 5 is a bottom perspective view of the second communication module 14 that shows additional exemplary features, including a power switch 54 and charging terminals 56. The power switch 54 is preferably a pushbutton switch that turns the second communication module 14 on and off, enabling the communication device user to limit power consumption while the module 14 is not in use. In a preferred embodiment, the second communication module 14 is also configured to turn on automatically when removed from its assembled position within the first communication module 12, and to turn off automatically when replaced in its mounted position. In this preferred embodiment, the power switch 54 may be used to turn off the second communication module 13 without returning it to its mounted position. In other embodiments, the second communication module 14 may also include other switched functions, such as a mute function, controlled by one or more additional switches located on the first and/or second module. For example, a mute function may operate to disable the microphone 14d and the background

Claims	Prior Art
	noise microphone 48 without ending a communication function such as a voice call. Griffin ’456 at [0051] FIGS. 15a and 15b show one alternative design 120 for the second communication module. FIG. 15a shows a top perspective view of the alternative second communication module 120. FIG. 15b shows a side perspective view of the alternative second communication module 120. The alternative communication module 120 preferably includes a housing 128, a speaker 120a, a microphone 120d and a switch 126. The housing 121 preferably includes a substantially oval-shaped top profile, and indentations 122 and 124 that define handles by which a user may grasp and hold the second communication module 120. In addition, the housing 121 preferably has a main body portion with two sections: an upper section 120b that lies substantially to one side of the speaker 120a; and a lower section 120c that lies substantially on the opposite side of the speaker 120a. The microphone 120d is preferably located at a distal end of the lower section 120c. The switch 126 is preferably located on a top portion of the housing 121 and operates similarly to the switch 54 shown in FIG. 5. The module may also include an additional microphone adapted to receive background noise for use in executing noise cancellation operations for the desired but corrupted voice or audio signals received at microphone 120d. Griffin ’456 at [0056] The second communication module 162 is preferably an RF-enabled ear-piece that may be connected to (both mechanically and electrically) the first communication module 161 as described above. The second communication module 162 preferably includes a microphone and a speaker 190, a short-range wireless transceiver 192, an antenna 194, a rechargeable battery 188, and possibly an integral processor 196. The second communication module 162 may also include a background noise microphone 48 and a noise cancellation circuit 191 as described above with reference to FIG. 4. When the second communication module 162 is placed into the first communication module 161, a shared secret can be exchanged between the two wireless components of the communication device 160 so that any communications between the first and second communication modules 161/162 may be encrypted. Also, the rechargeable battery 188 of the second module 162 may be recharged by the battery 184 of the first communication module 161 through power supply recharging circuitry 186 when the two modules are in electrical contact. Miller ’585 discloses that the “use of more than one microphone in various positions to improve sound pickup directionality allows the wearer's voice to be sensed more clearly and extraneous background noises to more

Claims	Prior Art
	easily be canceled" (example of the claimed positioned to pick up at least environmental audio input associated with an environment around the head-worn personal electronic apparatus). The following citations show examples of where the Miller '585 discloses this limitation. Miller '585 at [0048] To assist picking up the wearer's voice, housing 124 is located on earstem 104 to be close to the wearer's mouth. In other instances, however, housing 124 is located elsewhere on eyeglasses 100 (e.g., on support loop 118, on a frame surrounding one of the lenses (FIG. 4)). In FIG. 1, microphone housing 124 is shown extending from temple portion 116. In other instances in which temple portion 116 is sufficiently large, or the microphone is sufficiently small, housing 124 is coextensive with temple portion 116 so that there is no significant change in the cross section of the earstem in the microphone housing portion. Making the microphone housing coextensive with the shape of the earstem reduces accidental wear on or breakage of the housing. Additional microphones are used in some embodiments to improve sound pickup quality. Such additional microphones are placed in various positions, such as on the same earstem, the opposite earstem, or on a frame supporting the lenses. The use of more than one microphone in various positions to improve sound pickup directionality allows the wearer's voice to be sensed more clearly and extraneous background noises to more easily be canceled. Consequently, enhanced directionality improves performance of, for example, voice recognition software executed by digital signal processors described below, and improves the quality of the wearer's voice for remote conversation or for recording as dictation. Miller '585 at [0065] FIG. 11 is a side cutaway view showing a microphone mounting embodiment. Microphone 1102 is shown positioned within microphone housing 124. One microphone terminal 1104 is coupled to wire 910. Another microphone terminal 1106 is coupled to wire 912. Microphone case opening 1108 to the microphone pickup element is positioned to be aligned with opening 126 in earstem 104. Openings 126, 1108 are oriented to pick up the sound originating from the wearer's mouth. It is known that microphone directionality is achieved by various microphone case shapes and various positions of openings allowing primary and secondary sound pressure to reach the microphone pickup element (e.g., holes positioned on opposite sides of the microphone casing). Therefore, microphone opening 1108 and earstem opening 126 are illustrative of microphone 1102 directionality that picks up the user's voice while attenuating background noise (i.e., directional microphone pointed at the wearer's mouth).

Claims	Prior Art
	Miller ’585 at [0079] FIGS. 19A and 19B illustrate microphone directionality in embodiments of eyeglasses 1502. As seen in FIG. 19A, lower directional opening 1808 provides a primary pickup zone 1902 towards the wearer's mouth. Upper directional opening 1520 provides a secondary pickup zone 1904 up and away from the wearer in a direction from which little sound originates. FIG. 19B shows another view of zones 1902, 1904. FIG. 19B also shows a benefit of using two microphones symmetrically mounted on the eyeglasses. Primary pickup zones 1902 and 1906 may be additive, providing an additional boost over sounds detected in secondary pickup zones 1904 and 1908. Thus pickup of the wearer's voice is further enhanced while unwanted background noise is reduced. The one or more microphones may be used in combination with conventional noise cancellation software which is easily modified for use in these embodiments. Miller ’585 at [0089] DSP 2206 processes the BLUETOOTH stack software and applications software such as echo cancellation, voice recognition, command and control, speech compression, and speech synthesis. In one instance DSP 2206 is a Texas Instruments DSP part no. TMS320VC5402PGE100. In some instances DSP 2206 executes noise reduction software (e.g., echo canceling) that improves the sound quality originating at the one or more microphones mounted on the eyewear. Noise cancellation software is commercially available (e.g., from Texas Instruments, Incorporated), and modification of such software for this application is easily accomplished in light of this disclosure. A POSITA would have been motivated to combine the Jabra BT800 with the Phonak Perseo, the Jabra BT800 with Griffin ’456, the Jabra BT800 with Miller ’585, and reasonably expected success in doing so, for the same reasons explained above for [18d]. *Supra* [18d]. To the extent that the Jabra BT800, the Phonak Perseo, Griffin ’456, and Miller ’585 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, the Phonak Perseo, Griffin ’456, and Miller ’585, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[18f] a rechargeable battery contained within the head-worn structure;	The Jabra BT800 expressly or inherently discloses “a rechargeable battery contained within the head-worn structure.” For example: *See* above at claim [1e].

Claims	Prior Art
	To the extent that the Jabra BT800 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[18g] a sensor at least partially contained within the head-worn structure and configured to capture data;	The Jabra BT800, Irvin '332, and Iuliis '007 expressly or inherently disclose "a sensor at least partially contained within the head-worn structure and configured to capture data." For example: *See* above at claim 12. To the extent that the Jabra BT800, Irvin '332, and Iuliis '007 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Irvin '332, ad Iuliis '007, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[18h] electronic circuitry contained within the head-worn structure, the electronic circuitry being electrically connected to at least one or more of the first microphone, the second microphone, the rechargeable battery and the sensor, the electronic circuitry being configured to at least process the audio input from at least the user via the first microphone to remove at least a portion of the environmental audio input associated with the environment picked up via the second microphone, the electronic circuitry being configured to process at least the data captured by the sensor, and the electronic circuitry being configured to determine whether the head-worn structure is being worn by a user	The Jabra BT800, Irvin '332, Griffin '456, and Miller '585 expressly or inherently disclose "electronic circuitry contained within the head-worn structure, the electronic circuitry being electrically connected to at least one or more of the first microphone, the second microphone, the rechargeable battery and the sensor, the electronic circuitry being configured to at least process the audio input from at least the user via the first microphone to remove at least a portion of the environmental audio input associated with the environment picked up via the second microphone, the electronic circuitry being configured to process at least the data captured by the sensor, and the electronic circuitry being configured to determine whether the head-worn structure is being worn by a user based on at least the processed sensor data." For example: On information and belief, any microphone included in the Jabra BT800 is connected to the rechargeable battery for power and the electronic circuitry to process the audio inputs. On information and belief, the Jabra BT800's electronic circuitry is configured to at least process the audio input from at least the user via the first microphone to remove at least a portion of the environmental audio input associated with the environment picked up via the second microphone because it includes "DSP digital signal processing for noise cancellation." The following citations show examples of where the Jabra BT800 discloses this limitation.

Claims	Prior Art
based on at least the processed sensor data;	Jabra BT800 User Manual at Page 3

Summary of features

- Operational features:
  - Answer call
  - End call
  - Reject call
  - Last number redialing
  - Call list
  - Automatic volume control
  - Call waiting
  - Put call on hold
  - Mute
  - Display caller ID
  - Ringing tones
  - Call vibrate feature
  - Supports voice-dialing (subject to phone)
  - DSP (digital signal processing) for noise cancellation
- Rechargeable battery with direct charging option from PC with USB cable
- Up to 6 hours talk time and 125 hours standby time
- Total weight including battery only 25 grams
- Range up to 10 meters (33 feet)
- Bluetooth[1] (see Glossary) version 1.2
- Headset and hands-free Bluetooth profiles[2]

Your Jabra BT800 is compatible with most Bluetooth mobile phones. You can check whether your phone has Bluetooth capability by visiting your phone manufacturer's web site or Jabra's website (www.jabra.com)

Claims	Prior Art
	Jabra BT800 User Manual at Page 5

3 Basic usage of your Jabra BT800 headset

The operation of the basic features in the headset is very similar to your mobile phone.

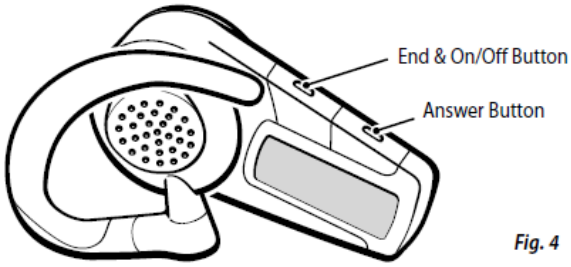


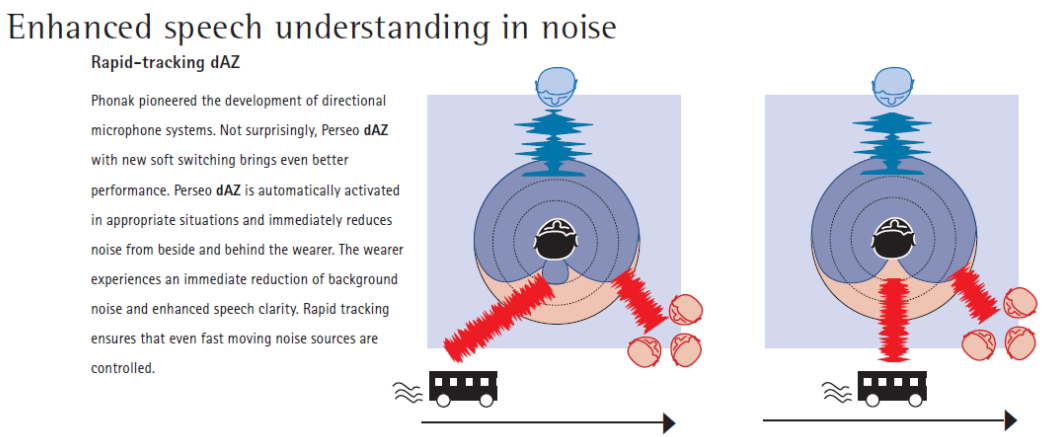
Fig. 4

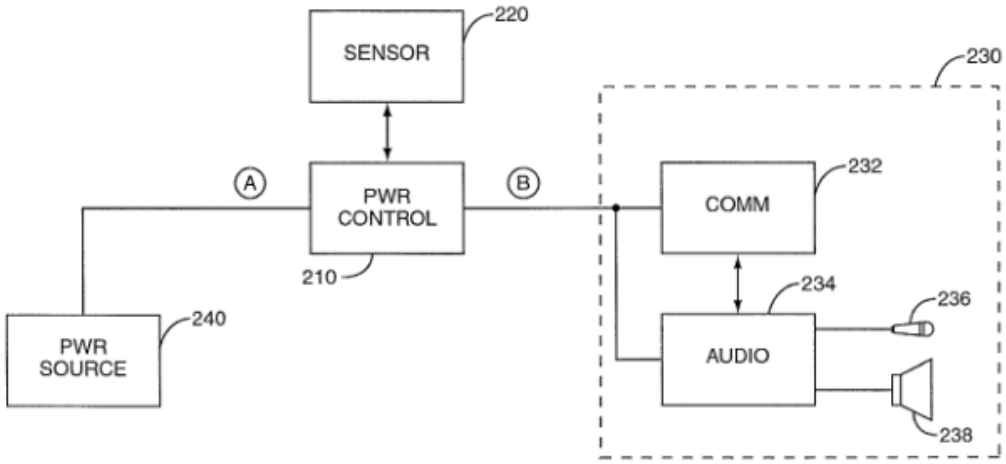
1. **To answer a call**
   - You answer the call directly on the headset with a tap on the answer button. A simple tap on the headset's answer button will capture and transfer the call to the headset
2. **To end a call**
   - A tap on the end button terminates the active call
   - You can also reject an incoming call directly from the headset. Press the end button and the call will be rejected. Depending on the phone settings, the person who called you will either be forwarded to your voice mail or hear a busy signal
3. **To make a call**
   - If you make a call from the mobile phone, the call will (subject to phone settings) be automatically transferred to the headset
   - Voice dialing is activated with a tap on the answer button. For further information about using this feature, please consult your phone's user manual. You will get the best results if you record the voice-dialing tag through your headset
   - Activate last number redial with a press on the answer button on the headset

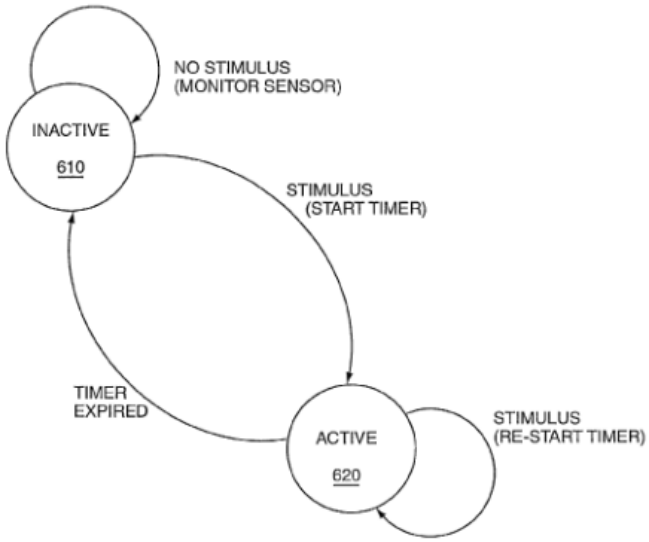
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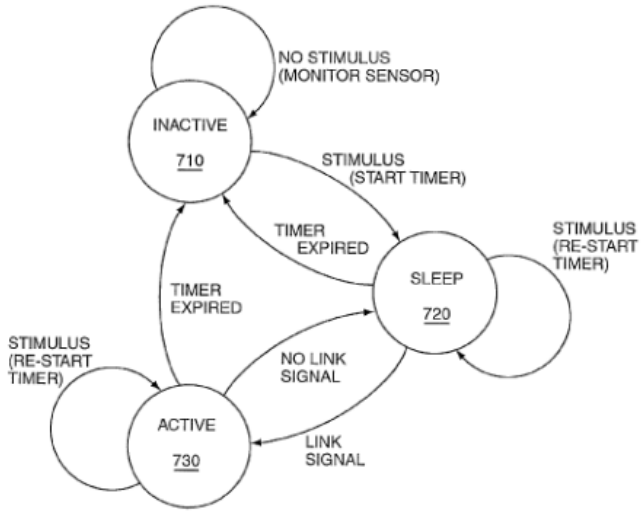
On information and belief, the Phonak Perseo electronic circuitry is configured to at least process the audio input from at least the user via the first microphone to remove at least a portion of the environmental audio input associated with the environment picked up via the second microphone because it includes "directional microphone systems" for "reduction of background noise and enhanced speech clarity."

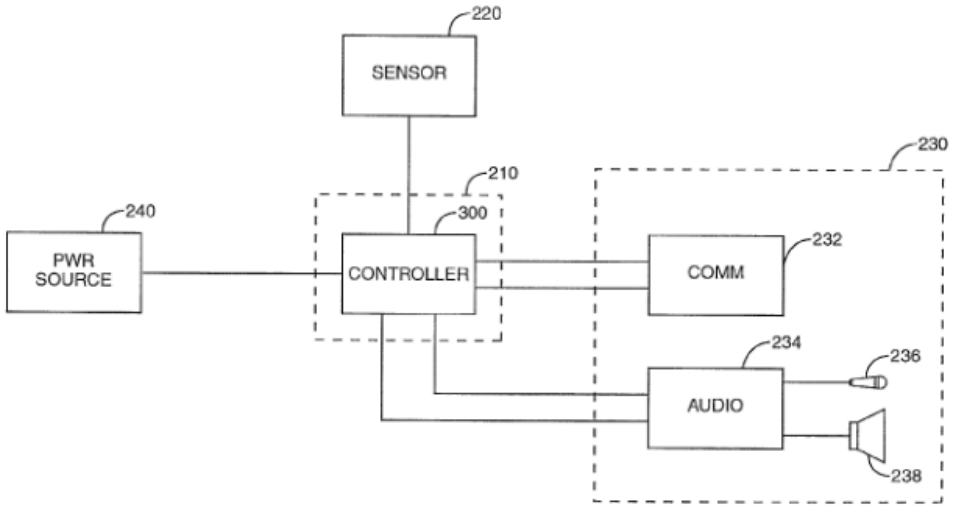
The following citations show examples of where the Phonak Perseo discloses this limitation.

Claims	Prior Art
	Phonak Perseo Brochure at 14.  Irvin '332 discloses the electronic circuitry being configured to process at least the data captured by the sensor, and the electronic circuitry being configured to determine whether the head-worn structure is being worn by a user based on at least the processed sensor data for the reasons explained above for claims 12–15 and [18g]. *Supra* claims 12–15, [18g]. The following citations show examples of where the Irvin '332 discloses this limitation. Irvin '332 at Abstract A wireless headset for use with a separate communications device, such as a cellular telephone, includes automatic on/off capabilities to maximize battery life. By detecting a user's interaction, such as picking up the headset or placing it upon the user's body, the wireless headset automatically transitions from an inactive state to an active state. Techniques for automatic headset enabling include but are not limited to motion sensors, attitude or position sensors, proximity sensors, and contact sensors. These techniques may be used individually or in any combination. An internal timer allows the wireless headset to return to its inactive state a defined interval after cessation of movement or removal of the wireless headset. Including an optional sleep state further optimizes battery life. In the sleep state, only a portion of the wireless headset circuitry is enabled. Rather than transitioning from inactive to active, the headset transitions from inactive to sleep. In sleep, the headset periodically monitors for a signal from the separate communications device. Upon detection of such a signal, the wireless headset transitions to its active state, thereby providing full functionality to the user.

Claims	Prior Art
	Irvin ’332 at Figure 2A  *FIG. 2A*

Claims	Prior Art
	Irvin ’332 at Figure 6  FIG. 6

Claims	Prior Art
	Irvin ’332 at Figure 7  FIG. 7

Claims	Prior Art
	Irvin ’332 at Figure 8  *FIG. 8* Irvin ’332 at 2:16–34 The present invention includes both a method and apparatus allowing a wireless headset to automatically control its operating state to minimize power consumption, thereby maximizing the life of its power source, such as a battery. The wireless headset serves as a communication accessory to a base unit, such as a cellular telephone. When not in use, the wireless headset reverts to an inactive state and draws essentially no power. A power control circuit imparts automatic enabling capability to the wireless headset. Preferably, the power control circuit employs a sensor responsive to a natural stimulus associated with a person preparing to use the wireless headset. The wireless headset may sense motion, physical orientation, or user proximity. Sensing techniques include but are not limited to micro-electro-mechanical-systems (MEMS), mercury switches, attitude switches, and IR or acoustic proximity sensors. In some embodiments, the wireless headset transitions from the inactive state to an active state in response to a user picking it up or mounting the wireless headset upon their head. Irvin ’332 at 2:35–50 In a more sophisticated embodiment, the wireless headset may transition from the inactive state to a sleep state, based on user stimulus. In the sleep state, only a portion of the headset circuitry is enabled, thus

Claims	Prior Art
	conserving power. While in the sleep state, the wireless headset monitors for a signal from the base unit, and, when such a signal is received, it transitions from the sleep state to the active state. Further, once active, the wireless headset can continue to monitor for communications link activity. Thus, if communications with the base unit cease, the wireless headset can return to the sleep state and periodically check for resumed communications activity. A timer allows the wireless headset to automatically return to the inactive state subsequent to use. Cessation of movement or detected removal of the wireless headset from the user's head can indicate termination of use and trigger a timed power-down. Irvin '332 at 3:53–4:2 The communications circuit 230 provides wireless headset functionality, including audio input and output and wireless communications with the base unit 102. The communications or headset circuit 230 includes a wireless communications interface 232 providing a wireless communications link for sending and receiving information to and from the base unit 102. The wireless communications interface 232 includes at least a wireless receiver and wireless transmitter. Audio input received via microphone 236 is conditioned by the audio interface 234 and then processed by the communications interface 232 for transmittal to the base unit 102. Audio information received from the base unit 102 is processed by the wireless communications interface 232 and then conditioned in the audio interface 234 for output to a user via speaker 238. With reference to FIG. 1A or 1B, the microphone 236 may be located in microphone pickup 120, and speaker 238 may be located in earpiece 130. Irvin '332 at 4:39–67 FIG. 3A illustrates a preferred embodiment for the wireless headset 100. In FIG. 3A, the power control circuit 210 independently enables the wireless communications interface 232 and audio interface 234. Thus, select portions of communications circuit 230 may be enabled in response to the sensor output signal. Once the wireless communications interface 232 is enabled, it provides a signal, termed a "link active" signal, to the power control circuit 210 based on detecting a wireless signal received from the base unit 102. Based on the assertion of the link active signal, the power control circuit 210 enables the audio interface 234. FIG. 3B provides more functional details regarding the power control circuit 210 of FIG. 3A. Again, the control logic 212 is responsive to a sensor output signal from sensor 220. However, in response to the sensor output signal, the control logic 212 turns on switch 214 while switch 216 remains off, thereby enabling the wireless communications interface 232. As with the previously discussed embodiment, power control circuit 210 includes the timer 218. In a preferred embodiment, control logic 212 starts timer 218 upon enabling the wireless communications interface 232, and resets timer 218 based on subsequent

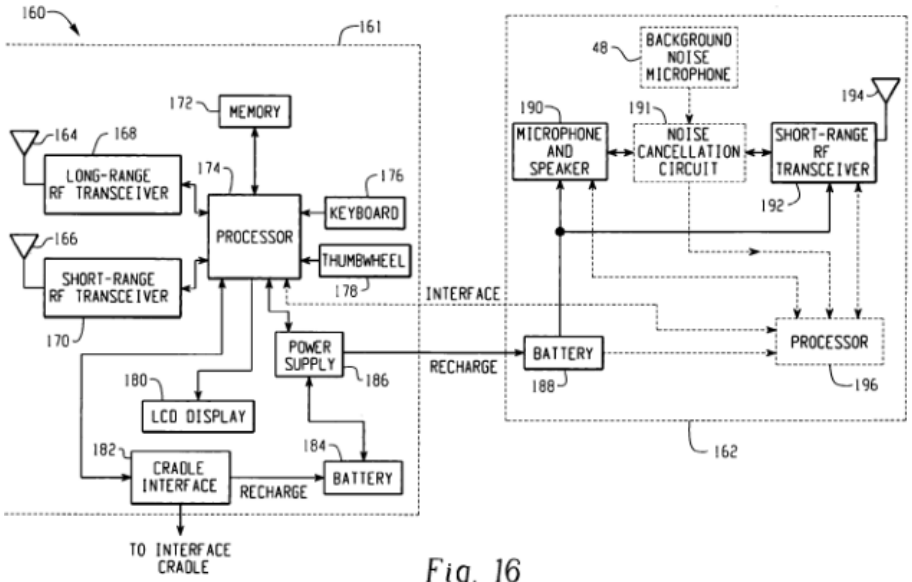
Claims	Prior Art
	or continued assertion of the sensor output signal. If the wireless communications interface 232 asserts the link active signal, the control logic 212 turns on switch 216, thereby enabling the audio interface 234. If the timer 218 expires, the control logic 212 turns off switches 214 and 216, thereby disabling the wireless communications interface 232 and the audio interface 234. Irvin '332 at 5:1–23 Because the wireless headset 100 of the present invention automatically enables and disables its communication functions based on use, the sensor 220 may be based on a variety of technologies. In general, its purpose is to provide a signal responsive to a natural stimulus associated with use of the headset by a user. Movement or vibration of the wireless headset 100, or placement of the wireless headset 100 upon the user's body indicates usage. Movement may be detected based on vibration or by sensing acceleration, such as with an accelerometer. Mechanical or liquid-based switches represent alternate mechanisms for sensing movement. In such switches, movement causes an electrical connection to be established between contact pairs. Further, the particular sensor 220 employed may be tuned or configured such that only stimulus consistent with actual use actuates the sensor, thus avoiding inadvertent or unintended enabling of the wireless headset 100. In such configurations, the sensor 220 preferably employs output conditioning that prevents assertion of the sensor output signal for stimulus below a defined threshold. Alternatively, the power control circuit 210 may include such conditioning as part of its interface to the sensor 220. FIGS. 4A–4D illustrate possible sensor embodiments. Irvin '332 at 5:25–52 In FIG. 4A, the power control circuit 210 is operatively associated with a MEMS device, with the MEMS device functioning as the sensor 220. Devices based on MEMS technology may be responsive to general vibration or motion, or may be configured to respond only to specific acceleration along defined axes. As MEMS devices may easily include output conditioning electronics, the sensitivity or responsiveness of the sensor 220 incorporating the MEMS device may be tailored such that the sensor output signal is asserted only for motion or vibration above a certain threshold. A typical MEMS employs modified microelectronics fabrication techniques and includes small mechanical elements responsive to movement or vibration, such as cantilever beams formed by selectively etching a silicon wafer. In a preferred embodiment of the present invention, sensor 220 includes a MEMS device simultaneously fulfilling the requirements of low power consumption, relative low-cost, and adequate signal discrimination. In this context, signal discrimination means that the sensor 220 is not prone to nuisance assertions of its sensor output signal caused by minute movement or vibration. Although the body of work associated with MEMS technology is quite comprehensive, significant insight into the basic structures and techniques of MEMS technology may be gained from U.S. Pat. No. 5,659,195 to Kaiser et al., U.S. Pat. No. 5,663,507

Claims	Prior Art
	to Westervelt et al., and U.S. Pat. No. 5,76,480 to Pister, the disclosures of which are incorporated herein by reference. Irvin '332 at 5:53–6:2 FIG. 4B illustrates the power control circuit 210 coupled to a liquid-based switch functioning as the sensor 220. The sensor 220 may be a mercury-filled switch, or may employ other conductive liquids. Depending upon its configuration, the sensor 220, implemented as a liquid-based switch, may function as a motion sensor or as an attitude sensor. As a motion sensor, the sensor 220 includes first and second contacts disposed in a manner such that motion of the contained liquid places the first and second contacts in electrical connection. As an attitude sensor, sensor 220 includes first and second contacts disposed in a manner such that one or more specific physical orientations of the wireless headset 100 causes the contained liquid in sensor 220 to place the first and second contacts in electrical connection. The power control circuit 210 connects to the first and second contacts of sensor 220, and is responsive to the electrical connection completed by the contained liquid. Irvin '332 at 6:20–33 FIG. 4D illustrates the power control circuit 210 coupled with a proximity sensor 220 not based on mechanical actuation. The proximity sensor 220 may be an active or passive IR sensor, may be a resistive or other type of thermal sensor, or may be an acoustic sensor. As a proximity sensor, sensor 220 provides indication that a user has placed the wireless headset 100 upon their body. As such, any of the foregoing or other presence sensing techniques may be used to implement sensor 220. Preferably, when configured as a proximity sensor, sensor 220 requires minimal power and provides a sensor output signal based on proximity to the user's body. Depending upon the sensing technology chosen, the control circuit 210 may be required to periodically stimulate sensor 220 to generate a detection response. Irvin '332 at 7:1–8:3 Note that the foregoing diagrams illustrate various configurations for the present invention, with these configurations allowing the wireless headset 100 to automatically enable and disable select portions of its electronic circuitry based on user stimulus. Enabling and disabling may constitute physical connection and disconnection of power between the power source 240 and the communications or headset circuit 230, or may simply represent the assertion and de-assertion of specific enabling signals. Thus, the foregoing diagrams should not be construed as limiting in any way regarding the specific circuit implementation of the wireless headset 100. FIGS. 2–5 illustrate functional diagrams and these various functions may have corresponding separate circuit elements, or may be included in integrated fashion in

Claims	Prior Art
	one or more devices. For example, a microprocessor in a sleep or halt mode may be directly connected to a battery and configured to wake up in response to an input from the sensor 220. Thus, the microprocessor could serve as the power control circuit 210, as well as providing functions related to the communications interface 232 and audio interface 234. FIGS. 8 and 9, in particular, illustrate an exemplary embodiment of the present invention wherein an integrated controller provides the functionality of the power control circuit 210. In FIG. 8, the power control circuit 210 includes an integrated controller 300. The integrated controller 300 provides power control functionality associated with the timer 218, switches 214 and 216, and control logic 212. In this embodiment, the controller 300 provides both power and control/signal interconnections for the wireless communications interface 232 and audio interface 234. The controller 300 independently enables the wireless communications interface 232 and audio interface 234 in response to the sensor output signal from sensor 220. As with other embodiments, the controller 300 may enable both the wireless communication interface 232 and audio interface 234 in response to the sensor output signal, or may only enable the wireless communications interface 232, or a portion thereof. In this latter, case, the controller 300 enables the audio interface 234 in response to receiving the link signal from the enabled portion of the wireless communications interface 232. FIG. 9 provides more detail regarding the controller 300 shown in FIG. 8. A main power controller 310 provides power/control outputs to power controllers 330 and 340, which, in turn, provide power control outputs to the wireless communications interface 232 and audio interface 234, respectively. The main power controller 310 additionally interfaces with and provides power to a functional controller 350 and a sensor controller 320. The functional controller 350 provides signal and control interfaces with both the wireless communications interface 232 and the audio interface 234. In an exemplary embodiment, the main power controller initially enables only the sensor controller 320. Then, in response to the sensor output signal, the main controller 310 enables power controller 330 at least a portion of the functional controller 350. In response, power controller 330 enables at least a portion of the wireless communications interface 232. Then, in response to receiving the link signal from the wireless communications interface 232—the link signal may be received via the functional controller 350—the main power controller 310 enables the power controller 340 associated with the audio interface 234. The power controllers 330 and 340 may comprise FET switches combined with control logic responsive to control signals asserted by the main power controller 310, the functional controller 350, and/or the wireless communications interface 232. Irvin ’332 at 8:11–50 FIGS. 6 and 7 illustrate operation of the wireless headset 100. FIG. 6 is a state diagram for one exemplary embodiment of the present invention. When the wireless headset 100 is not in use, it automatically enters an inactive state (610). As explained, this inactive state may constitute disconnecting the communications

Claims	Prior Art
	circuit 230 from the power source 240, or may simply represent placing the communications circuit 230 in a non-functional, low-power condition. Absent user stimulus, such as motion of the wireless headset 100 or placement of the wireless headset 100 upon the user's body, the wireless headset 100 remains in the inactive state (610). In response to user stimulus, as detected by sensor 220, the power control circuit 210 enables the communications circuit 230, with this enabling representing a transition from the inactive state to an active state (620). Upon entering the active state, the power control circuit 210 initializes and starts the timer 218. The timer 218 incrementally counts from a starting value to an ending value, with the progression from starting to ending values representing a defined interval of time. Upon expiration of the timer 218, the power control circuit 210 disables the communications circuit 230. This interval of time may be preprogrammed to a convenient value, or may be selectable based on input from the base unit 102. For example, a timeout interval of five minutes may provide a reasonable compromise between user convenience and battery life. While in the active state (620), the power control circuit 210 resets the timer 218 based on the reassertion or continued assertion of the sensor output signal from sensor 220. Such resetting prevents expiration of the timer 218 and, as such, causes the power control circuit 210 to leave the communications or headset circuit 230 enabled. Thus, the power control circuit 210 is designed to leave the wireless headset 100 in the active state (620) while the wireless headset is in use by a user. Absent user stimulus, the timer 218 of power control circuit 210 expires, thereby causing the wireless headset 100 to transition from the active state (620) to the inactive state (610) based on the power control circuit 210 disabling the communications circuit 230. Irvin ’332 at 8:51–9:12 FIG. 7 is a state diagram for a preferred embodiment of the present invention. Operation of the wireless headset 100 illustrated in FIG. 7 is distinguished from that shown in FIG. 6 by inclusion of an additional state, denoted as the sleep state (720). Inclusion of the sleep state provides an additional opportunity to control the power consumption of wireless headset 100 based on specific operating conditions. As before, the wireless headset 100 remains in the inactive state (710) absent user stimulus. Upon detecting user stimulus, the wireless headset 100 transitions from the inactive state (710) to the sleep state (720). In this state, the power control circuit 210 enables only a portion of the communications circuit 230. Specifically, the power control circuit 210 enables the wireless communications interface 232 or a portion thereof. Then, using a signal output from the wireless communications interface 232, the power control circuit 210 determines if the base unit 102 is active, or if the base unit 102 is attempting to communicate with the wireless headset 100. In some embodiments, the wireless headset 100 infers activity by detecting, via its wireless communications interface, a carrier signal from the base unit 102. In other embodiments, the wireless headset detects activity based on receiving a “wake-up” signal from the base unit 102. Note that monitoring for the base unit carrier signal may be performed continuously by the wireless headset 100

Claims	Prior Art
	while in the sleep state, or may be performed periodically; thereby further reducing sleep state power consumption. For periodic carrier monitoring, the wireless headset 100 may employ an exemplary monitoring interval of 0.5 seconds. Irvin '332 at 9:13–65 Upon detecting the carrier signal or wake-up signal from the base unit 102, as indicated by the link signal shown in FIG. 7, the wireless headset 100 transitions from the sleep state (720) to the active state (730). To further reduce power consumption, the wireless headset 100 may only monitor for the external signal on a periodic basis. If the wireless headset 100 is configured to monitor for the external signal on a periodic basis and the base unit 102 is configured to emit a periodic wake-up signal, the periodic monitoring of the wireless headset 100 is set such that its monitoring frequency is not an integer multiple of the wake-up signal frequency. Upon causing the wireless headset 100 to transition from the inactive state (710) to the sleep state (720), the power control circuit 210 initializes and starts the timer 218. While in the sleep state (720), subsequent or continued assertion of the sensor output signal from the sensor 220 causes the power control circuit 210 to reset its timer 218. Absent such user stimulus, the timer 218 expires and the power control circuit 210 disables the communications circuit 230. After transitioning from the sleep state (720) to the active state (730), based on detection of the signal from the base unit 102, the power control circuit 210 continues resetting its timer 218 based on user stimulus, as done in the sleep state (720). Thus, continued user stimulus causes the power control circuit 210 to leave the wireless headset 100 fully functional in the active state (730). The present invention provides methods and apparatus allowing the wireless headset 100 to conveniently transition from a non-functional inactive state to a fully functional active state, based on its detection of certain user stimulus. In a preferred embodiment, the wireless headset 100 transitions from the inactive state to the intermediate sleep state, thereby conserving power. Upon detection of the carrier or the wake-up signal from the base unit 102, the wireless headset 100 transitions from the sleep state to the fully functional active state. The wireless headset 100 includes a sensor 220 for detecting the user stimulus. As the sensor 220 may be a motion sensor, a vibration sensor, an attitude sensor, or a proximity sensor, the specific user stimulus may include the user moving and/or placing the wireless headset 100 upon their body. The operation of the wireless headset 100 in accordance with the present invention admits tremendous flexibility with respect to implementation. As noted, many different circuit implementations may provide the inventive features of the present invention. These implementations may include hardware and software, and can reflect varying degrees of integration between the functional circuit blocks discussed. Indeed, all such variations for providing a wireless headset 100 that automatically controls its

Claims	Prior Art
	power consumption or operating state based on detection of a user stimulus are within the scope of the present invention. Griffin '456's "second communication module 162 may also include ... a noise cancellation circuit 191" (example of the claimed electronic circuitry) and "background noise signals" from the "background noise microphone" "are then subtracted from the corrupted speech received by the microphone 14d in the noise cancellation circuit" (example of the claimed electronic circuitry being configured to at least process the audio input from at least the user via the first microphone to remove at least a portion of the environmental audio input associated with the environment picked up via the second microphone). Griffin '456 discloses the "microphone" (example of the claimed first microphone), "background noise microphone," and the "battery" are all connected to electronic circuitry such as the "noise cancellation circuit" and "processor" as shown in Figure 16, for example. A POSITA also would have understood that Griffin '456's "sensory circuits" were also interconnected to the other circuit components in Figure 16 so that it could be powered and communicate the data it sensed to the other components. The following citations show examples of where the Griffin '456 discloses this limitation. Griffin '456 at Figure 16  Fig. 16

Claims	Prior Art
	Griffin ’456 at [0023]–[0025] FIG. 16 is an exemplary electrical block diagram of the multi-module communication devices shown in FIGS. 1-15; FIG. 17 illustrates one contemplated implementation of the communication device described above; FIG. 18 illustrates a further embodiment of a communication device that includes wireless communication between the device modules and a third module, such as an RF interface cradle; and Griffin ’456 at [0032]–[0033] FIG. 4 is a top perspective view of the second communication module 14 shown in FIGS. 1 and 2. The second communication module 14 is preferably a voice communication device that includes a speaker 14a, a main body 14b, a boom 14c and a microphone 14d. Operationally, the speaker 14a is placed in the ear of a communication device user with the boom 14c extending towards the user's mouth. To avoid rotational movement of the second communication module 14 while the speaker 14a is in the user's ear, the center of gravity of the module 14 should preferably be as close to the speaker 14a as possible. Thus, any relatively heavy components located inside the main body portion 14b should preferably be located adjacent the speaker 14a. In this manner, moments about the speaker are minimized, and the second communication module 14 should remain substantially stationary while the speaker is in the communication device user's ear. Optimally, the length of the boom portion 14c should be maximized such that the microphone 14d is located in the proximity of the communication device user's mouth when the module 14 is in use. The moment about the speaker 14a, however, increases in proportion to the length of the boom 14c. Thus, in order to maintain stability, the length of the boom 14c may not be sufficient to position the microphone 14d adjacent to a user's mouth. The microphone 14d will, therefore, likely receive not only a user's speech, but also undesired noise signals from a multitude of sources, such as other speakers in the vicinity or car engine noise. In order to reduce this background noise, the second communication module preferably 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 ’456 at [0051] FIGS. 15a and 15b show one alternative design 120 for the second communication module. FIG. 15a shows a top perspective view of the alternative second communication module 120. FIG. 15b shows a side perspective view of the alternative second communication module 120. The alternative communication module 120 preferably includes a housing 128, a speaker 120a, a microphone 120d and a switch 126. The housing 121 preferably includes a substantially oval-shaped top profile, and indentations

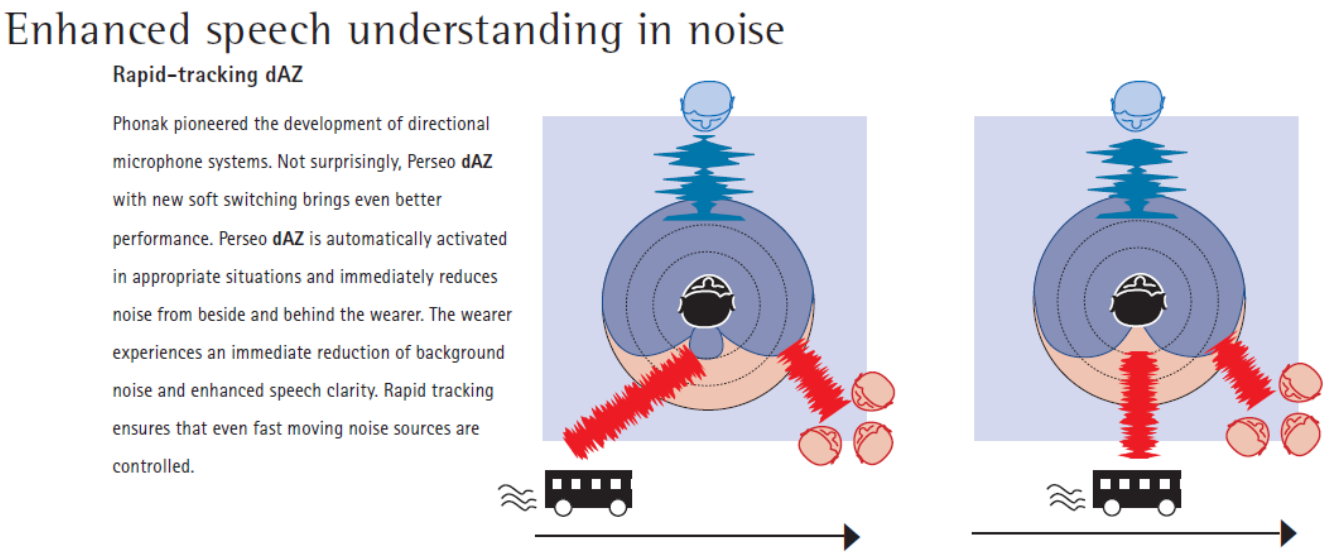
Claims	Prior Art
	122 and 124 that define handles by which a user may grasp and hold the second communication module 120. In addition, the housing 121 preferably has a main body portion with two sections: an upper section 120b that lies substantially to one side of the speaker 120a; and a lower section 120c that lies substantially on the opposite side of the speaker 120a. The microphone 120d is preferably located at a distal end of the lower section 120c. The switch 126 is preferably located on a top portion of the housing 121 and operates similarly to the switch 54 shown in FIG. 5. The module may also include an additional microphone adapted to receive background noise for use in executing noise cancellation operations for the desired but corrupted voice or audio signals received at microphone 120d. Griffin '456 at [0053] FIG. 16 is an exemplary electrical block diagram 160 of the multi-module communication devices shown in FIGS. 1-15. Another type of communication device that could be modified for use with this system is described in co-pending U.S. patent applications Ser. Nos. 09/106,585, 09/344,432, 09/543,231, 09/634,774 and 09/663,972. These applications, which are co-owned with the present application, are hereby incorporated herein by reference. The communication devices described in these applications include only a single wireless RF component for communicating over a single communication path to a long-range wireless network. The devices shown in FIGS. 1-15 are similar to these devices in that they can communicate over a long-range wireless network, but also preferably include an RF interface for communicating over a short-range wireless network or link. Griffin '456 at [0056] The second communication module 162 is preferably an RF-enabled ear-piece that may be connected to (both mechanically and electrically) the first communication module 161 as described above. The second communication module 162 preferably includes a microphone and a speaker 190, a short-range wireless transceiver 192, an antenna 194, a rechargeable battery 188, and possibly an integral processor 196. The second communication module 162 may also include a background noise microphone 48 and a noise cancellation circuit 191 as described above with reference to FIG. 4. When the second communication module 162 is placed into the first communication module 161, a shared secret can be exchanged between the two wireless components of the communication device 160 so that any communications between the first and second communication modules 161/162 may be encrypted. Also, the rechargeable battery 188 of the second module 162 may be recharged by the battery 184 of the first communication module 161 through power supply recharging circuitry 186 when the two modules are in electrical contact.

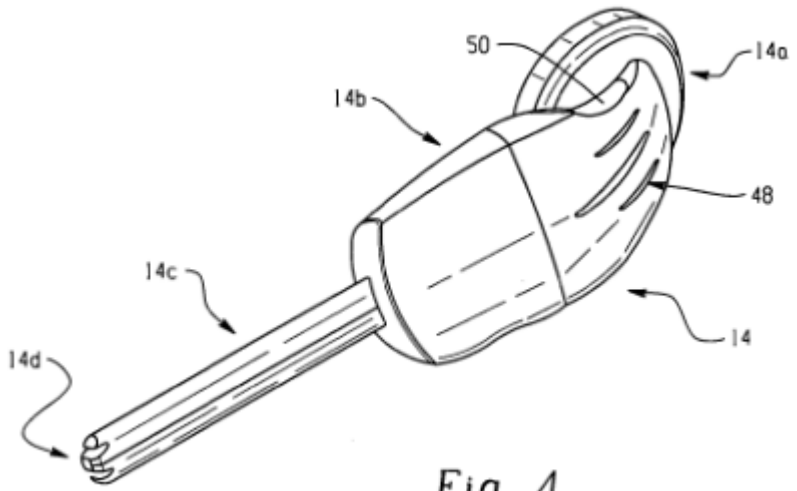
Claims	Prior Art
	Miller ’585 discloses “[t]he one or more microphones may be used in combination with conventional noise cancellation software which is easily modified for use in these embodiments” (example of the claimed electronic circuitry being configured to at least process the audio input from at least the user via the first microphone to remove at least a portion of the environmental audio input associated with the environment picked up via the second microphone). Miller ’585 discloses “DSP 2206 executes noise reduction software (e.g., echo canceling) that improves the sound quality originating at the one or more microphones mounted on the eyewear” (example of the claimed electronic circuitry contained within the head-worn structure, the electronic circuitry being electrically connected to at least one or more of the first microphone, the second microphone). A POSITA also would have understood that Miller ’585’s electronic components and circuitry would have been connected to a battery to power it. The following citations show examples of where the Miller ’585 discloses this limitation. Miller ’585 at [0048] To assist picking up the wearer's voice, housing 124 is located on earstem 104 to be close to the wearer's mouth. In other instances, however, housing 124 is located elsewhere on eyeglasses 100 (e.g., on support loop 118, on a frame surrounding one of the lenses (FIG. 4)). In FIG. 1, microphone housing 124 is shown extending from temple portion 116. In other instances in which temple portion 116 is sufficiently large, or the microphone is sufficiently small, housing 124 is coextensive with temple portion 116 so that there is no significant change in the cross section of the earstem in the microphone housing portion. Making the microphone housing coextensive with the shape of the earstem reduces accidental wear on or breakage of the housing. Additional microphones are used in some embodiments to improve sound pickup quality. Such additional microphones are placed in various positions, such as on the same earstem, the opposite earstem, or on a frame supporting the lenses. The use of more than one microphone in various positions to improve sound pickup directionality allows the wearer's voice to be sensed more clearly and extraneous background noises to more easily be canceled. Consequently, enhanced directionality improves performance of, for example, voice recognition software executed by digital signal processors described below, and improves the quality of the wearer's voice for remote conversation or for recording as dictation. Miller ’585 at [0065] FIG. 11 is a side cutaway view showing a microphone mounting embodiment. Microphone 1102 is shown positioned within microphone housing 124. One microphone terminal 1104 is coupled to wire 910. Another microphone terminal 1106 is coupled to wire 912. Microphone case opening 1108 to the

Claims	Prior Art
	microphone pickup element is positioned to be aligned with opening 126 in earstem 104. Openings 126, 1108 are oriented to pick up the sound originating from the wearer's mouth. It is known that microphone directionality is achieved by various microphone case shapes and various positions of openings allowing primary and secondary sound pressure to reach the microphone pickup element (e.g., holes positioned on opposite sides of the microphone casing). Therefore, microphone opening 1108 and earstem opening 126 are illustrative of microphone 1102 directionality that picks up the user's voice while attenuating background noise (i.e., directional microphone pointed at the wearer's mouth). Miller ’585 at [0079] FIGS. 19A and 19B illustrate microphone directionality in embodiments of eyeglasses 1502. As seen in FIG. 19A, lower directional opening 1808 provides a primary pickup zone 1902 towards the wearer's mouth. Upper directional opening 1520 provides a secondary pickup zone 1904 up and away from the wearer in a direction from which little sound originates. FIG. 19B shows another view of zones 1902, 1904. FIG. 19B also shows a benefit of using two microphones symmetrically mounted on the eyeglasses. Primary pickup zones 1902 and 1906 may be additive, providing an additional boost over sounds detected in secondary pickup zones 1904 and 1908. Thus pickup of the wearer's voice is further enhanced while unwanted background noise is reduced. The one or more microphones may be used in combination with conventional noise cancellation software which is easily modified for use in these embodiments. Miller ’585 at [0089] DSP 2206 processes the BLUETOOTH stack software and applications software such as echo cancellation, voice recognition, command and control, speech compression, and speech synthesis. In one instance DSP 2206 is a Texas Instruments DSP part no. TMS320VC5402PGE100. In some instances DSP 2206 executes noise reduction software (e.g., echo canceling) that improves the sound quality originating at the one or more microphones mounted on the eyewear. Noise cancellation software is commercially available (e.g., from Texas Instruments, Incorporated), and modification of such software for this application is easily accomplished in light of this disclosure. A POSITA would have been motivated to combine the Jabra BT800 with Griffin ’456 and the Jabra BT800 with Miler ’585 to achieve noise cancelling solutions, and reasonably expected success in doing so, for the reasons explained above for [1d] and [1e]. *Supra* [1d], [1e]. A POSITA would have been motivated to combine the Jabra BT800 with Irvin ’332, and reasonably expected success in doing so, for the reasons explained above for [18g]. *Supra* [18g].

Claims	Prior Art
	To the extent that the Jabra BT800, Irvin ’332, Griffin ’456, and Miller ’585 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Irvin ’332, Griffin ’456, and Miller ’585, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[18i] wireless communication circuitry at least partially contained within the head-worn structure, the wireless communication circuitry being electrically connected to at least the rechargeable battery; and	The Jabra BT800 expressly or inherently discloses “wireless communication circuitry at least partially contained within the head-worn structure, the wireless communication circuitry being electrically connected to at least the rechargeable battery.” For example: *See* above at claim [1g]. To the extent that the Jabra BT800 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[18j] at least one conductive element at least partially included within the head-worn structure, the at least one conductive element being at least partially exposed to enable interconnection therewith, the at least one conductive element being electrically connected to at least the rechargeable battery; and	The Jabra BT800, Jabra FreeSpeak, and Griffin ’456 expressly or inherently disclose “at least one conductive element at least partially included within the head-worn structure, the at least one conductive element being at least partially exposed to enable interconnection therewith, the at least one conductive element being electrically connected to at least the rechargeable battery.” For example: *See* above at claim [1h]. To the extent that the Jabra BT800, Jabra FreeSpeak, and Griffin ’456 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Jabra FreeSpeak, and Griffin ’456, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[18k] a charging apparatus having at least a charging connector,	The Jabra BT800, Jabra FreeSpeak, and Griffin ’456 expressly or inherently disclose “a charging apparatus having at least a charging connector.” For example: *See* above at claim [1i]. To the extent that the Jabra BT800, Jabra FreeSpeak, and Griffin ’456 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Jabra FreeSpeak, and Griffin ’456, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[18l] wherein on placement of the head-worn personal electronic	The Jabra BT800, Jabra FreeSpeak, and Griffin ’456 expressly or inherently disclose “wherein on placement of the head-worn personal electronic apparatus in the charging apparatus, electrical connection results at least

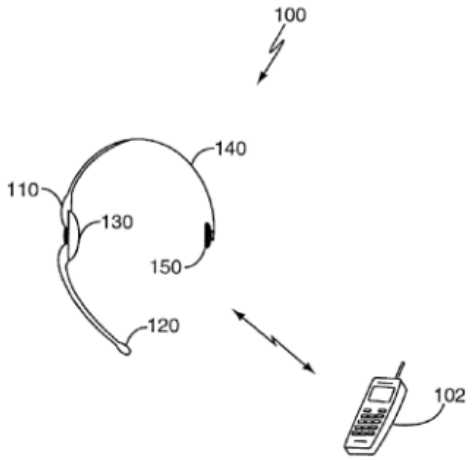
Claims	Prior Art
apparatus in the charging apparatus, electrical connection results at least from the at least one conductive element connecting with the charging connector, and thereby the rechargeable battery of the head-worn personal electronic apparatus is able to be recharged while the head-worn personal electronic apparatus is placed in the charging apparatus.	from the at least one conductive element connecting with the charging connector, and thereby the rechargeable battery of the head-worn personal electronic apparatus is able to be recharged while the head-worn personal electronic apparatus is placed in the charging apparatus." For example: *See* above at claim [1j]. To the extent that the Jabra BT800, Jabra FreeSpeak, and Griffin '456 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Jabra FreeSpeak, and Griffin '456, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
19. A system as recited in claim 18, wherein the first microphone is positioned to be directed forward towards the user's front when the head-worn structure is being worn by the user, and the second microphone is positioned to be directed outward away from the user's head when the head-worn structure is being worn by the user.	The Jabra BT800, the Phonak Perseo, Griffin '456, and Miller '585 expressly or inherently disclose "[a] system as recited in claim 18, wherein the first microphone is positioned to be directed forward towards the user's front when the head-worn structure is being worn by the user, and the second microphone is positioned to be directed outward away from the user's head when the head-worn structure is being worn by the user." For example: On information and belief, the Phonak Perseo includes wherein the first microphone is positioned to be directed forward towards the user's front when the head-worn structure is being worn by the user, and the second microphone is positioned to be directed outward away from the user's head when the head-worn structure is being worn by the user because it includes "directional microphone systems" for "reduction of background noise and enhanced speech clarity." The following citations show examples of where the Phonak Perseo discloses this limitation. Phonak Perseo Brochure at 14.

Claims	Prior Art
	 Griffin '456 discloses that "microphone 14d" (example of the claimed microphone) "is located in the proximity of the communication device user's mouth when the module 14 is in use" or "the microphone 14d is adjacent to the user's mouth" (example of the claimed first microphone is positioned to be directed forward towards the user's front when the head-worn structure is being worn by the user, and the) whereas the "background noise microphone 48" is placed on the outside other end of the module away from the user's mouth, as shown in Figure 4 (example of the claimed second microphone is positioned to be directed outward away from the user's head when the head-worn structure is being worn by the user). The following citations show examples of where the Griffin '456 discloses this limitation.

Claims	Prior Art
	Griffin ’456 at Figure 4  Fig. 4 Griffin ’456 at [0032]–[0033] FIG. 4 is a top perspective view of the second communication module 14 shown in FIGS. 1 and 2. The second communication module 14 is preferably a voice communication device that includes a speaker 14a, a main body 14b, a boom 14c and a microphone 14d. Operationally, the speaker 14a is placed in the ear of a communication device user with the boom 14c extending towards the user's mouth. To avoid rotational movement of the second communication module 14 while the speaker 14a is in the user's ear, the center of gravity of the module 14 should preferably be as close to the speaker 14a as possible. Thus, any relatively heavy components located inside the main body portion 14b should preferably be located adjacent the speaker 14a. In this manner, moments about the speaker are minimized, and the second communication module 14 should remain substantially stationary while the speaker is in the communication device user's ear. Optimally, the length of the boom portion 14c should be maximized such that the microphone 14d is located in the proximity of the communication device user's mouth when the module 14 is in use. The moment about the speaker 14a, however, increases in proportion to the length of the boom 14c. Thus, in order to maintain stability, the length of the boom 14c may not be sufficient to position the microphone 14d adjacent to a user's mouth. The microphone 14d will, therefore, likely receive not only a user's speech, but also undesired noise signals from a multitude of sources, such as other speakers in the vicinity or car engine noise. In order to reduce this background noise, the second communication module preferably includes a noise cancellation circuit with a background noise microphone 48 as shown in FIG.

Claims	Prior Art
	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 '456 at [0052] Like the second communication modules described above, the alternative module 120 communicates via a wireless link with an associated first communication module and is designed to provide for hands-free operation. The speaker 120a is placed in a user's ear such that body section 120c and thus microphone 120d extend toward the user's mouth. Extension of the upper and lower main body sections 120b and 120c on opposite sides of the speaker 120a allows for effective weight balancing. A further feature of the alternative second communication module 120 involves a raised portion 128 that overlies the upper and lower main body sections 120b and 120c. The raised portion 128 is preferably a removable cover member that provides simple access to manufacturer-selected internal components, such as a single-use replaceable battery, for service or installation by a user. Miller '585 discloses "the microphone is directional and is oriented to selectively pick up the wearer's voice" (example of the claimed wherein the microphone is configured to be positioned closer to mouth of the user than the another microphone, when the wireless wearable device is worn by the user). The following citations show examples of where the Miller '585 discloses this limitation. Miller '585 at [0011] The microphone is mounted in the earstem or in a frame supporting one or more lenses in the eye protection portion. In some cases the microphone is directional and is oriented to selectively pick up the wearer's voice. Multiple microphones provide enhanced directional pickup. A POSITA would have been motivated to combine the Jabra BT800 with the Phonak Perseo, the Jabra BT800 with Griffin '456, and the Jabra BT800 with Miller '585, and reasonably expected success, for the same reasons discussed above for [18d]. Supra [18d]. To the extent that the Jabra BT800, the Phonak Perseo, Griffin '456, and Miller '585 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, the Phonak Perseo, Griffin '456, and Miller '585, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.

Claims	Prior Art
20. A system as recited in claim 19, wherein the head-worn personal electronic apparatus comprises: a touch sensitive surface at least partially contained within the head-worn structure and configured to sense a touch input associated with the user, wherein the sensed touch input operating to at least alter operation of the head-worn electronic personal audio apparatus.	The Jabra BT800, Hollemans '490, and Zadesky '230 expressly or inherently disclose "[a] system as recited in claim 20, wherein the head-worn electronic personal audio apparatus is configured to support audio output to the user via the speaker." For example: *See* above at claim 2. To the extent that the Jabra BT800, Hollemans '490, and Zadesky '230 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Hollemans '490, and Zadesky '230, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[21a] A system as recited in claim 20, wherein the head-worn electronic personal audio apparatus is configured to support audio output to the user via the speaker, and	The Jabra BT800 expressly or inherently discloses "[a] system as recited in claim 20, wherein the head-worn electronic personal audio apparatus is configured to support audio output to the user via the speaker." For example: *See* above at claim 4[a]. To the extent that the Jabra BT800 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[21b] wherein the at least one operation of the head-worn electronic personal audio apparatus being altered concerns control of the audio output being provided to the user.	The Jabra BT800, Hollemans '490, and Zadesky '230 expressly or inherently disclose "wherein the at least one operation of the head-worn electronic personal audio apparatus being altered concerns control of the audio output being provided to the user." For example: *See* above at claim [4b]. To the extent that the Jabra BT800, Hollemans '490, and Zadesky '230 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Hollemans '490, and Zadesky '230, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
22. A system as recited in claim 20, wherein the system comprises: a Hall effect detector configured to	The Jabra BT800, Spitzer '001, and Ritter '100 expressly or inherently disclose "wherein the at least one operation of the head-worn electronic personal audio apparatus being altered concerns control of the audio output being provided to the user." For example:

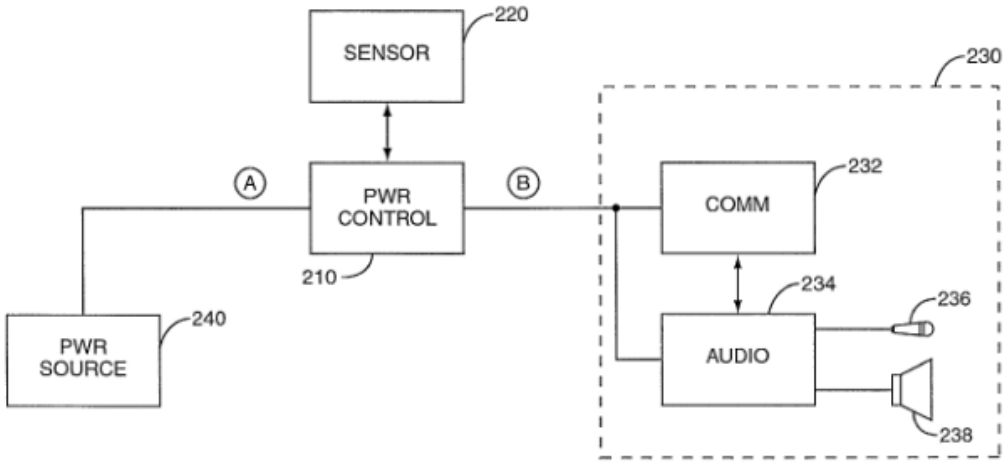
Claims	Prior Art
capture data associated with a magnetic characteristic.	*See* above at claim 16. To the extent that the Jabra BT800, Spitzer '001, and Ritter '100 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Spitzer '001, and Ritter '100 those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
23. A system as recited in claim 18, wherein the sensor is positioned to be directed towards the user's head when the head-worn structure is being worn.	The Jabra BT800 and Irvin '332 expressly or inherently disclose "[a] system as recited in claim 18, wherein the sensor is positioned to be directed towards the user's head when the head-worn structure is being worn." For example: Irvin '332 "contact sensor, is placed in the earpiece 130, in the retaining member 140, or in the retaining pad 150" (example of the claimed sensor is positioned to be directed towards the user's head when the head-worn structure is being worn). Moreover, a POSITA would have understood that contact sensors, or other proximity sensors like IR sensors, would have been directed towards the user's head to detect that the user's head is proximate. The following citations show examples of where the Irvin '332 discloses this limitation. Irvin '332 at Figure 1  *FIG. 1*

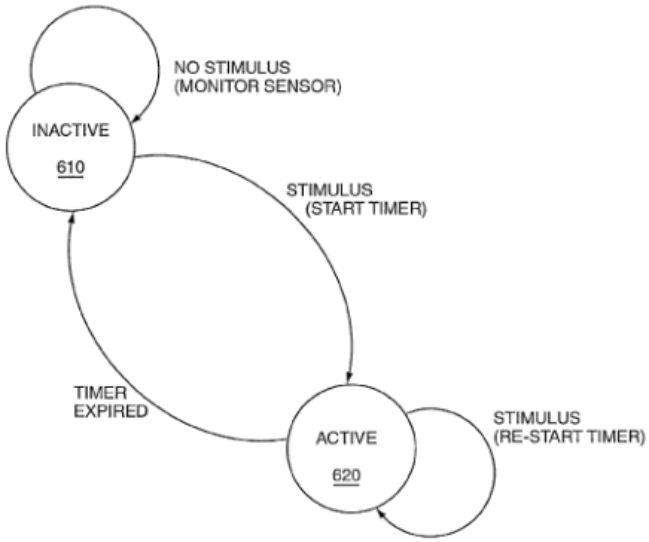
Claims	Prior Art
	Irvin ’332 at 6:3–19 FIG. 4C illustrates the power control circuit 210 coupled with a contact switch functioning as the sensor 220. The contact switch includes a first and second contact connected to the power control circuit 210, and connecting member 222 actuated when the user places the wireless headset 100 on their body. When actuated, the connecting member 222 places the first and second contacts of sensor 220 in electrical connection. Ideally, the sensor 220, when configured as a contact sensor, is placed in the earpiece 130, in the retaining member 140, or in the retaining pad 150 shown in FIG. 1B. Preferably, when sensor 220 is configured as a contact-based proximity sensor, the contacting element of sensor 220 is sealed in a manner that minimizes contaminant ingress. In some embodiments, the contact sensor may be actuated by the user resiliently expanding the retaining member 140 or other element of the wireless headset 100 for mounting upon their body. Irvin ’332 at 6:20–33 FIG. 4D illustrates the power control circuit 210 coupled with a proximity sensor 220 not based on mechanical actuation. The proximity sensor 220 may be an active or passive IR sensor, may be a resistive or other type of thermal sensor, or may be an acoustic sensor. As a proximity sensor, sensor 220 provides indication that a user has placed the wireless headset 100 upon their body. As such, any of the foregoing or other presence sensing techniques may be used to implement sensor 220. Preferably, when configured as a proximity sensor, sensor 220 requires minimal power and provides a sensor output signal based on proximity to the user's body. Depending upon the sensing technology chosen, the control circuit 210 may be required to periodically stimulate sensor 220 to generate a detection response. A POSITA would have understood that Griffin ’456’s “sensory circuits” are directed toward the user’s head when the head–worn structure is being worn because they measure the “device user’s vital information such as pulse and blood pressure,” and thus would have been directed towards the user’s skin. Similarly a POSITA would have understood the “sensory circuits” are directed towards the head because Griffin ’456’s “second communication module” (example of the claimed head–worn structure) is “fitted into or onto an ear of a communication device user.” The following citations show examples of where the Griffin ’456 discloses this limitation. A POSITA would have been motivated to combine the Jabra BT800 with Irvin ’332’s sensor directed towards the user’s head in order to improve the ability of the sensor to collect data from the user. A POSITA would have reasonably expected to succeed in combining the Jabra BT800 with Irvin ’332 for the reasons explained above in [18g]. *Supra* [18g].

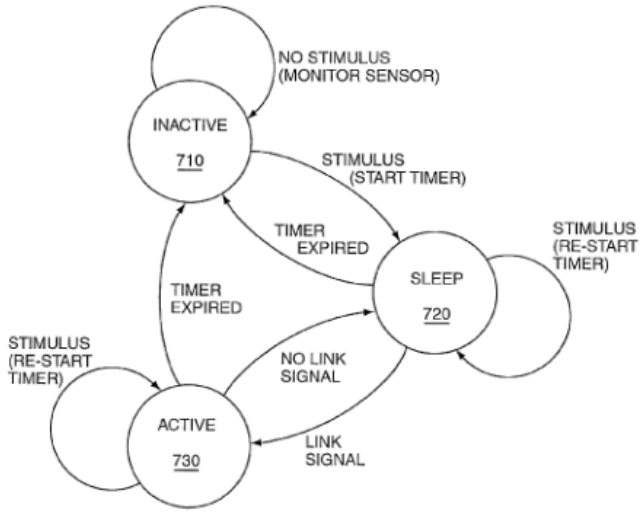
Claims	Prior Art
	To the extent that the Jabra BT800 and Irvin ’332 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800 and Irvin ’332, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
24. A system as recited in claim 23, wherein the data captured by the sensor is dependent on thermal characteristics of the user's head when the head-worn structure is being worn.	The Jabra BT800, Irvin ’332, and Iuliis ’007 expressly or inherently disclose “[a] system as recited in claim 23, wherein the data captured by the sensor is dependent on thermal characteristics of the user's head when the head-worn structure is being worn.” For example: Irvin ’332’s “wireless headset” includes a “thermal sensor” that “provides indication that a user has placed the wireless headset 100 upon their body,” which is the head as a headset (example of the claimed data captured by the sensor is dependent on thermal characteristics of the user's head when the head-worn structure is being worn). The following citations show examples of where the Irvin ’332 discloses this limitation. Irvin ’332 at 6:20–33 FIG. 4D illustrates the power control circuit 210 coupled with a proximity sensor 220 not based on mechanical actuation. The proximity sensor 220 may be an active or passive IR sensor, may be a resistive or other type of thermal sensor, or may be an acoustic sensor. As a proximity sensor, sensor 220 provides indication that a user has placed the wireless headset 100 upon their body. As such, any of the foregoing or other presence sensing techniques may be used to implement sensor 220. Preferably, when configured as a proximity sensor, sensor 220 requires minimal power and provides a sensor output signal based on proximity to the user's body. Depending upon the sensing technology chosen, the control circuit 210 may be required to periodically stimulate sensor 220 to generate a detection response. Iuliis ’007 discloses “connector unit 102 may also include sensors such as a heart monitor, light sensor, temperature sensor, motion sensor (e.g., accelerometer), etc. that provide external information about the user” (example of the claimed wherein the data captured by the sensor is dependent on thermal characteristics of the user's head when the head-worn structure is being worn). Iuliis ’007 at 9:62–10:2 The connector unit 102 may also include sensors such as a heart monitor, light sensor, temperature sensor, motion sensor (e.g., accelerometer), etc. that provide external information about the user or the user's surroundings that can be used by the handheld electronic device. Examples of sensors that can be used

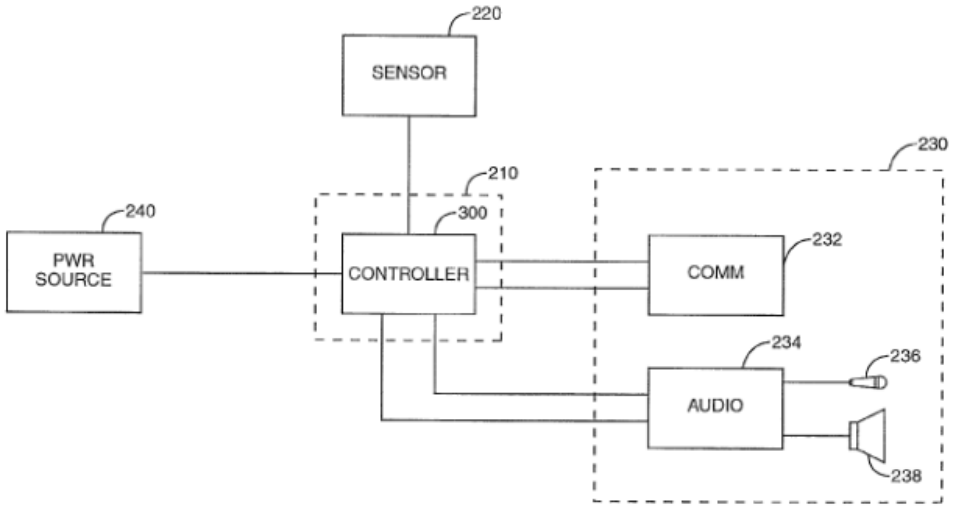
Claims	Prior Art
	may be found in U.S. patent application Ser. Nos. 10/402,311, 10/997,479, 60/658,777, and 60/663,345, which are herein incorporated by reference. A POSITA would have known that thermal characteristics were well–known characteristics that would have indicated a human presence due to body temperature. As such, a POTISA would have understood that a thermal sensor was an advantageous way to detect the presence of a wearer. A POSITA thus would have been motivated to combine Irvin '332's thermal sensor into the Jabra BT800 to detect the presence of a use. A POSITA would have reasonably expected success because thermal sensors were well–known, routine, and conventional sensors. As such, using Irvin '332's thermal sensor would have used known features according to their known functions (conventional thermal sensor), to achieve predictable results (the Jabra BT800 includes a known thermal sensor to detect heat from the user's head). A POSITA would have been motivated to combine the Jabra BT800 with Iuliis '007, and reasonably expected success in doing so, for the same reasons discussed above for the other references. To the extent that the Jabra BT800, Irvin '332, and Iuliis '007 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Irvin '332, and Iuliis '007 those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
25. A system as recited in claim 18, wherein the head-worn personal electronic apparatus is configured to receive a voice input via the first microphone, determine or receive a determination of a requested operation from the voice input using voice recognition, and control an operation by the head-worn personal electronic apparatus based on the requested operation.	The Jabra BT800, Griffin '456, and Miller '585 expressly or inherently disclose "[a] system as recited in claim 18, wherein the head-worn personal electronic apparatus is configured to receive a voice input via the first microphone, determine or receive a determination of a requested operation from the voice input using voice recognition, and control an operation by the head-worn personal electronic apparatus based on the requested operation." For example: *See* above at claim [10b]. To the extent that the Jabra BT800, Griffin '456, and Miller '585 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Griffin '456, and Miller '585, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
26. A system as recited in claim 18, wherein the head-worn personal electronic apparatus is configured to at least alter operation of the head-worn	The Jabra BT800 and Irvin '332 expressly or inherently disclose "[a] system as recited in claim 18, wherein the head-worn personal electronic apparatus is configured to at least alter operation of the head-worn personal electronic apparatus based at least in part on the sensed data from the sensor." For example:

Claims	Prior Art
personal electronic apparatus based at least in part on the sensed data from the sensor.	Irvin ’332’s “wireless headset” (example of the claimed head–worn personal electronic apparatus) “transitions from the inactive state to an active state” (example of the claimed alter operation) “in response to a user picking it up or mounting the wireless headset upon their head,” which is determined based the “sensor” (example of the claimed based at least in part on the sensed data from the sensor). The following citations show examples of where the Irvin ’332 discloses this limitation. Irvin ’332 at Abstract A wireless headset for use with a separate communications device, such as a cellular telephone, includes automatic on/off capabilities to maximize battery life. By detecting a user's interaction, such as picking up the headset or placing it upon the user's body, the wireless headset automatically transitions from an inactive state to an active state. Techniques for automatic headset enabling include but are not limited to motion sensors, attitude or position sensors, proximity sensors, and contact sensors. These techniques may be used individually or in any combination. An internal timer allows the wireless headset to return to its inactive state a defined interval after cessation of movement or removal of the wireless headset. Including an optional sleep state further optimizes battery life. In the sleep state, only a portion of the wireless headset circuitry is enabled. Rather than transitioning from inactive to active, the headset transitions from inactive to sleep. In sleep, the headset periodically monitors for a signal from the separate communications device. Upon detection of such a signal, the wireless headset transitions to its active state, thereby providing full functionality to the user.

Claims	Prior Art
	Irvin ’332 at Figure 2A  *FIG. 2A*

Claims	Prior Art
	Irvin ’332 at Figure 6  *FIG. 6*

Claims	Prior Art
	Irvin ’332 at Figure 7  FIG. 7

Claims	Prior Art
	Irvin ’332 at Figure 8  *FIG. 8* Irvin ’332 at 2:16–34 The present invention includes both a method and apparatus allowing a wireless headset to automatically control its operating state to minimize power consumption, thereby maximizing the life of its power source, such as a battery. The wireless headset serves as a communication accessory to a base unit, such as a cellular telephone. When not in use, the wireless headset reverts to an inactive state and draws essentially no power. A power control circuit imparts automatic enabling capability to the wireless headset. Preferably, the power control circuit employs a sensor responsive to a natural stimulus associated with a person preparing to use the wireless headset. The wireless headset may sense motion, physical orientation, or user proximity. Sensing techniques include but are not limited to micro-electro-mechanical-systems (MEMS), mercury switches, attitude switches, and IR or acoustic proximity sensors. In some embodiments, the wireless headset transitions from the inactive state to an active state in response to a user picking it up or mounting the wireless headset upon their head. Irvin ’332 at 2:35–50 In a more sophisticated embodiment, the wireless headset may transition from the inactive state to a sleep state, based on user stimulus. In the sleep state, only a portion of the headset circuitry is enabled, thus

Claims	Prior Art
	conserving power. While in the sleep state, the wireless headset monitors for a signal from the base unit, and, when such a signal is received, it transitions from the sleep state to the active state. Further, once active, the wireless headset can continue to monitor for communications link activity. Thus, if communications with the base unit cease, the wireless headset can return to the sleep state and periodically check for resumed communications activity. A timer allows the wireless headset to automatically return to the inactive state subsequent to use. Cessation of movement or detected removal of the wireless headset from the user's head can indicate termination of use and trigger a timed power-down. Irvin '332 at 3:53–4:2 The communications circuit 230 provides wireless headset functionality, including audio input and output and wireless communications with the base unit 102. The communications or headset circuit 230 includes a wireless communications interface 232 providing a wireless communications link for sending and receiving information to and from the base unit 102. The wireless communications interface 232 includes at least a wireless receiver and wireless transmitter. Audio input received via microphone 236 is conditioned by the audio interface 234 and then processed by the communications interface 232 for transmittal to the base unit 102. Audio information received from the base unit 102 is processed by the wireless communications interface 232 and then conditioned in the audio interface 234 for output to a user via speaker 238. With reference to FIG. 1A or 1B, the microphone 236 may be located in microphone pickup 120, and speaker 238 may be located in earpiece 130. Irvin '332 at 4:39–67 FIG. 3A illustrates a preferred embodiment for the wireless headset 100. In FIG. 3A, the power control circuit 210 independently enables the wireless communications interface 232 and audio interface 234. Thus, select portions of communications circuit 230 may be enabled in response to the sensor output signal. Once the wireless communications interface 232 is enabled, it provides a signal, termed a "link active" signal, to the power control circuit 210 based on detecting a wireless signal received from the base unit 102. Based on the assertion of the link active signal, the power control circuit 210 enables the audio interface 234. FIG. 3B provides more functional details regarding the power control circuit 210 of FIG. 3A. Again, the control logic 212 is responsive to a sensor output signal from sensor 220. However, in response to the sensor output signal, the control logic 212 turns on switch 214 while switch 216 remains off, thereby enabling the wireless communications interface 232. As with the previously discussed embodiment, power control circuit 210 includes the timer 218. In a preferred embodiment, control logic 212 starts timer 218 upon enabling the wireless communications interface 232, and resets timer 218 based on subsequent

Claims	Prior Art
	or continued assertion of the sensor output signal. If the wireless communications interface 232 asserts the link active signal, the control logic 212 turns on switch 216, thereby enabling the audio interface 234. If the timer 218 expires, the control logic 212 turns off switches 214 and 216, thereby disabling the wireless communications interface 232 and the audio interface 234. Irvin '332 at 5:1–23 Because the wireless headset 100 of the present invention automatically enables and disables its communication functions based on use, the sensor 220 may be based on a variety of technologies. In general, its purpose is to provide a signal responsive to a natural stimulus associated with use of the headset by a user. Movement or vibration of the wireless headset 100, or placement of the wireless headset 100 upon the user's body indicates usage. Movement may be detected based on vibration or by sensing acceleration, such as with an accelerometer. Mechanical or liquid-based switches represent alternate mechanisms for sensing movement. In such switches, movement causes an electrical connection to be established between contact pairs. Further, the particular sensor 220 employed may be tuned or configured such that only stimulus consistent with actual use actuates the sensor, thus avoiding inadvertent or unintended enabling of the wireless headset 100. In such configurations, the sensor 220 preferably employs output conditioning that prevents assertion of the sensor output signal for stimulus below a defined threshold. Alternatively, the power control circuit 210 may include such conditioning as part of its interface to the sensor 220. FIGS. 4A–4D illustrate possible sensor embodiments. Irvin '332 at 5:25–52 In FIG. 4A, the power control circuit 210 is operatively associated with a MEMS device, with the MEMS device functioning as the sensor 220. Devices based on MEMS technology may be responsive to general vibration or motion, or may be configured to respond only to specific acceleration along defined axes. As MEMS devices may easily include output conditioning electronics, the sensitivity or responsiveness of the sensor 220 incorporating the MEMS device may be tailored such that the sensor output signal is asserted only for motion or vibration above a certain threshold. A typical MEMS employs modified microelectronics fabrication techniques and includes small mechanical elements responsive to movement or vibration, such as cantilever beams formed by selectively etching a silicon wafer. In a preferred embodiment of the present invention, sensor 220 includes a MEMS device simultaneously fulfilling the requirements of low power consumption, relative low-cost, and adequate signal discrimination. In this context, signal discrimination means that the sensor 220 is not prone to nuisance assertions of its sensor output signal caused by minute movement or vibration. Although the body of work associated with MEMS technology is quite comprehensive, significant insight into the basic structures and techniques of MEMS technology may be gained from U.S. Pat. No. 5,659,195 to Kaiser et al., U.S. Pat. No. 5,663,507

Claims	Prior Art
	to Westervelt et al., and U.S. Pat. No. 5,76,480 to Pister, the disclosures of which are incorporated herein by reference. Irvin '332 at 5:53–6:2 FIG. 4B illustrates the power control circuit 210 coupled to a liquid-based switch functioning as the sensor 220. The sensor 220 may be a mercury-filled switch, or may employ other conductive liquids. Depending upon its configuration, the sensor 220, implemented as a liquid-based switch, may function as a motion sensor or as an attitude sensor. As a motion sensor, the sensor 220 includes first and second contacts disposed in a manner such that motion of the contained liquid places the first and second contacts in electrical connection. As an attitude sensor, sensor 220 includes first and second contacts disposed in a manner such that one or more specific physical orientations of the wireless headset 100 causes the contained liquid in sensor 220 to place the first and second contacts in electrical connection. The power control circuit 210 connects to the first and second contacts of sensor 220, and is responsive to the electrical connection completed by the contained liquid. Irvin '332 at 6:20–33 FIG. 4D illustrates the power control circuit 210 coupled with a proximity sensor 220 not based on mechanical actuation. The proximity sensor 220 may be an active or passive IR sensor, may be a resistive or other type of thermal sensor, or may be an acoustic sensor. As a proximity sensor, sensor 220 provides indication that a user has placed the wireless headset 100 upon their body. As such, any of the foregoing or other presence sensing techniques may be used to implement sensor 220. Preferably, when configured as a proximity sensor, sensor 220 requires minimal power and provides a sensor output signal based on proximity to the user's body. Depending upon the sensing technology chosen, the control circuit 210 may be required to periodically stimulate sensor 220 to generate a detection response. Irvin '332 at 7:1–8:3 Note that the foregoing diagrams illustrate various configurations for the present invention, with these configurations allowing the wireless headset 100 to automatically enable and disable select portions of its electronic circuitry based on user stimulus. Enabling and disabling may constitute physical connection and disconnection of power between the power source 240 and the communications or headset circuit 230, or may simply represent the assertion and de-assertion of specific enabling signals. Thus, the foregoing diagrams should not be construed as limiting in any way regarding the specific circuit implementation of the wireless headset 100. FIGS. 2–5 illustrate functional diagrams and these various functions may have corresponding separate circuit elements, or may be included in integrated fashion in

Claims	Prior Art
	one or more devices. For example, a microprocessor in a sleep or halt mode may be directly connected to a battery and configured to wake up in response to an input from the sensor 220. Thus, the microprocessor could serve as the power control circuit 210, as well as providing functions related to the communications interface 232 and audio interface 234. FIGS. 8 and 9, in particular, illustrate an exemplary embodiment of the present invention wherein an integrated controller provides the functionality of the power control circuit 210. In FIG. 8, the power control circuit 210 includes an integrated controller 300. The integrated controller 300 provides power control functionality associated with the timer 218, switches 214 and 216, and control logic 212. In this embodiment, the controller 300 provides both power and control/signal interconnections for the wireless communications interface 232 and audio interface 234. The controller 300 independently enables the wireless communications interface 232 and audio interface 234 in response to the sensor output signal from sensor 220. As with other embodiments, the controller 300 may enable both the wireless communication interface 232 and audio interface 234 in response to the sensor output signal, or may only enable the wireless communications interface 232, or a portion thereof. In this latter, case, the controller 300 enables the audio interface 234 in response to receiving the link signal from the enabled portion of the wireless communications interface 232. FIG. 9 provides more detail regarding the controller 300 shown in FIG. 8. A main power controller 310 provides power/control outputs to power controllers 330 and 340, which, in turn, provide power control outputs to the wireless communications interface 232 and audio interface 234, respectively. The main power controller 310 additionally interfaces with and provides power to a functional controller 350 and a sensor controller 320. The functional controller 350 provides signal and control interfaces with both the wireless communications interface 232 and the audio interface 234. In an exemplary embodiment, the main power controller initially enables only the sensor controller 320. Then, in response to the sensor output signal, the main controller 310 enables power controller 330 at least a portion of the functional controller 350. In response, power controller 330 enables at least a portion of the wireless communications interface 232. Then, in response to receiving the link signal from the wireless communications interface 232—the link signal may be received via the functional controller 350—the main power controller 310 enables the power controller 340 associated with the audio interface 234. The power controllers 330 and 340 may comprise FET switches combined with control logic responsive to control signals asserted by the main power controller 310, the functional controller 350, and/or the wireless communications interface 232. Irvin ’332 at 8:11–50 FIGS. 6 and 7 illustrate operation of the wireless headset 100. FIG. 6 is a state diagram for one exemplary embodiment of the present invention. When the wireless headset 100 is not in use, it automatically enters an inactive state (610). As explained, this inactive state may constitute disconnecting the communications

Claims	Prior Art
	circuit 230 from the power source 240, or may simply represent placing the communications circuit 230 in a non-functional, low-power condition. Absent user stimulus, such as motion of the wireless headset 100 or placement of the wireless headset 100 upon the user's body, the wireless headset 100 remains in the inactive state (610). In response to user stimulus, as detected by sensor 220, the power control circuit 210 enables the communications circuit 230, with this enabling representing a transition from the inactive state to an active state (620). Upon entering the active state, the power control circuit 210 initializes and starts the timer 218. The timer 218 incrementally counts from a starting value to an ending value, with the progression from starting to ending values representing a defined interval of time. Upon expiration of the timer 218, the power control circuit 210 disables the communications circuit 230. This interval of time may be preprogrammed to a convenient value, or may be selectable based on input from the base unit 102. For example, a timeout interval of five minutes may provide a reasonable compromise between user convenience and battery life. While in the active state (620), the power control circuit 210 resets the timer 218 based on the reassertion or continued assertion of the sensor output signal from sensor 220. Such resetting prevents expiration of the timer 218 and, as such, causes the power control circuit 210 to leave the communications or headset circuit 230 enabled. Thus, the power control circuit 210 is designed to leave the wireless headset 100 in the active state (620) while the wireless headset is in use by a user. Absent user stimulus, the timer 218 of power control circuit 210 expires, thereby causing the wireless headset 100 to transition from the active state (620) to the inactive state (610) based on the power control circuit 210 disabling the communications circuit 230. Irvin ’332 at 8:51–9:12 FIG. 7 is a state diagram for a preferred embodiment of the present invention. Operation of the wireless headset 100 illustrated in FIG. 7 is distinguished from that shown in FIG. 6 by inclusion of an additional state, denoted as the sleep state (720). Inclusion of the sleep state provides an additional opportunity to control the power consumption of wireless headset 100 based on specific operating conditions. As before, the wireless headset 100 remains in the inactive state (710) absent user stimulus. Upon detecting user stimulus, the wireless headset 100 transitions from the inactive state (710) to the sleep state (720). In this state, the power control circuit 210 enables only a portion of the communications circuit 230. Specifically, the power control circuit 210 enables the wireless communications interface 232 or a portion thereof. Then, using a signal output from the wireless communications interface 232, the power control circuit 210 determines if the base unit 102 is active, or if the base unit 102 is attempting to communicate with the wireless headset 100. In some embodiments, the wireless headset 100 infers activity by detecting, via its wireless communications interface, a carrier signal from the base unit 102. In other embodiments, the wireless headset detects activity based on receiving a “wake-up” signal from the base unit 102. Note that monitoring for the base unit carrier signal may be performed continuously by the wireless headset 100

Claims	Prior Art
	while in the sleep state, or may be performed periodically; thereby further reducing sleep state power consumption. For periodic carrier monitoring, the wireless headset 100 may employ an exemplary monitoring interval of 0.5 seconds. Irvin '332 at 9:13–65 Upon detecting the carrier signal or wake-up signal from the base unit 102, as indicated by the link signal shown in FIG. 7, the wireless headset 100 transitions from the sleep state (720) to the active state (730). To further reduce power consumption, the wireless headset 100 may only monitor for the external signal on a periodic basis. If the wireless headset 100 is configured to monitor for the external signal on a periodic basis and the base unit 102 is configured to emit a periodic wake-up signal, the periodic monitoring of the wireless headset 100 is set such that its monitoring frequency is not an integer multiple of the wake-up signal frequency. Upon causing the wireless headset 100 to transition from the inactive state (710) to the sleep state (720), the power control circuit 210 initializes and starts the timer 218. While in the sleep state (720), subsequent or continued assertion of the sensor output signal from the sensor 220 causes the power control circuit 210 to reset its timer 218. Absent such user stimulus, the timer 218 expires and the power control circuit 210 disables the communications circuit 230. After transitioning from the sleep state (720) to the active state (730), based on detection of the signal from the base unit 102, the power control circuit 210 continues resetting its timer 218 based on user stimulus, as done in the sleep state (720). Thus, continued user stimulus causes the power control circuit 210 to leave the wireless headset 100 fully functional in the active state (730). The present invention provides methods and apparatus allowing the wireless headset 100 to conveniently transition from a non-functional inactive state to a fully functional active state, based on its detection of certain user stimulus. In a preferred embodiment, the wireless headset 100 transitions from the inactive state to the intermediate sleep state, thereby conserving power. Upon detection of the carrier or the wake-up signal from the base unit 102, the wireless headset 100 transitions from the sleep state to the fully functional active state. The wireless headset 100 includes a sensor 220 for detecting the user stimulus. As the sensor 220 may be a motion sensor, a vibration sensor, an attitude sensor, or a proximity sensor, the specific user stimulus may include the user moving and/or placing the wireless headset 100 upon their body. The operation of the wireless headset 100 in accordance with the present invention admits tremendous flexibility with respect to implementation. As noted, many different circuit implementations may provide the inventive features of the present invention. These implementations may include hardware and software, and can reflect varying degrees of integration between the functional circuit blocks discussed. Indeed, all such variations for providing a wireless headset 100 that automatically controls its

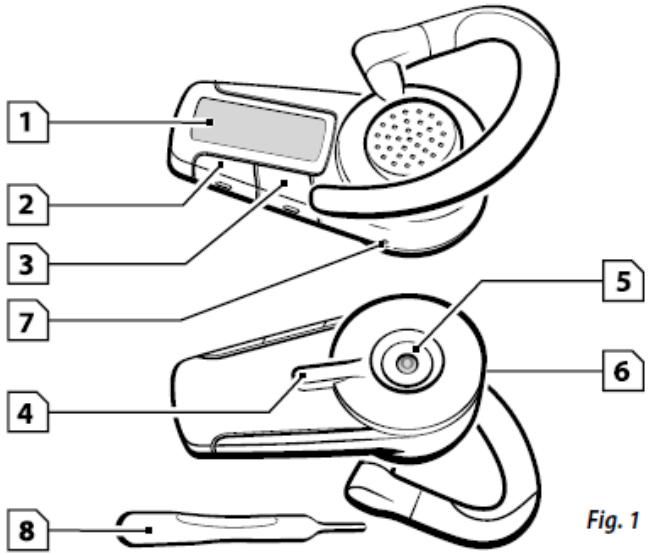
Claims	Prior Art
	power consumption or operating state based on detection of a user stimulus are within the scope of the present invention. A POSITA would have been motivated to combine Irvin '332's sensor based operation alteration into the Jabra BT800, and reasonably expected success in doing so, for the reasons explained above for claim [14b]. *Supra* [14b]. *See also supra* claims 12-13. To the extent that the Jabra BT800 and Irvin '332 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800 and Irvin '332, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[27a]. A system as recited in claim 26, wherein the head-worn personal electronic apparatus is configured to support audio output to the user via the speaker, and	The Jabra BT800 expressly or inherently discloses "[a] system as recited in claim 26, wherein the head-worn personal electronic apparatus is configured to support audio output to the user via the speaker." For example: *See* above at claim 4[a]. To the extent that the Jabra BT800 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[27b] wherein the operation of the head-worn personal electronic apparatus being altered concerns control of the audio output being provided to the user.	The Jabra BT800 and Irvin '332 expressly or inherently disclose "wherein the operation of the head-worn personal electronic apparatus being altered concerns control of the audio output being provided to the user." For example: *See* above at claim [14b]. To the extent that the Jabra BT800 and Irvin '332 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800 and Irvin '332, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
28. A system as recited in claim 18, wherein the head-worn personal electronic apparatus comprises: a user input device supported by the head-worn structure, the user input device being configured to receive a user	The Jabra BT800, Hollemans '490, and Zadesky '230 expressly or inherently disclose "wherein the head-worn personal electronic apparatus comprises: a user input device supported by the head-worn structure, the user input device being configured to receive a user input, the user input device is based on at least capacitive effect, wherein the user input being received induces at least a capacitive change to produce at least an electrical response." For example: Hollemans '490 discloses a "touch-sensitive area is used for picking up a gesture made on the area with e.g. a stylus or a finger" on a earbud device (example of the claimed a user input device supported by the head-worn

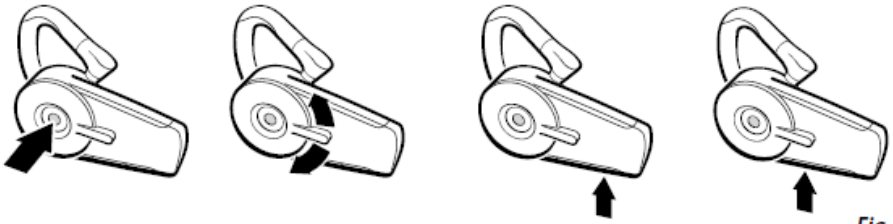
Claims	Prior Art
input, the user input device is based on at least capacitive effect, wherein the user input being received induces at least a capacitive change to produce at least an electrical response.	structure). Hollemans '490's "touch-sensitive area 122 can be realized in many ways, including a sensor for changes in capacity or induced voltages or currents, a grid of conducting parts between which changes in resistance are measured and detected" (example of the claimed wherein the user input being received induces at least a capacitive change to produce at least an electrical response). The following citations show examples of where the Hollemans '490 discloses this limitation. Hollemans '490 at 4:24–5:7 The controller 120 is used for commanding the device 110 to perform one or more of its functions or capabilities. The basic assumption is that the device 110 is remote or tucked away in a pocket or clamped to a belt or clothing, such that operating it becomes relatively hard. The controller 120 makes it possible to operate the device 110. The controller 120 is generally wired to the device 110 by means of a wire 140 (see figure 2) and a plug (not shown) that fits into a socket (not shown) of the device 110. The remote controller 120 has an outer surface 121, see also figure 2. The outer surface 121 is just the physical outer side of the controller 120. A part of this outer surface 121 is sensitive to being touched and is referred to as the touch-sensitive area 122. Optionally, the controller 120 comprises a second area that is sensitive to being touched, referred to as the further touch-sensitive area 123. The touch-sensitive area 122 can be realized in many ways, including a sensor for changes in capacity or induced voltages or currents, a grid of conducting parts between which changes in resistance are measured and detected, or an ordinary pressure sensor, button or temperature sensor. Another possibility is to measure and detect changes in either a passive or an active electromagnetic field. With the passive variant, the controller 120 relies on, for example, nearby power lines to generate measurable fields when being touched. With the active variant, the controller 120 generates an electromagnetic field of its own. Hollemans '490 at 5:8–34 Figure 5 is a block diagram of an embodiment of the remote controller 120 according to the invention. The touch-sensitive area 122 and the further touch-sensitive area 123 are coupled to touch-detecting means 124. The touch-detecting means 124 measures the internal resistance of a part of the human body that touches the touch-sensitive area 122. Figure 6 shows an example of a circuit for the touch-detecting means 124. The internal resistance is determined with a voltage divider composed of the touch-sensitive area 122 and a resistor 129. Without touching, the output voltage of the divider will be the supply voltage, but with touching, the output voltage will decrease. Touching can thus be detected. The output voltage of the voltage divider 129, 122 is input for a buffer 127 that provides a copy of the voltage at its output 128. The output of the touch-detecting means 124 can be coupled to the input of temporal pattern analysis means 125. The temporal pattern analysis means 125 may comprise an A/D-converter (not shown) for converting the analog output signal of the touch-detecting means 124 into a digital representation of the output signal. The output signal of the temporal pattern analysis means 125 that represent detected

Claims	Prior Art
	temporal patterns may be coupled to control signal generating means 126, for generating and transmitting the control signal 130 and the further control signal 131. The control signal 130 sent by the controller 120 to the device 110 can take several forms. One example is that the control signal 130 is an electric DC current that runs upon closing a circuit between a pair of conductors in the wire 140. Also several resistance levels between two pins (not shown) of the plug (not shown) may represent several control signals. Another example is an electric AC current or voltage with a particular frequency or frequencies. These frequencies may advantageously be above the frequencies perceived by a human ear, so as to be multiplexed on the same wire 140 that carries audio frequencies. Yet another example is a digital electric signal. Wire 140 may carry the control signal 130, but other media like air or fiber could also carry it, especially in the case of an electromagnetic signal. Hollemans '490 at 8:1–18 In a first way, the touch-sensitive area is used to detect a tempo of being tapped. The tempo detected may be used to adjust a rhythm of a sound, e.g. as transferred by the personal audio system. The tempo detected may also be used to find or select matching content, for example, a song with a tempo that resembles the tempo detected. The tempo detected may also be used to adapt the speed of playback of the current music to the tempo detected. The tempo detected may also be used to enter metadata that pertains to the currently played music, by tapping along in the same tempo. An advantage is that tempo information may be entered in a natural way, without being dependent on menu navigation on a player that is relatively hard to operate. Another advantage is that no complex algorithms are required for obtaining meaningful and accurate tempo information, because relatively simple time averaging logic suffices. In a second way, the touch-sensitive area is used for detecting a pressure with which the area is touched. When a person presses harder on the touch-sensitive area of the remote control, more skin contacts the area. This increases a conductivity and lowers the measured skin resistance. By means of a precise measurement it is possible to sense these differences in pressure. The pressure may for example be used for a more sophisticated volume and cueing control. An example is changing a setting with a speed that is proportional with the pressure. Hollemans '490 at 8:19–33 In a third way, the touch-sensitive area is used for picking up a gesture made on the area with e.g. a stylus or a finger. The remote control may be extended for this purpose with means for detecting a gesture, e.g. a laser beetle, a small camera, an IR movement sensor, or a cross-capacitance sensor. The system may be arranged to detect a gesture being made on the area. The gesture detected may be used for controlling a setting of the system. Examples of a setting are a selection of a next or a previous track, a volume, a position of a stereo image, e.g. a panning position, a balance position. The gesture detected may also be

Claims	Prior Art
	used for controlling a mouse pointer, navigating a menu, entering a tapping pattern, scrolling content on display. The 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. The list may contain items like contacts, artists, song titles, etc. The gesture detected may be a user defined gesture for activating a user defined function. The gesture detected may be used for user identification by matching with initials or an autograph. The gesture may extend into two dimensions, e.g. a planar gesture, or it may extend into three dimensions. Zadesky '230 discloses "touch pads" that may be "based on … capacitive sensing" (example of the claimed a user input device supported by the head-worn structure, the user input device being configured to receive a user input, the user input device is based on at least capacitive effect), by which the touch pad includes electrodes and "detect[s] the change in capacitance at each of the electrodes as the finger passes over the grid" (example of the claimed wherein the user input being received induces at least a capacitive change to produce at least an electrical response). The following citations show examples of where the Zadesky '230 discloses this limitation. Zadesky '230 at 2:29–43 To elaborate further, touch pads generally include one or more sensors for detecting the proximity of the finger thereto. By way of example, the sensors may be based on resistive sensing, surface acoustic wave sensing, pressure sensing (e.g., strain gauge), optical sensing, capacitive sensing and the like. The sensors are generally dispersed about the touch pad with each sensor representing an x, y position. In most cases, the sensors are arranged in a grid of columns and rows. Distinct x and y position signals, which control the x, y movement of a pointer device on the display screen, are thus generated when a finger is moved across the grid of sensors within the touch pad. For brevity sake, the remaining discussion will be held to the discussion of capacitive sensing technologies. It should be noted, however, that the other technologies have similar features. Zadesky '230 at 2:44–3:5 Capacitive sensing touch pads generally contain several layers of material. For example, the touch pad may include a protective shield, one or more electrode layers and a circuit board. The protective shield typically covers the electrode layer(s), and the electrode layer(s) is generally disposed on a front side of the circuit board. As is generally well known, the protective shield is the part of the touch pad that is touched by the user to implement cursor movements on a display screen. The electrode layer(s), on the other hand, is used to interpret the x, y position of the user's finger when the user's finger is resting or

Claims	Prior Art
	moving on the protective shield. The electrode layer (s) typically consists of a plurality of electrodes that are positioned in columns and rows so as to form a grid array. The columns and rows are generally based on the Cartesian coordinate system and thus the rows and columns correspond to the x and y directions. The touch pad may also include sensing electronics for detecting signals associated with the electrodes. For example, the sensing electronics may be adapted to detect the change in capacitance at each of the electrodes as the finger passes over the grid. The sensing electronics are generally located on the backside of the circuit board. By way of example, the sensing electronics may include an application specific integrated circuit (ASIC) that is configured to measure the amount of capacitance in each of the electrodes and to compute the position of finger movement based on the capacitance in each of the electrodes. The ASIC may also be configured to report this information to the computing device. A POSITA wold have been motivated to combine the Jabra BT800 with Zadesky '230 and the Jabra BT800 with Hollemans '490, and reasonably expected success in doing so, for the reasons explained in claims 2, 5–7. *Supra* claims 2, 5–7. Moreover, Zadesky '230 describes the types of sensors that "touch pads generally include," such as "capacitive sensing," and a POSITA would have been motivated to combine the Jabra BT800 with Zadesky '230 and the Jabra BT800 with Hollemans '490 for this additional detail of how to implement touch pads. Zadesky '230, 2:29–43. To the extent that the Jabra BT800, Hollemans '490, and Zadesky '230 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Hollemans '490, and Zadesky '230, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
29. A system as recited in claim 28, wherein the user input device is configured to distinguish at least a direction of the user input with respect to the user input device.	The Jabra BT800, Hollemans '490, and Zadesky '230 expressly or inherently disclose "[a] system as recited in claim 28, wherein the user input device is configured to distinguish at least a direction of the user input with respect to the user input device." For example: *See* above at claim 5. To the extent that the Jabra BT800, Hollemans '490, and Zadesky '230 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Hollemans '490, and Zadesky '230, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
30. A system as recited in claim 28, wherein the electronic circuitry is electrically connected to the user input device to receive user input	The Jabra BT800, Hollemans '490, and Zadesky '230 expressly or inherently disclose "[a] system as recited in claim 28, wherein the electronic circuitry is electrically connected to the user input device to receive user input data from the user input device, and wherein the head-worn personal electronic apparatus is configured

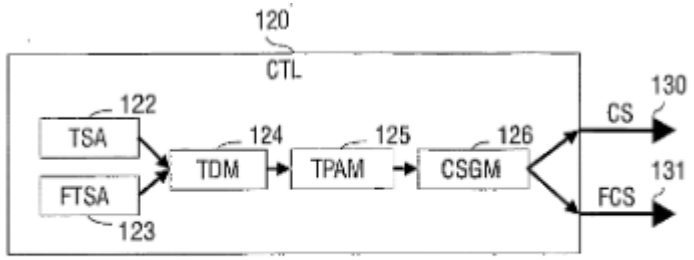
Claims	Prior Art
data from the user input device, and wherein the head-worn personal electronic apparatus is configured to detect at least a sliding of a finger action with respect to the user input device using at least the electronic circuitry and the user input data.	to detect at least a sliding of a finger action with respect to the user input device using at least the electronic circuitry and the user input data." For example: The Jabra BT800 discloses wherein the head-worn personal electronic apparatus is configured to detect at least a sliding of a finger action with respect to the user input device using at least the electronic circuitry and the user input data for the reasons explained above for claim 6. *Supra* claim 6. On information and belief, any touch sensitive surface would have been connected to electronic circuitry, such as a processor, inside the Jabra BT800 to allow the electronic circuitry to receive user input data from the user input device. The following citations show examples of where the Jabra BT800 discloses this limitation. Jabra BT800 User Manual at Page 2 **Jabra BT800 Overview** 1 Display shows caller ID, battery status etc. 2 Answer button 3 End & on/off button 4 Jog wheel – volume and menu control 5 Mute/menu button/blue LED 6 Charging socket 7 Pairing stylus switch 8 Stylus for activating the pairing function  *Fig. 1* 2

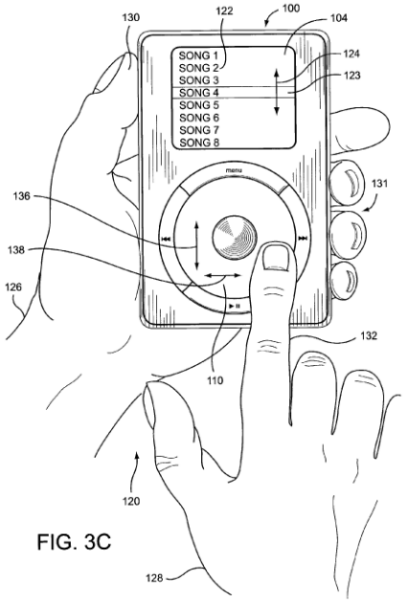
Claims	Prior Art
	Jabra BT800 User Manual at Page 5 **4. Volume control and mute function** • Your Jabra BT800 headset features an automatic volume control that adjusts the volume depending on ambient noise level. You can manually adjust the volume using the volume jog wheel see Fig 5 • During a conversation, press the mute button to mute the call. You un-mute by adjusting the volume level on the volume jog wheel or by tapping on the mute button see Fig 6  *Fig. 5*  *Fig. 6* Jabra BT800 User Manual at Page 6 **2. Access the menu** From the menu, you can adjust your settings according to your preferences. See Fig 7 • Access the menu when your are not receiving or making a call with a press on the mute / menu button • Use the jog wheel to navigate the menu • Select or activate a menu item with a tap on the answer button • Exit / go back in the menu with a tap on the end button   6 *Fig. 7*

Claims	Prior Art
	Hollemans ’490 discloses that “[t]he touch-sensitive area 122 and the further touch-sensitive area 123 are coupled to touch-detecting means 124,” as shown in Figure 5, for example (example of the claimed electronic circuitry is electrically connected to the user input device to receive user input data from the user input device). The “touch-sensitive area is used for picking up a gesture made on the area with e.g. a stylus or a finger,” such as “scrolling content on display,” making a “character, like a letter from an alphabet,” or a “two dimensions, e.g. a planar gesture” (example of the claimed wherein the head-worn personal electronic apparatus is configured to detect at least a sliding of a finger action with respect to the user input device using at least the electronic circuitry and the user input data). The following citations show examples of where the Hollemans ’490 discloses this limitation. Hollemans ’490 at 1:10–3:21 A personal audio system as described in the opening paragraph is known from the now ubiquitous mobile audio devices like MP3 players and mobile phones. One particular example of such a system is the iPod MP3 player from Apple as reviewed in c’t 2002 Heft 26, pages 132-141, “Plattenmeister” by Peter Nonhoff-Arps, Sven Hansen, and available with product no. M8737LL/A (see also http://www.apple.com/ipod/). This and similar products typically comprise a set of two earpieces also known as ear buds that can be inserted into the ears of the user. These products typically also include a remote controller for controlling one or more functions of the device. A plug connects both the remote controller and the earpieces with the device, by plugging it into a socket of the device. The remote controller is usually included in the wire somewhere between the earpieces and the plug. As a result, the remote control has no fixed position but is dangling about as part of the wire. Hence, when the user wants to use the remote control for e.g. lowering volume, muting, or skipping an audio track or station, the user first needs to look for the remote controller. Subsequently, the user needs to get hold of the controller. This needs to be done in such a way that the controller has the right orientation for operating it. Finally, after being confident about the orientation of the controller, the user may try to find and operate the tiny button to activate the desired function. This requires considerable time and attention from the user, which may lead to dangerous situations when the user takes part in traffic. It is an object of the present invention to provide a personal audio system as described in the opening paragraph that does not suffer from the above-mentioned drawbacks. 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.

Claims	Prior Art
	The remote controller thus gets a fixed position with respect to the user in or by the human ear. It is easy to find one's ear. This prevents looking for the remote controller. In addition, the user is not tempted to look at the remote controller, because there is nothing relevant to be seen for controlling the device. To avoid having to find tiny buttons, merely touching the remote controller somewhere on its touch-sensitive area operates said remote controller, which detects being touched and subsequently sends the control signal to the device. Also the problem of finding the proper orientation of the remote controller is solved by wearing the remote controller in or by the ear, because its orientation becomes fixed with respect to the user. 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. This fits in with a particularly comfortable and popular shape for the earpieces or ear buds. The shape consists of a thick disc containing a transducer and a protruding part from which a wire extends. When being worn, the protruding part of the earpiece offers a surface area that is easily accessible for touching. Advantageously, the controller is arranged to detect a temporal pattern in the touch-sensitive area being touched, and to send the control signal in response to detecting the temporal pattern. In general, the device offers a plurality of functions and capabilities. Rather than having more buttons on the remote control that may be hard to distinguish, the single touch-sensitive area is used for controlling the plurality of functions. The temporal pattern is a particularly appropriate user interface, because it is easy to create temporal patterns in touching the area rhythmically and because the temporal patterns can constitute a natural and consistent interface. 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. Advantageously, the outer surface has a further touch-sensitive area, such that the further touch-sensitive area is touched substantially by the ear when the controller is substantially worn in or by a human ear, the controller being arranged to send the control signal only if the further touch-sensitive area is touched. This will prevent the accidental remote control of the device when the remote controller is not worn, thus preventing unwanted activation of the device and unnecessary battery exhaustion. Advantageously, the controller is arranged to send a further control signal to the device if the further touch-sensitive area is touched. This makes it, for example, possible for the device to pause playing music as soon as the earpiece is taken out and to resume playing music upon re-insertion. In an embodiment of the personal audio system according to the invention, the system comprises a second controller for remotely controlling the device by sending a further control signal to the device, the second controller having an outer surface with a further touch-sensitive area, the second controller being arranged to be substantially worn in or by a human ear, and the second controller being further arranged to detect a further temporal pattern in the further touch-sensitive area being touched, and to send the further control signal in response to detecting the further temporal pattern. A second controller fits in with the natural

Claims	Prior Art
	symmetry of the human head. It also considerably enhances the user interface for controlling the device. For example, the symmetry can be exploited in such a way that a long tap at the left remote controller decreases the volume, but a long tap at the right controller increases the volume. Hollemans '490 at 5:8–34 Figure 5 is a block diagram of an embodiment of the remote controller 120 according to the invention. The touch-sensitive area 122 and the further touch-sensitive area 123 are coupled to touch-detecting means 124. The touch-detecting means 124 measures the internal resistance of a part of the human body that touches the touch-sensitive area 122. Figure 6 shows an example of a circuit for the touch-detecting means 124. The internal resistance is determined with a voltage divider composed of the touch-sensitive area 122 and a resistor 129. Without touching, the output voltage of the divider will be the supply voltage, but with touching, the output voltage will decrease. Touching can thus be detected. The output voltage of the voltage divider 129, 122 is input for a buffer 127 that provides a copy of the voltage at its output 128. The output of the touch-detecting means 124 can be coupled to the input of temporal pattern analysis means 125. The temporal pattern analysis means 125 may comprise an A/D-converter (not shown) for converting the analog output signal of the touch-detecting means 124 into a digital representation of the output signal. The output signal of the temporal pattern analysis means 125 that represent detected temporal patterns may be coupled to control signal generating means 126, for generating and transmitting the control signal 130 and the further control signal 131. The control signal 130 sent by the controller 120 to the device 110 can take several forms. One example is that the control signal 130 is an electric DC current that runs upon closing a circuit between a pair of conductors in the wire 140. Also several resistance levels between two pins (not shown) of the plug (not shown) may represent several control signals. Another example is an electric AC current or voltage with a particular frequency or frequencies. These frequencies may advantageously be above the frequencies perceived by a human ear, so as to be multiplexed on the same wire 140 that carries audio frequencies. Yet another example is a digital electric signal. Wire 140 may carry the control signal 130, but other media like air or fiber could also carry it, especially in the case of an electromagnetic signal. Hollemans '490 at 8:19–33 In a third way, the touch-sensitive area is used for picking up a gesture made on the area with e.g. a stylus or a finger. The remote control may be extended for this purpose with means for detecting a gesture, e.g. a laser beetle, a small camera, an IR movement sensor, or a cross-capacitance sensor. The system may be arranged to detect a gesture being made on the area. The gesture detected may be used for controlling a setting of the system. Examples of a setting are a selection of a next or a previous track, a volume, a position of a stereo image, e.g. a panning position, a balance position. The gesture detected may also be used for controlling a mouse pointer, navigating a menu, entering a tapping pattern, scrolling content on

Claims	Prior Art
	display. The 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. The list may contain items like contacts, artists, song titles, etc. The gesture detected may be a user defined gesture for activating a user defined function. The gesture detected may be used for user identification by matching with initials or an autograph. The gesture may extend into two dimensions, e.g. a planar gesture, or it may extend into three dimensions. Hollemans '490 at Figure 5  FIG.5 Zadesky '230 further discloses that "signals" from sensors are supplied to a "processor," as such, a POSITA would have understood that the "processor" (example of the claimed electronic circuitry) detected sliding finger input from Zadesky '230's "touch pad" (example of the claimed wherein the electronic circuitry is electrically connected to the user input device to receive user input data from the user input device, and wherein the head-worn personal electronic apparatus is configured to detect at least a sliding of a finger action with respect to the user input device using at least the electronic circuitry and the user input data). The following citations show examples of where the Zadesky '230 discloses this limitation.

Claims	Prior Art
	Zadesky ’230 at Figure 3C  FIG. 3C Zadesky ’230 at 1:47–65 In portable computing devices such as laptop computers, the input devices are commonly touch pads. With a touch pad, the movement of an input pointer (i.e., cursor) corresponds to the relative movements of the user's finger (or stylus) as the finger is moved along a surface of the touch pad. Touch pads can also make a selection on the display screen when one or more taps are detected on the surface of the touch pad. In some cases, any portion of the touch pad may be tapped, and in other cases a dedicated portion of the touch pad may be tapped. In stationary devices such as desktop computers, the input devices are generally selected from mice and trackballs. With a mouse, the movement of the input pointer corresponds to the relative movements of the mouse as the user moves the mouse along a surface. With a trackball, the movement of the input pointer corresponds to the relative movements of a ball as the user rotates the ball within a housing. Both mice and trackballs generally include one or more buttons for making selections on the display screen. Zadesky ’230 at 2:29–43 To elaborate further, touch pads generally include one or more sensors for detecting the proximity of the finger thereto. By way of example, the sensors may be based on resistive sensing, surface acoustic wave

Claims	Prior Art
	sensing, pressure sensing (e.g., strain gauge), optical sensing, capacitive sensing and the like. The sensors are generally dispersed about the touch pad with each sensor representing an x, y position. In most cases, the sensors are arranged in a grid of columns and rows. Distinct x and y position signals, which control the x, y movement of a pointer device on the display screen, are thus generated when a finger is moved across the grid of sensors within the touch pad. For brevity sake, the remaining discussion will be held to the discussion of capacitive sensing technologies. It should be noted, however, that the other technologies have similar features. Zadesky ’230 at 2:44–3:5 Capacitive sensing touch pads generally contain several layers of material. For example, the touch pad may include a protective shield, one or more electrode layers and a circuit board. The protective shield typically covers the electrode layer(s), and the electrode layer(s) is generally disposed on a front side of the circuit board. As is generally well known, the protective shield is the part of the touch pad that is touched by the user to implement cursor movements on a display screen. The electrode layer(s), on the other hand, is used to interpret the x, y position of the user's finger when the user's finger is resting or moving on the protective shield. The electrode layer (s) typically consists of a plurality of electrodes that are positioned in columns and rows so as to form a grid array. The columns and rows are generally based on the Cartesian coordinate system and thus the rows and columns correspond to the x and y directions. The touch pad may also include sensing electronics for detecting signals associated with the electrodes. For example, the sensing electronics may be adapted to detect the change in capacitance at each of the electrodes as the finger passes over the grid. The sensing electronics are generally located on the backside of the circuit board. By way of example, the sensing electronics may include an application specific integrated circuit (ASIC) that is configured to measure the amount of capacitance in each of the electrodes and to compute the position of finger movement based on the capacitance in each of the electrodes. The ASIC may also be configured to report this information to the computing device. Zadesky ’230 at 4:37–49 The present invention relates to touch pads. According to one aspect of the invention, a touch pad is provided on a media player to facilitate user interaction therewith. In one embodiment, the media player is a handheld device. According to another aspect of the invention, a touch pad is provided that can sense and resolve angular and/or radial positions of a moving object (e.g., finger) as it is moved in a largely rotational and/or radial manner across the touch pad. In one embodiment, the touch pad that is based on polar coordinates rather than Cartesian coordinates. Other aspects of the invention will become apparent below. In any case, the aspects are not limiting and the various aspects of the invention can be used

Claims	Prior Art
	separately or in combination. Zadesky ’230 at 5:61–6:19 The media player 100 also includes a touch pad 110. The touch pad 110 is configured to provide one or more control functions for controlling various applications associated with the media player 100. For example, the touch initiated control function may be used to move an object or perform an action on the display screen 104 or to make selections or issue commands associated with operating the media player 100. In most cases, the touch pad 110 is arranged to receive input from a finger moving across the surface of the touch pad 110 in order to implement the touch initiated control function. The touch pad may be widely varied. For example, the touch pad be a conventional touch pad based on the Cartesian coordinate system, or the touch pad may be a touch pad based on a polar coordinate system (the later will be described in greater detail below). The manner in which the touch pad 110 receives input may be widely varied. In one embodiment, the touch pad 110 is configured receive input from a linear finger motion. In another embodiment, the touch pad 110 is configured receive input from a rotary or swirling finger motion. In yet another embodiment, the touch pad 110 is configured receive input from a radial finger motion. Additionally or alternatively, the touch pad 110 may be arranged to receive input from a finger tapping on the touch pad 100. By way of example, the tapping finger may initiate a control function for playing a song, opening a menu and the like. Zadesky ’230 at 6:38–7:5 The direction of scrolling may be widely varied. For example, scrolling may be implemented vertically (up or down) or horizontally (left or right). In the case of vertical scrolling, when a user scrolls down, each new set of data appears at the bottom of the viewing area and all other sets of data move up one position. If the viewing area is full, the top set of data moves out of the viewing area. Similarly, when a user scrolls up, each new set of data appears at the top of the viewing area and all other sets of data move down one position. If the viewing area is full, the bottom set of data moves out of the viewing area. In one implementation, the scrolling feature may be used to move a Graphical User Interface (GUI) vertically (up and down), or horizontally (left and right) in order to bring more data into view on a display screen. By way of example, in the case of an MP3 player, the scrolling feature may be used to help browse through songs stored in the MP3 player. The direction that the finger moves may be arranged to control the direction of scrolling. For example, the touch pad may be arranged to move the GUI vertically up when the finger is moved in a first direction and vertically down when the finger is moved in a second direction To elaborate, the display screen 104, during operation, may display a list of media items (e.g., songs). A

Claims	Prior Art
	user of the media player 100 is able to linearly scroll through the list of media items by moving his or her finger across the touch pad 110. As the finger moves around the touch pad 110, the displayed items from the list of media items are varied such that the user is able to effectively scroll through the list of media items. However, since the list of media items can be rather lengthy, the invention provides the ability for the user to rapidly traverse (or scroll) through the list of media items. In effect, the user is able to accelerate their traversal of the list of media items by moving his or her finger at greater speeds. Zadesky '230 at 8:52–9:21 FIGS. 3A-3C show the media player 100 of FIG. 2 being used by a user 120, in accordance with different embodiments of the invention. In all of these embodiments, the user 120 is linearly scrolling 104 (as shown by arrow 124) through a list of songs 122 displayed on the display screen via a slider bar 123. As shown, the media device 100 is comfortably held by one hand 126 while being comfortably addressed by the other hand 128. This configuration generally allows the user 120 to easily actuate the touch pad 110 with one or more fingers. For example, the thumb 130 and rightmost fingers 131 (or leftmost fingers if left handed) of the first hand 126 are used to grip the sides of the media player 100 while a finger 132 of the opposite hand 128 is used to actuate the touch pad 110. As shown, the entire top surface of the touch pad 110 is accessible to the user's finger 130. Referring to FIG. 3A, and in accordance with one embodiment of the invention, the touch pad 110 can be continuously actuated by a simple swirling motion of the finger 132 as shown by arrow 134. By swirling, it is meant that the finger moves in an arcuate or circular manner. For example, the finger may rotate relative to an imaginary axis. In particular, the finger can be rotated through 360 degrees of rotation without stopping. This form of motion may produce continuous or incremental scrolling on the display screen 104. Referring to FIG. 3B, and in accordance with one embodiment of the invention, the user 120 can slide his or her finger 132 radially between the inner and outer perimeter of the touch pad 110. For example, the touch pad 110 may be actuated radially as shown by arrow 140. Referring to FIG. 3C, and in accordance with one embodiment of the invention, the user 120 can slide his or her finger 132 substantially tangentially from all sides of the touch pad 110. For example, the touch pad 110 may be actuated forwards and backwards as shown by arrows 136 and side to side by arrows 138. Zadesky '230 at 9:39–61 As shown, the touch pad 202 is divided into several independent and spatially distinct zones 210 that are positioned around the periphery of the touch pad 202. Any number of zones may be used. In one embodiment, each of the zones 210 represents a polar angle that specifies the angular position of the zone in the plane of the touch pad 202. By way of example, the zones 210 may be positioned at 2 degree increments all the way around the touch pad 202. Each of the zones 210 has an associated sensor disposed

Claims	Prior Art
	therein for detecting the presence of an object such as a finger. The sensors may be widely varied. For example, the sensors may be based on resistive sensing, surface acoustic wave sensing, pressure sensing (e.g., strain gauge, pressure plates, piezoelectric transducers or the like), optical sensing, capacitive sensing and the like. In general, when an object approaches a zone 210, and more particularly a sensor, a position signal is generated that informs the media system 200 that the object is at a specific angular position on the touch pad 202. When an object is moved between zones 210 or over multiple zones 210, multiple position signals are generated. These multiple position signals may be used to determine the angular location, direction, speed and acceleration of the object as its moved around the touch pad 202. Zadesky '230 at 9:62–10:33 The system 200 also includes a control assembly 212 that is coupled to the touch pad 202. The control assembly 212 is configured to acquire the position signals from the sensors and to supply the acquired signals to a processor 214 of the system. By way of example, the control assembly 212 may include an application specific integrated circuit (ASIC) that is configured to monitor the signals from the sensors, to compute the angular location, direction, speed and acceleration of the monitored signals and to report this information to the processor 214. The processor 214 is coupled between the control assembly 212 and the display screen 204. The processor 214 is configured to control motion inputs to the display screen 204. In one sequence, the processor 214 receives angular motion information from the control assembly 212 and then determines the next items of the media list 211 that are to be presented on the display screen 204. In making this determination, the processor 214 can take into consideration the length of the media list 211. Typically, the processor 214 will determine the rate of movement of the finger such that the transitioning to different items in the media list 211 can be performed faster when the finger is moved at greater speeds. In effect, to the user, the more rapid swirling of the finger enables effective acceleration of the transitioning of the list of media items 211. Alternatively, the control assembly 212 and processor 214 may be combined in some embodiments. Although not shown, the processor 214 can also control a buzzer to provide audio feedback to a user. The audio feedback can, for example, be a clicking sound produced by the buzzer. In one embodiment, the buzzer 216 is a piezo-electric buzzer. As the rate of transitioning through the list of media items increases, the frequency of the clicking sounds increases. Alternatively, when the rate that the finger is moved slows, the rate of transitioning through the list of media items decreases, and thus the frequency of the clicking sounds correspondingly slows. Hence, the clicking sounds provide audio feedback to the user as to the rate in which the media items within the list of media items are being traversed.

Claims	Prior Art
	Zadesky ’230 at 10:34–51 Additionally or alternatively, the system via the touch pad may be configured to transform radial motion an object such as a finger (as shown in FIG. 3B) into translational or linear motion on the display screen. By radial, it is meant that the object moves in a substantially radial direction from the center of the touch pad to an outer perimeter of the touch pad. In one embodiment, the touch pad is arranged to continuously determine the radial position of a finger relative to the planar surface of the touch pad. This allows a user to linearly scroll through a media list on the display screen by moving the object at least partially between the center and outer perimeter of the touch pad. For example, by moving the object between a small and large radius (e.g., 0–3 cm) on the touch pad. This may also allow a user to vary a characteristic of the media player. For example, by moving radially, the user may be able to change the volume of sound being played on the media player (i.e., acts like a potentiometer). Zadesky ’230 at 13:13–27 The various aspects of the invention described above can be used alone or in various combinations. The invention is preferably implemented by a combination of hardware and software, but can also be implemented in hardware or software. The invention can also be embodied as computer readable code on a computer readable medium. The computer readable medium is any data storage device that can store data which can thereafter be read by a computer system. Examples of the computer readable medium include read-only memory, random-access memory, CD-ROMs, DVDs, magnetic tape, optical data storage devices, and carrier waves. The computer readable medium can also be distributed over a network coupled computer systems so that the computer readable code is stored and executed in a distributed fashion. Zadesky ’230 at 13:36–60 The advantages of the invention are numerous. Different embodiments or implementations may yield one or more of the following advantages. It should be noted that this is not an exhaustive list and there may be other advantages which are not described herein. One advantage of the invention is that a user is able to easily and rapidly traverse a lengthy list of media items. Another advantage of the invention is that a substantial portion of the touch pad is accessible to the user, i.e., the touch pad provides a large surface area for manipulation thereof. Another advantage of the invention is that the touch pad can be continuously actuated by a simple swirling motion of a finger, i.e., the finger can be rotated through 360 degrees of rotation without stopping. Another advantage of the invention is that the touch pad provides more range of finger positions. For example, a left handed user may choose to use one portion of the touch pad while a right handed user may choose to use another portion of the touch pad. In essence, the

Claims	Prior Art
	touch pad is more ergonomic. Another advantage of the invention is that the touch pad makes the media player more aesthetically pleasing. Another advantage of the invention is that the touch pad allows an intuitive way to scroll on a display screen. For example, the user can manipulate the his or her finger side to side for horizontal scrolling and the user can manipulate his or her finger backwards and forwards for vertical scrolling. A POSITA would have been motivated to combine the Jabra BT800 with Zadesky '230 and the Jabra BT800 with Hollemans '490, and reasonably expected success in doing so, for the reasons explained above for claim 6. *Supra* claim 6. A POSITA further would have been motivated to electrically connect the input to the electronic circuitry to enable the electronic circuitry, such as the processor, to receive the data from the input and use it to make determinations. This would have required no more than conventional circuit connection techniques to yield predictable results. To the extent that the Jabra BT800, Hollemans '490, and Zadesky '230 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Hollemans '490, and Zadesky '230, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
31. A system as recited in claim 28, wherein the electronic circuitry is electrically connected to the user input device to receive user input data from the user input device, and wherein the head-worn personal electronic apparatus is configured to distinguish at least whether the user input pertains to a forward sliding action or a backward sliding action with respect to the user input device using at least the electronic circuitry and the user input data.	The Jabra BT800 User Manual, Hollemans '490, and Zadesky '230 expressly or inherently disclose "[a] system as recited in claim 28, wherein the electronic circuitry is electrically connected to the user input device to receive user input data from the user input device, and wherein the head-worn personal electronic apparatus is configured to distinguish at least whether the user input pertains to a forward sliding action or a backward sliding action with respect to the user input device using at least the electronic circuitry and the user input data." For example: The Jabra BT800 discloses wherein the head-worn personal electronic apparatus is configured to distinguish at least whether the user input pertains to a forward sliding action or a backward sliding action with respect to the user input device using at least the electronic circuitry and the user input data for the reasons explained above for claim 7. *Supra* claim 7. On information and belief, any touch sensitive surface would have been connected to electronic circuitry, such as a processor, inside the Jabra BT800 to allow the electronic circuitry to receive user input data from the user input device. The following citations show examples of where the Jabra BT800 discloses this limitation.

Claims	Prior Art
	Jabra BT800 User Manual at Page 2

Jabra BT800 Overview

1 Display shows caller ID, battery status etc.
2 Answer button
3 End & on/off button
4 Jog wheel – volume and menu control
5 Mute/menu button/blue LED
6 Charging socket
7 Pairing stylus switch
8 Stylus for activating the pairing function

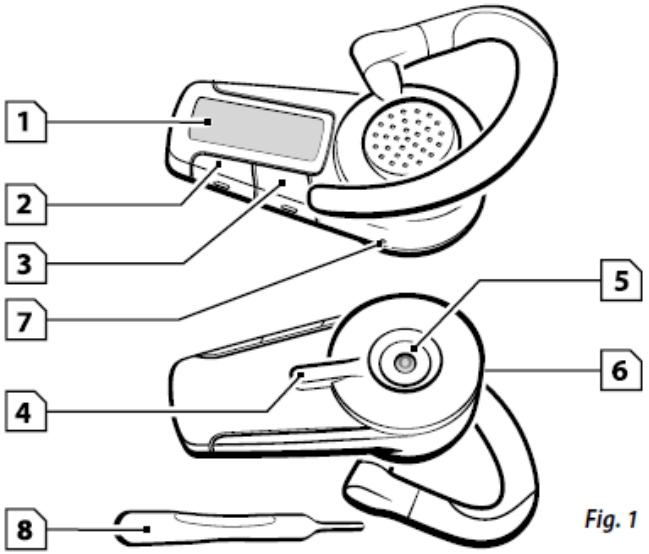
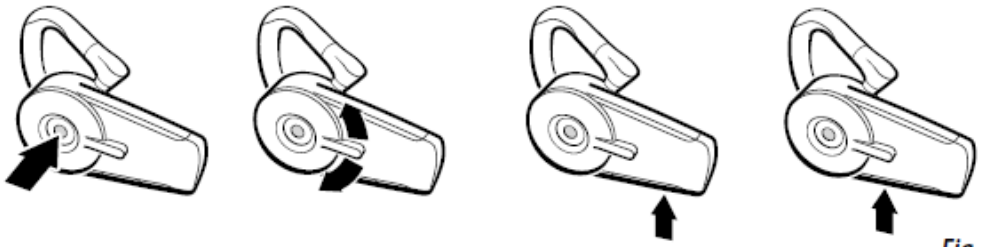


Fig. 1

2

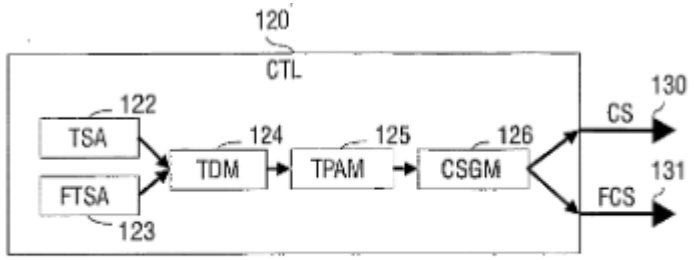
Claims	Prior Art
	Jabra BT800 User Manual at Page 5 **4. Volume control and mute function** • Your Jabra BT800 headset features an automatic volume control that adjusts the volume depending on ambient noise level. You can manually adjust the volume using the volume jog wheel see Fig 5 • During a conversation, press the mute button to mute the call. You un-mute by adjusting the volume level on the volume jog wheel or by tapping on the mute button see Fig 6  *Fig. 5*  *Fig. 6*

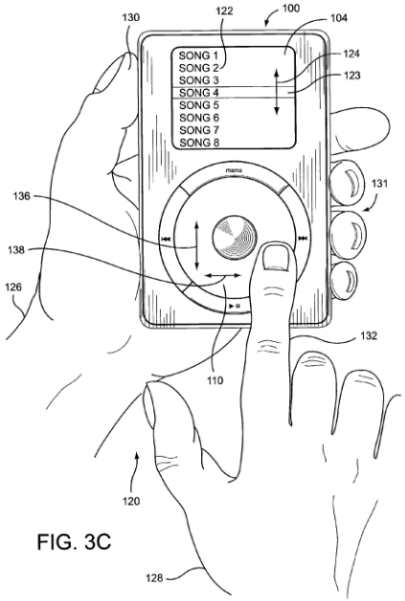
Claims	Prior Art
	Jabra BT800 User Manual at Page 6 **2. Access the menu** From the menu, you can adjust your settings according to your preferences. See Fig 7 • Access the menu when your are not receiving or making a call with a press on the mute / menu button • Use the jog wheel to navigate the menu • Select or activate a menu item with a tap on the answer button • Exit / go back in the menu with a tap on the end button   6 *Fig. 7* Hollemans '490's "touchpad" or "touch–sensitive area" (example of the claimed touch sensitive surface) can be "used for picking up a gesture made on the area" with a "finger" (example of the claimed head-worn personal electronic apparatus is configured to distinguish at least whether the user input pertains to a forward sliding action or a backward sliding action with respect to the user input device using at least the electronic circuitry and the user input data). This input is received by the electronic circuitry as explained above for claim 30. *Supra* claim 30. The following citations show examples of where the Hollemans '490 discloses this limitation. Hollemans '490 at 1:10–3:21 A personal audio system as described in the opening paragraph is known from the now ubiquitous mobile audio devices like MP3 players and mobile phones. One particular example of such a system is the iPod MP3 player from Apple as reviewed in c't 2002 Heft 26, pages 132-141, "Plattenmeister" by Peter Nonhoff-Arps, Sven Hansen, and available with product no. M8737LL/A (see also

Claims	Prior Art
	http://www.apple.com/ipod/). This and similar products typically comprise a set of two earpieces also known as ear buds that can be inserted into the ears of the user. These products typically also include a remote controller for controlling one or more functions of the device. A plug connects both the remote controller and the earpieces with the device, by plugging it into a socket of the device. The remote controller is usually included in the wire somewhere between the earpieces and the plug. As a result, the remote control has no fixed position but is dangling about as part of the wire. Hence, when the user wants to use the remote control for e.g. lowering volume, muting, or skipping an audio track or station, the user first needs to look for the remote controller. Subsequently, the user needs to get hold of the controller. This needs to be done in such a way that the controller has the right orientation for operating it. Finally, after being confident about the orientation of the controller, the user may try to find and operate the tiny button to activate the desired function. This requires considerable time and attention from the user, which may lead to dangerous situations when the user takes part in traffic. It is an object of the present invention to provide a personal audio system as described in the opening paragraph that does not suffer from the above-mentioned drawbacks. 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. The remote controller thus gets a fixed position with respect to the user in or by the human ear. It is easy to find one's ear. This prevents looking for the remote controller. In addition, the user is not tempted to look at the remote controller, because there is nothing relevant to be seen for controlling the device. To avoid having to find tiny buttons, merely touching the remote controller somewhere on its touch-sensitive area operates said remote controller, which detects being touched and subsequently sends the control signal to the device. Also the problem of finding the proper orientation of the remote controller is solved by wearing the remote controller in or by the ear, because its orientation becomes fixed with respect to the user. 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. This fits in with a particularly comfortable and popular shape for the earpieces or ear buds. The shape consists of a thick disc containing a transducer and a protruding part from which a wire extends. When being worn, the protruding part of the earpiece offers a surface area that is easily accessible for touching. Advantageously, the controller is arranged to detect a temporal pattern in the touch-sensitive area being touched, and to send the control signal in response to detecting the temporal pattern. In general, the device

Claims	Prior Art
	offers a plurality of functions and capabilities. Rather than having more buttons on the remote control that may be hard to distinguish, the single touch-sensitive area is used for controlling the plurality of functions. The temporal pattern is a particularly appropriate user interface, because it is easy to create temporal patterns in touching the area rhythmically and because the temporal patterns can constitute a natural and consistent interface. 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. Advantageously, the outer surface has a further touch-sensitive area, such that the further touch-sensitive area is touched substantially by the ear when the controller is substantially worn in or by a human ear, the controller being arranged to send the control signal only if the further touch-sensitive area is touched. This will prevent the accidental remote control of the device when the remote controller is not worn, thus preventing unwanted activation of the device and unnecessary battery exhaustion. Advantageously, the controller is arranged to send a further control signal to the device if the further touch-sensitive area is touched. This makes it, for example, possible for the device to pause playing music as soon as the earpiece is taken out and to resume playing music upon re-insertion. In an embodiment of the personal audio system according to the invention, the system comprises a second controller for remotely controlling the device by sending a further control signal to the device, the second controller having an outer surface with a further touch-sensitive area, the second controller being arranged to be substantially worn in or by a human ear, and the second controller being further arranged to detect a further temporal pattern in the further touch-sensitive area being touched, and to send the further control signal in response to detecting the further temporal pattern. A second controller fits in with the natural symmetry of the human head. It also considerably enhances the user interface for controlling the device. For example, the symmetry can be exploited in such a way that a long tap at the left remote controller decreases the volume, but a long tap at the right controller increases the volume. Hollemans ’490 at 5:8–34 Figure 5 is a block diagram of an embodiment of the remote controller 120 according to the invention. The touch-sensitive area 122 and the further touch-sensitive area 123 are coupled to touch-detecting means 124. The touch-detecting means 124 measures the internal resistance of a part of the human body that touches the touch-sensitive area 122. Figure 6 shows an example of a circuit for the touch-detecting means 124. The internal resistance is determined with a voltage divider composed of the touch-sensitive area 122 and a resistor 129. Without touching, the output voltage of the divider will be the supply voltage, but with touching, the output voltage will decrease. Touching can thus be detected. The output voltage of the voltage divider 129, 122 is input for a buffer 127 that provides a copy of the voltage at its output 128. The output of the touch-detecting means 124 can be coupled to the input of temporal pattern analysis means 125. The temporal pattern analysis means 125 may comprise an A/D-converter (not shown) for converting the analog output signal of the touch-detecting means 124 into a digital representation of the

Claims	Prior Art
	output signal. The output signal of the temporal pattern analysis means 125 that represent detected temporal patterns may be coupled to control signal generating means 126, for generating and transmitting the control signal 130 and the further control signal 131. The control signal 130 sent by the controller 120 to the device 110 can take several forms. One example is that the control signal 130 is an electric DC current that runs upon closing a circuit between a pair of conductors in the wire 140. Also several resistance levels between two pins (not shown) of the plug (not shown) may represent several control signals. Another example is an electric AC current or voltage with a particular frequency or frequencies. These frequencies may advantageously be above the frequencies perceived by a human ear, so as to be multiplexed on the same wire 140 that carries audio frequencies. Yet another example is a digital electric signal. Wire 140 may carry the control signal 130, but other media like air or fiber could also carry it, especially in the case of an electromagnetic signal. Hollemans ’490 at 8:19–33 In a third way, the touch-sensitive area is used for picking up a gesture made on the area with e.g. a stylus or a finger. The remote control may be extended for this purpose with means for detecting a gesture, e.g. a laser beetle, a small camera, an IR movement sensor, or a cross-capacitance sensor. The system may be arranged to detect a gesture being made on the area. The gesture detected may be used for controlling a setting of the system. Examples of a setting are a selection of a next or a previous track, a volume, a position of a stereo image, e.g. a panning position, a balance position. The gesture detected may also be used for controlling a mouse pointer, navigating a menu, entering a tapping pattern, scrolling content on display. The 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. The list may contain items like contacts, artists, song titles, etc. The gesture detected may be a user defined gesture for activating a user defined function. The gesture detected may be used for user identification by matching with initials or an autograph. The gesture may extend into two dimensions, e.g. a planar gesture, or it may extend into three dimensions.

Claims	Prior Art
	Hollemans ’490 at Figure 5  FIG.5 Zadesky ’230’s sliding action on the touchpad “may be actuated forwards and backwards” (example of the claimed head-worn personal electronic apparatus is configured to distinguish at least whether the user input pertains to a forward sliding action or a backward sliding action with respect to the user input device using at least the electronic circuitry and the user input data). This input is received by the electronic circuitry as explained above for claim 30. *Supra* claim 30. The following citations show examples of where the Zadesky ’230 discloses this limitation.

Claims	Prior Art
	Zadesky ’230 at Figure 3C  FIG. 3C Zadesky ’230 at 1:47–65 In portable computing devices such as laptop computers, the input devices are commonly touch pads. With a touch pad, the movement of an input pointer (i.e., cursor) corresponds to the relative movements of the user's finger (or stylus) as the finger is moved along a surface of the touch pad. Touch pads can also make a selection on the display screen when one or more taps are detected on the surface of the touch pad. In some cases, any portion of the touch pad may be tapped, and in other cases a dedicated portion of the touch pad may be tapped. In stationary devices such as desktop computers, the input devices are generally selected from mice and trackballs. With a mouse, the movement of the input pointer corresponds to the relative movements of the mouse as the user moves the mouse along a surface. With a trackball, the movement of the input pointer corresponds to the relative movements of a ball as the user rotates the ball within a housing. Both mice and trackballs generally include one or more buttons for making selections on the display screen. Zadesky ’230 at 2:29–43 To elaborate further, touch pads generally include one or more sensors for detecting the proximity of the finger thereto. By way of example, the sensors may be based on resistive sensing, surface acoustic wave

Claims	Prior Art
	sensing, pressure sensing (e.g., strain gauge), optical sensing, capacitive sensing and the like. The sensors are generally dispersed about the touch pad with each sensor representing an x, y position. In most cases, the sensors are arranged in a grid of columns and rows. Distinct x and y position signals, which control the x, y movement of a pointer device on the display screen, are thus generated when a finger is moved across the grid of sensors within the touch pad. For brevity sake, the remaining discussion will be held to the discussion of capacitive sensing technologies. It should be noted, however, that the other technologies have similar features. Zadesky ’230 at 2:44–3:5 Capacitive sensing touch pads generally contain several layers of material. For example, the touch pad may include a protective shield, one or more electrode layers and a circuit board. The protective shield typically covers the electrode layer(s), and the electrode layer(s) is generally disposed on a front side of the circuit board. As is generally well known, the protective shield is the part of the touch pad that is touched by the user to implement cursor movements on a display screen. The electrode layer(s), on the other hand, is used to interpret the x, y position of the user's finger when the user's finger is resting or moving on the protective shield. The electrode layer (s) typically consists of a plurality of electrodes that are positioned in columns and rows so as to form a grid array. The columns and rows are generally based on the Cartesian coordinate system and thus the rows and columns correspond to the x and y directions. The touch pad may also include sensing electronics for detecting signals associated with the electrodes. For example, the sensing electronics may be adapted to detect the change in capacitance at each of the electrodes as the finger passes over the grid. The sensing electronics are generally located on the backside of the circuit board. By way of example, the sensing electronics may include an application specific integrated circuit (ASIC) that is configured to measure the amount of capacitance in each of the electrodes and to compute the position of finger movement based on the capacitance in each of the electrodes. The ASIC may also be configured to report this information to the computing device. Zadesky ’230 at 4:37–49 The present invention relates to touch pads. According to one aspect of the invention, a touch pad is provided on a media player to facilitate user interaction therewith. In one embodiment, the media player is a handheld device. According to another aspect of the invention, a touch pad is provided that can sense and resolve angular and/or radial positions of a moving object (e.g., finger) as it is moved in a largely rotational and/or radial manner across the touch pad. In one embodiment, the touch pad that is based on polar coordinates rather than Cartesian coordinates. Other aspects of the invention will become apparent below. In any case, the aspects are not limiting and the various aspects of the invention can be used

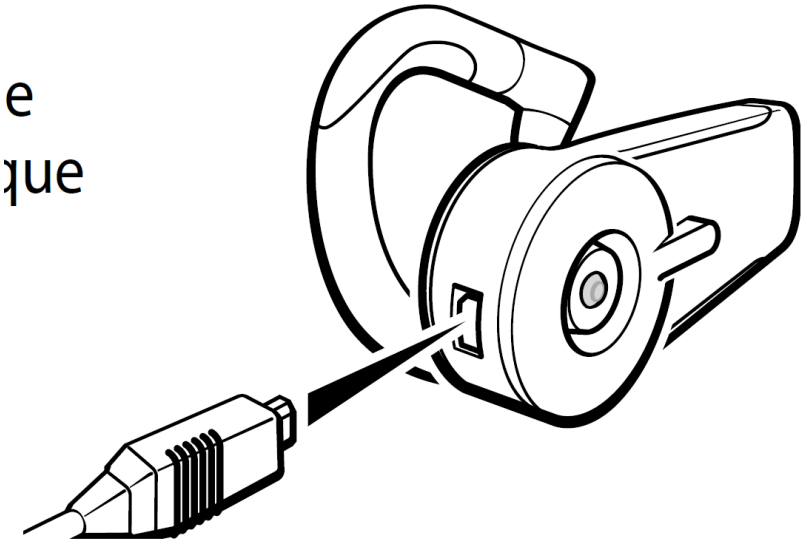
Claims	Prior Art
	separately or in combination. Zadesky ’230 at 5:61–6:19 The media player 100 also includes a touch pad 110. The touch pad 110 is configured to provide one or more control functions for controlling various applications associated with the media player 100. For example, the touch initiated control function may be used to move an object or perform an action on the display screen 104 or to make selections or issue commands associated with operating the media player 100. In most cases, the touch pad 110 is arranged to receive input from a finger moving across the surface of the touch pad 110 in order to implement the touch initiated control function. The touch pad may be widely varied. For example, the touch pad be a conventional touch pad based on the Cartesian coordinate system, or the touch pad may be a touch pad based on a polar coordinate system (the later will be described in greater detail below). The manner in which the touch pad 110 receives input may be widely varied. In one embodiment, the touch pad 110 is configured receive input from a linear finger motion. In another embodiment, the touch pad 110 is configured receive input from a rotary or swirling finger motion. In yet another embodiment, the touch pad 110 is configured receive input from a radial finger motion. Additionally or alternatively, the touch pad 110 may be arranged to receive input from a finger tapping on the touch pad 100. By way of example, the tapping finger may initiate a control function for playing a song, opening a menu and the like. Zadesky ’230 at 6:38–7:5 The direction of scrolling may be widely varied. For example, scrolling may be implemented vertically (up or down) or horizontally (left or right). In the case of vertical scrolling, when a user scrolls down, each new set of data appears at the bottom of the viewing area and all other sets of data move up one position. If the viewing area is full, the top set of data moves out of the viewing area. Similarly, when a user scrolls up, each new set of data appears at the top of the viewing area and all other sets of data move down one position. If the viewing area is full, the bottom set of data moves out of the viewing area. In one implementation, the scrolling feature may be used to move a Graphical User Interface (GUI) vertically (up and down), or horizontally (left and right) in order to bring more data into view on a display screen. By way of example, in the case of an MP3 player, the scrolling feature may be used to help browse through songs stored in the MP3 player. The direction that the finger moves may be arranged to control the direction of scrolling. For example, the touch pad may be arranged to move the GUI vertically up when the finger is moved in a first direction and vertically down when the finger is moved in a second direction To elaborate, the display screen 104, during operation, may display a list of media items (e.g., songs). A

Claims	Prior Art
	user of the media player 100 is able to linearly scroll through the list of media items by moving his or her finger across the touch pad 110. As the finger moves around the touch pad 110, the displayed items from the list of media items are varied such that the user is able to effectively scroll through the list of media items. However, since the list of media items can be rather lengthy, the invention provides the ability for the user to rapidly traverse (or scroll) through the list of media items. In effect, the user is able to accelerate their traversal of the list of media items by moving his or her finger at greater speeds. Zadesky '230 at 8:52–9:21 FIGS. 3A-3C show the media player 100 of FIG. 2 being used by a user 120, in accordance with different embodiments of the invention. In all of these embodiments, the user 120 is linearly scrolling 104 (as shown by arrow 124) through a list of songs 122 displayed on the display screen via a slider bar 123. As shown, the media device 100 is comfortably held by one hand 126 while being comfortably addressed by the other hand 128. This configuration generally allows the user 120 to easily actuate the touch pad 110 with one or more fingers. For example, the thumb 130 and rightmost fingers 131 (or leftmost fingers if left handed) of the first hand 126 are used to grip the sides of the media player 100 while a finger 132 of the opposite hand 128 is used to actuate the touch pad 110. As shown, the entire top surface of the touch pad 110 is accessible to the user's finger 130. Referring to FIG. 3A, and in accordance with one embodiment of the invention, the touch pad 110 can be continuously actuated by a simple swirling motion of the finger 132 as shown by arrow 134. By swirling, it is meant that the finger moves in an arcuate or circular manner. For example, the finger may rotate relative to an imaginary axis. In particular, the finger can be rotated through 360 degrees of rotation without stopping. This form of motion may produce continuous or incremental scrolling on the display screen 104. Referring to FIG. 3B, and in accordance with one embodiment of the invention, the user 120 can slide his or her finger 132 radially between the inner and outer perimeter of the touch pad 110. For example, the touch pad 110 may be actuated radially as shown by arrow 140. Referring to FIG. 3C, and in accordance with one embodiment of the invention, the user 120 can slide his or her finger 132 substantially tangentially from all sides of the touch pad 110. For example, the touch pad 110 may be actuated forwards and backwards as shown by arrows 136 and side to side by arrows 138. Zadesky '230 at 9:39–61 As shown, the touch pad 202 is divided into several independent and spatially distinct zones 210 that are positioned around the periphery of the touch pad 202. Any number of zones may be used. In one embodiment, each of the zones 210 represents a polar angle that specifies the angular position of the zone in the plane of the touch pad 202. By way of example, the zones 210 may be positioned at 2 degree increments all the way around the touch pad 202. Each of the zones 210 has an associated sensor disposed

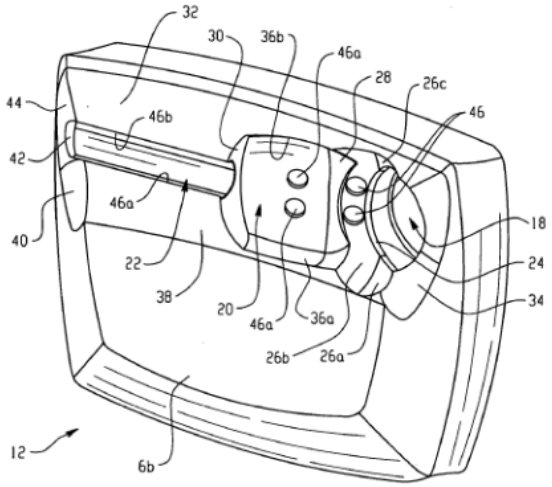
Claims	Prior Art
	therein for detecting the presence of an object such as a finger. The sensors may be widely varied. For example, the sensors may be based on resistive sensing, surface acoustic wave sensing, pressure sensing (e.g., strain gauge, pressure plates, piezoelectric transducers or the like), optical sensing, capacitive sensing and the like. In general, when an object approaches a zone 210, and more particularly a sensor, a position signal is generated that informs the media system 200 that the object is at a specific angular position on the touch pad 202. When an object is moved between zones 210 or over multiple zones 210, multiple position signals are generated. These multiple position signals may be used to determine the angular location, direction, speed and acceleration of the object as its moved around the touch pad 202. Zadesky '230 at 9:62–10:33 The system 200 also includes a control assembly 212 that is coupled to the touch pad 202. The control assembly 212 is configured to acquire the position signals from the sensors and to supply the acquired signals to a processor 214 of the system. By way of example, the control assembly 212 may include an application specific integrated circuit (ASIC) that is configured to monitor the signals from the sensors, to compute the angular location, direction, speed and acceleration of the monitored signals and to report this information to the processor 214. The processor 214 is coupled between the control assembly 212 and the display screen 204. The processor 214 is configured to control motion inputs to the display screen 204. In one sequence, the processor 214 receives angular motion information from the control assembly 212 and then determines the next items of the media list 211 that are to be presented on the display screen 204. In making this determination, the processor 214 can take into consideration the length of the media list 211. Typically, the processor 214 will determine the rate of movement of the finger such that the transitioning to different items in the media list 211 can be performed faster when the finger is moved at greater speeds. In effect, to the user, the more rapid swirling of the finger enables effective acceleration of the transitioning of the list of media items 211. Alternatively, the control assembly 212 and processor 214 may be combined in some embodiments. Although not shown, the processor 214 can also control a buzzer to provide audio feedback to a user. The audio feedback can, for example, be a clicking sound produced by the buzzer. In one embodiment, the buzzer 216 is a piezo-electric buzzer. As the rate of transitioning through the list of media items increases, the frequency of the clicking sounds increases. Alternatively, when the rate that the finger is moved slows, the rate of transitioning through the list of media items decreases, and thus the frequency of the clicking sounds correspondingly slows. Hence, the clicking sounds provide audio feedback to the user as to the rate in which the media items within the list of media items are being traversed.

Claims	Prior Art
	Zadesky ’230 at 10:34–51 Additionally or alternatively, the system via the touch pad may be configured to transform radial motion an object such as a finger (as shown in FIG. 3B) into translational or linear motion on the display screen. By radial, it is meant that the object moves in a substantially radial direction from the center of the touch pad to an outer perimeter of the touch pad. In one embodiment, the touch pad is arranged to continuously determine the radial position of a finger relative to the planar surface of the touch pad. This allows a user to linearly scroll through a media list on the display screen by moving the object at least partially between the center and outer perimeter of the touch pad. For example, by moving the object between a small and large radius (e.g., 0–3 cm) on the touch pad. This may also allow a user to vary a characteristic of the media player. For example, by moving radially, the user may be able to change the volume of sound being played on the media player (i.e., acts like a potentiometer). Zadesky ’230 at 13:13–27 The various aspects of the invention described above can be used alone or in various combinations. The invention is preferably implemented by a combination of hardware and software, but can also be implemented in hardware or software. The invention can also be embodied as computer readable code on a computer readable medium. The computer readable medium is any data storage device that can store data which can thereafter be read by a computer system. Examples of the computer readable medium include read-only memory, random-access memory, CD-ROMs, DVDs, magnetic tape, optical data storage devices, and carrier waves. The computer readable medium can also be distributed over a network coupled computer systems so that the computer readable code is stored and executed in a distributed fashion. Zadesky ’230 at 13:36–60 The advantages of the invention are numerous. Different embodiments or implementations may yield one or more of the following advantages. It should be noted that this is not an exhaustive list and there may be other advantages which are not described herein. One advantage of the invention is that a user is able to easily and rapidly traverse a lengthy list of media items. Another advantage of the invention is that a substantial portion of the touch pad is accessible to the user, i.e., the touch pad provides a large surface area for manipulation thereof. Another advantage of the invention is that the touch pad can be continuously actuated by a simple swirling motion of a finger, i.e., the finger can be rotated through 360 degrees of rotation without stopping. Another advantage of the invention is that the touch pad provides more range of finger positions. For example, a left handed user may choose to use one portion of the touch pad while a right handed user may choose to use another portion of the touch pad. In essence, the

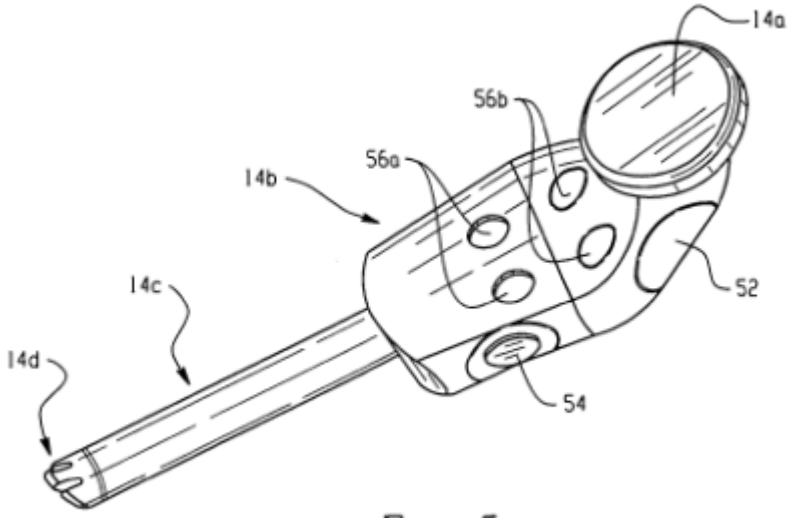
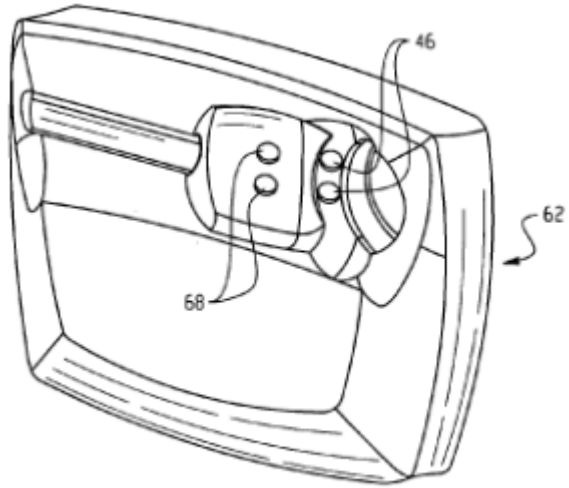
Claims	Prior Art
	touch pad is more ergonomic. Another advantage of the invention is that the touch pad makes the media player more aesthetically pleasing. Another advantage of the invention is that the touch pad allows an intuitive way to scroll on a display screen. For example, the user can manipulate the his or her finger side to side for horizontal scrolling and the user can manipulate his or her finger backwards and forwards for vertical scrolling. A POSITA would have been motivated to combine the Jabra BT800 with Zadesky '230 and the Jabra BT800 with Hollemans '490, and reasonably expected success in doing so, for the same reasons explained above for claims 7 and 30. *Supra* claims 7, 30. As explained for claim 30, a POSITA further would have been motivated to electrically connect the input to the electronic circuitry to enable the electronic circuitry, such as the processor, to receive the data from the input and use it to make determinations. This would have required no more than conventional circuit connection techniques to yield predictable results. *Supra* claim 30. To the extent that the Jabra BT800, Hollemans '490, and Zadesky '230 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Hollemans '490, and Zadesky '230, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
32. A system as recited in claim 18, wherein the system comprises: a Hall effect detector.	The Jabra BT800, Spitzer '001, and Ritter '100 expressly or inherently disclose "wherein the system comprises: a Hall effect detector." For example: *See* above at claim 16. To the extent that the Jabra BT800, Spitzer '001, Ritter '100 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Spitzer '001, Ritter '100 those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
34. A system as recited in claim 18, wherein the conductive element is a conductive pad.	The Jabra BT800, Jabra FreeSpeak, and Griffin '456 expressly or inherently disclose "[a] system as recited in claim 18, wherein the conductive element is a conductive pad." For example: On information and belief, the conductive element of the Jabra BT800 is a conductive pad. For example, as shown below, there is a conductive pad inside the Jabra BT800 that interfaces with the charger. Jabra BT800 User Manual at 4.

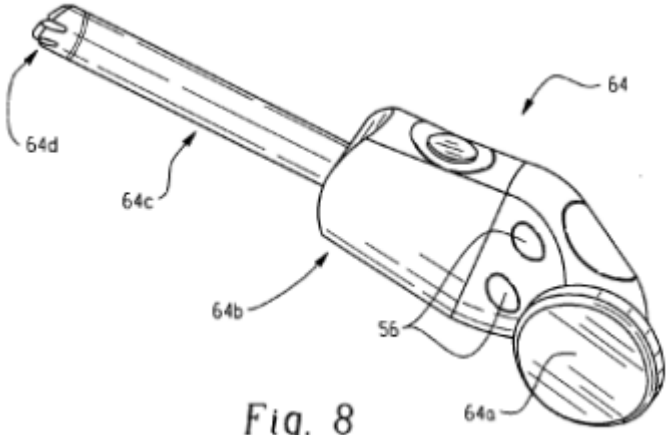
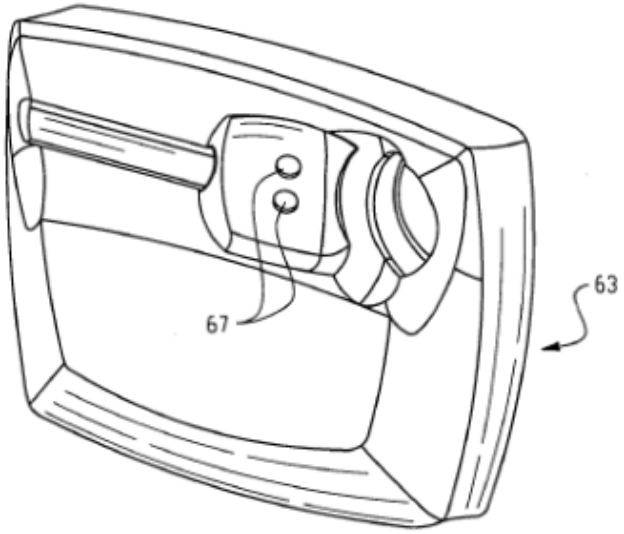
Claims	Prior Art
	 On information and belief, the Jabra FreeSpeak includes conductive pads on its surface to electrically connect with the charging cradle (example of the claimed conductive pad). For example, product images below show three metal contact pads on the surface of the Jabra FreeSpeak. The following citations show examples of where the Jabra FreeSpeak discloses this limitation. Jabra BT200 FreeSpeak Bluetooth Headset Review  Jabra FreeSpeak Brochure at page 2

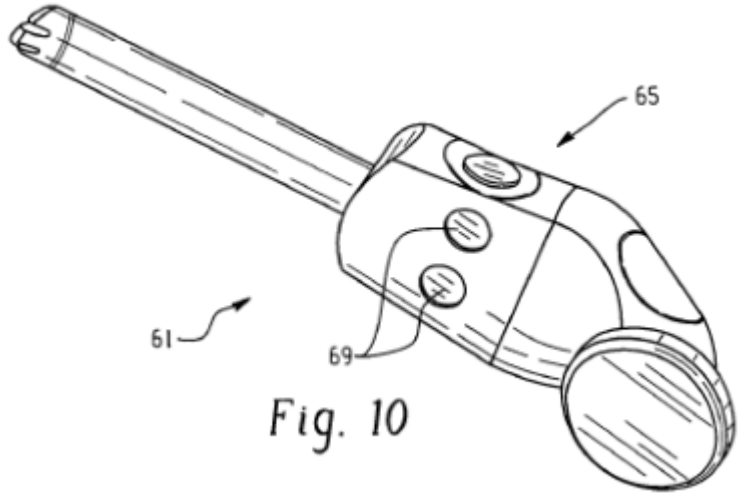
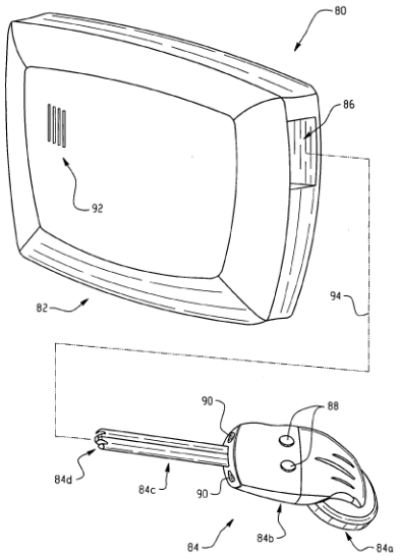
Claims	Prior Art
	 Griffin ’456’s charging terminals, such as “charging terminals 56 in the second communication module,” are examples of the claimed conductive pads, as shown in Figure 5. The following citations show examples of where the Griffin ’456 discloses this limitation.

Claims	Prior Art
	Griffin ’456 at Figure 3  Fig. 3

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Apple v. IngenioSpec, IPR2026-00253
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Claims	Prior Art
	Griffin ’456 at Figure 5  Fig. 5 Griffin ’456 at Figure 7  Fig. 7

Claims	Prior Art
	Griffin ’456 at Figure 8  Fig. 8 Griffin ’456 at Figure 9  Fig. 9

Claims	Prior Art
	Griffin ’456 at Figure 9  Fig. 10 Griffin ’456 at Figure 13  Fig. 13

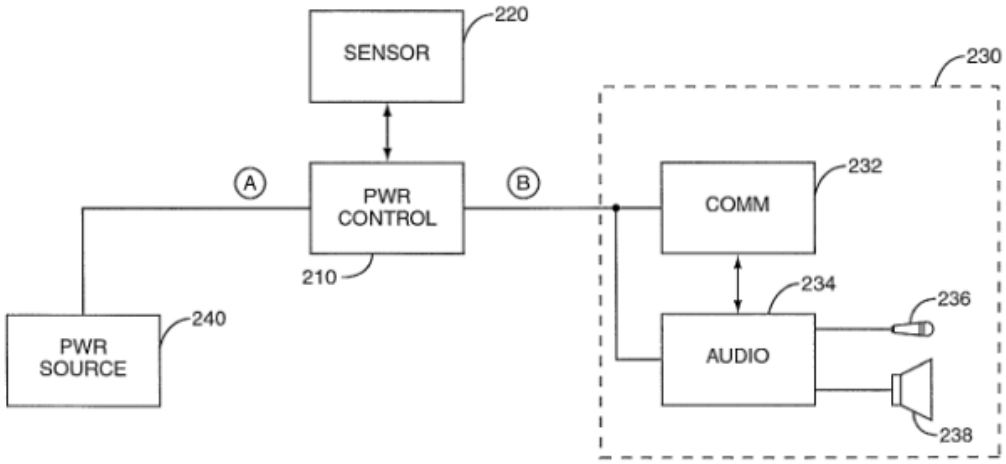
Claims	Prior Art
	Griffin ’456 at [0035] The charging terminals 56 on the second communication module 14 preferably mate with corresponding charging terminals 46 on the first communication module 12 shown in FIG. 3. Also shown in FIGS. 3 and 5 are alternative locations 46a and 56a for the respective charging terminals. The second communication module 14 preferably includes a rechargeable power source that is recharged by the first communication module 12 through the charging terminals 46 and 56 while the second communication module is in its fully mounted position as shown in FIG. 1. The charging terminals 46 on the first communication module 12 are preferably coupled to an internal power source through appropriate conversion and control circuitry in order to provide a charge to an additional power source in the second communication module. Griffin ’456 at [0036] In addition, the charging terminals 46 and 56 preferably include appropriate structures or arrangements to prevent discharging of the respective power sources or damage to internal components caused by external contact with the terminals. For example, the charging terminals 56 may be recessed below the surface of the main body 14b of the second communication module 14 in order to reduce the likelihood of external contact with the charging terminals 56, resulting in a short-circuit. In such an embodiment, the charging terminals 46 on the first communication module 12 may protrude from the surface 26b in order to make contact with recessed charging terminals 56 in the second communication module 14. Griffin ’456 at [0038] With reference again to FIG. 5, the second communication module 14 preferably includes a rechargeable power source that is charged through the recharging terminals 46 and 56 described above. It should be understood, however, that the second communication module 14 may alternatively include a single use power source, such as a non-rechargeable battery, making charging terminals 46 and 56 unnecessary. Griffin ’456 at [0039] FIGS. 6-8 show an alternative communication device 60 embodiment in which a second communication module 64 may be mounted to a first communication module 62 in either an operative or inoperative position. FIG. 6 is a bottom perspective view of the communication device 60 showing operative-mode connection terminals 66 on the second communication module 64. FIG. 7 is a bottom perspective view of the first communication module 62 showing both operative-mode connection terminals 68 and inoperative-mode connection terminals 46. FIG. 8 is a bottom perspective view of the second

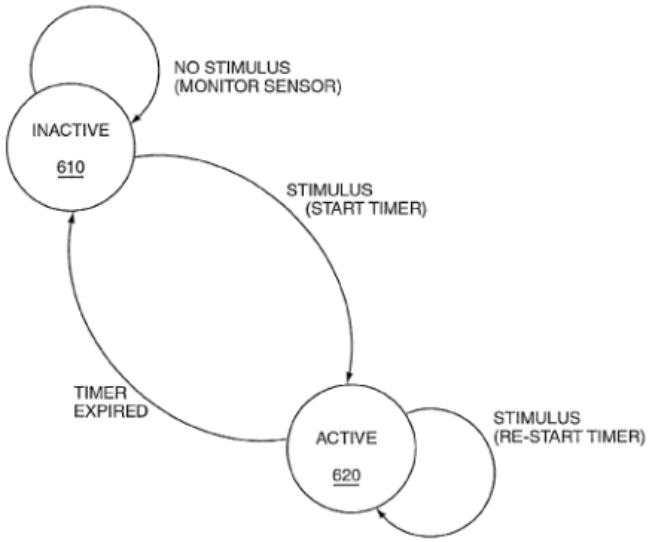
Claims	Prior Art
	communication module 64 showing inoperative-mode connection terminals 56. Griffin ’456 at [0040] When the second communication module 64 is mounted in an inoperative assembled position, the inoperative-mode terminals 46 in the first communication module 62 are electrically connected with the inoperative-mode terminals 56 on a front wall 64b of the second communication module 64, as shown in FIG. 8. In the inoperative assembled position, the inoperative-mode terminals 46 and 56 preferably operate as described above to charge a power source in the second communication module 64. Griffin ’456 at [0043] FIGS. 9 and 10 show another embodiment 61 of a communication device in which a second communication module 65 may be mounted to a first communication module 63 in either an operative or inoperative position, and the first communication module 63 utilizes only one set of multifunctional connection terminals 67. FIG. 9 is a bottom perspective view of the first communication module 63 showing the multifunctional connection terminals 67. FIG. 10 is a bottom perspective view of the second communication module showing a set of charging terminals 69. One function of the connection terminals 67 on the first communication module 63 may be to cooperate with the charging terminals 69 positioned on the second communication module 65 in order to supply power to a rechargeable power source in the second communication module 65 while it is mounted in the inoperative position. In addition, the multifunctional connection terminals 67 may also contact a second set of terminals on the top face of the second communication module 65 (as shown in FIG. 6) when the second communication module 65 is mounted in its operative assembled position. The multifunctional connection terminals 67 may then provide for simultaneous charging and use of the second communication module 65 while it is mounted in its operative position. Griffin ’456 at [0049] In addition, a set of contact terminals 88 on the second communication module 84 may cooperate with suitably located terminals inside cavity 86 to provide for recharging of a power source in the second module 84 and/or powering the second module 84 from the power source in the first module 82. In an alternative embodiment, a set of female terminals 90 may be located at a bottom edge of the main body 84b of the second communication module 84 that engage and electrically connect to corresponding male terminals inside the cavity 86.

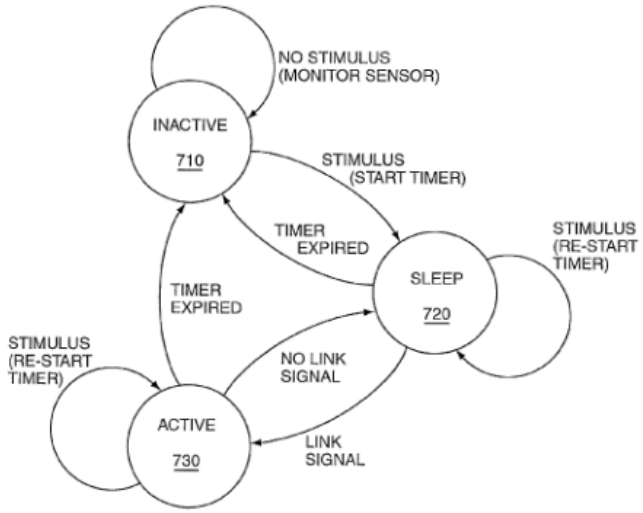
Claims	Prior Art
	A POSITA would have been motivated to combine Griffin '456's conductive pads into the Jabra BT800 to allow the Jabra BT800 to advantageously and more easily fit into and interface with a charging case or cradle, such as the one taught by Griffin. A POSITA would have recognized that conductive pads were more advantageous and better suited to charging cases and cradles than other conductive elements, such as a USB. A POSITA would have reasonably expected success in making this combination because conductive pads were well–known, routine, and conventional components. To the extent that the Jabra BT800, Jabra FreeSpeak, and Griffin '456 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Jabra FreeSpeak, and Griffin '456, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
35[pre]. A system, comprising:	The Jabra BT800 expressly or inherently disclose "[a] system." For example: *See* above at claim 1[pre]. To the extent that the Jabra BT800 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[35a] a head-worn personal electronic apparatus, including at least:	The Jabra BT800 expressly or inherently discloses "a head-worn personal electronic apparatus, including at least." For example: *See* above at claim [1a]. To the extent that the Jabra BT800 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[35b] a head-worn structure configured to be worn by a user;	The Jabra BT800 expressly or inherently discloses "a head-worn structure configured to be worn by a user." For example: *See* above at claim [1b]. To the extent that the Jabra BT800 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.

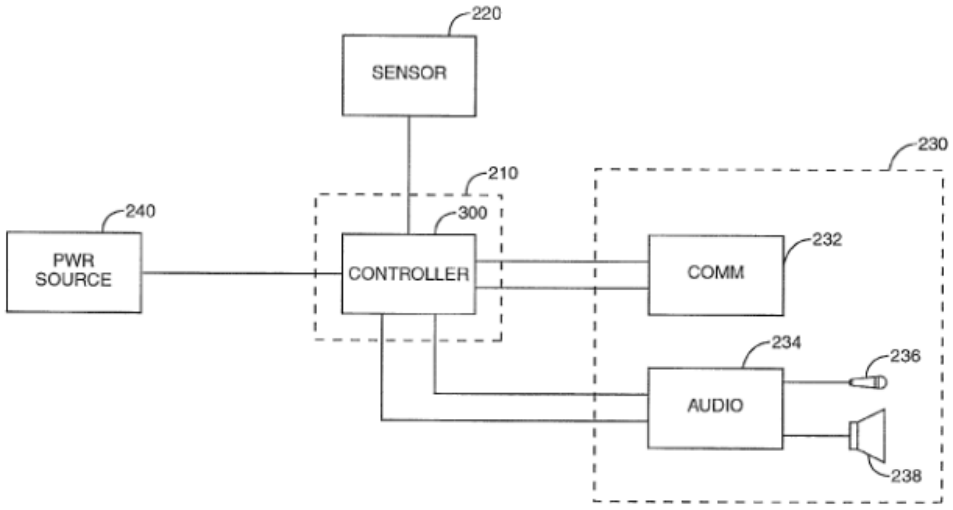
Claims	Prior Art
[35c] a speaker at least partially contained within the head-worn structure, the speaker being configured to be worn proximate to an ear of the user when the head-worn structure is being worn by the user;	The Jabra BT800 expressly or inherently discloses "a speaker at least partially contained within the head-worn structure, the speaker being configured to be worn proximate to an ear of the user when the head-worn structure is being worn by the user." For example: *See* above at claim [1c]. To the extent that the Jabra BT800 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[35d] a first microphone at least partially contained within the head-worn structure, the first microphone being positioned to pick up at least audio input from at least the user;	The Jabra BT80, Phonak Perseo, Griffin '456, and Miller '585 expressly or inherently disclose "a first microphone at least partially contained within the head-worn structure, the first microphone being positioned to pick up at least audio input from at least the user." For example: *See* above at claim [18d]. To the extent that Jabra BT800, Phonak Perseo, Griffin '456, and Miller '585 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Phonak Perseo, Griffin '456, and Miller '585, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[35e] a second microphone at least partially contained within the head-worn structure, the second microphone being positioned to pick up at least environmental audio input associated with an environment around the head-worn personal electronic apparatus;	The Jabra BT800, Phonak Perseo, Griffin '456, and Miller '585 expressly or inherently disclose "a second microphone at least partially contained within the head-worn structure, the second microphone being positioned to pick up at least environmental audio input associated with an environment around the head-worn personal electronic apparatus." For example: *See* above at claim [18e]. To the extent that the Jabra BT800, Phonak Perseo, Griffin '456, and Miller '585 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Phonak Perseo, Griffin '456, and Miller '585, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[35f] a rechargeable battery contained within the head-worn structure;	The Jabra BT800 expressly or inherently discloses "a rechargeable battery contained within the head-worn structure." For example: *See* above at claim [1e].

Claims	Prior Art
	To the extent that the Jabra BT800 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[35g] a "being worn" sensor at least partially contained within the head-worn structure and configured to detect data indicative of whether the head-worn structure of the head-worn personal electronic apparatus is being worn;	The Jabra BT800, Irvin '332, and Iuliis '007 expressly or inherently disclose "a "being worn" sensor at least partially contained within the head-worn structure and configured to detect data indicative of whether the head-worn structure of the head-worn personal electronic apparatus is being worn." For example: Irvin '332 discloses a "wireless headset" (example of the claimed head–worn structure) including a number of sensors such as "motion sensors, attitude or position sensors, proximity sensors, and contact sensors" (example of the claimed sensor) to determine "a user picking it up or mounting the wireless headset upon their head" (example of the claimed determine whether the wireless wearable device is being worn based on sensor outputs). The following citations show examples of where the Irvin '332 discloses this limitation. Irvin '332 at Abstract A wireless headset for use with a separate communications device, such as a cellular telephone, includes automatic on/off capabilities to maximize battery life. By detecting a user's interaction, such as picking up the headset or placing it upon the user's body, the wireless headset automatically transitions from an inactive state to an active state. Techniques for automatic headset enabling include but are not limited to motion sensors, attitude or position sensors, proximity sensors, and contact sensors. These techniques may be used individually or in any combination. An internal timer allows the wireless headset to return to its inactive state a defined interval after cessation of movement or removal of the wireless headset. Including an optional sleep state further optimizes battery life. In the sleep state, only a portion of the wireless headset circuitry is enabled. Rather than transitioning from inactive to active, the headset transitions from inactive to sleep. In sleep, the headset periodically monitors for a signal from the separate communications device. Upon detection of such a signal, the wireless headset transitions to its active state, thereby providing full functionality to the user.

Claims	Prior Art
	Irvin ’332 at Figure 2A  *FIG. 2A*

Claims	Prior Art
	Irvin ’332 at Figure 6  *FIG. 6*

Claims	Prior Art
	Irvin ’332 at Figure 7  FIG. 7

Claims	Prior Art
	Irvin ’332 at Figure 8  *FIG. 8* Irvin ’332 at 2:16–34 The present invention includes both a method and apparatus allowing a wireless headset to automatically control its operating state to minimize power consumption, thereby maximizing the life of its power source, such as a battery. The wireless headset serves as a communication accessory to a base unit, such as a cellular telephone. When not in use, the wireless headset reverts to an inactive state and draws essentially no power. A power control circuit imparts automatic enabling capability to the wireless headset. Preferably, the power control circuit employs a sensor responsive to a natural stimulus associated with a person preparing to use the wireless headset. The wireless headset may sense motion, physical orientation, or user proximity. Sensing techniques include but are not limited to micro-electro-mechanical-systems (MEMS), mercury switches, attitude switches, and IR or acoustic proximity sensors. In some embodiments, the wireless headset transitions from the inactive state to an active state in response to a user picking it up or mounting the wireless headset upon their head. Irvin ’332 at 2:35–50 In a more sophisticated embodiment, the wireless headset may transition from the inactive state to a sleep state, based on user stimulus. In the sleep state, only a portion of the headset circuitry is enabled, thus

Claims	Prior Art
	conserving power. While in the sleep state, the wireless headset monitors for a signal from the base unit, and, when such a signal is received, it transitions from the sleep state to the active state. Further, once active, the wireless headset can continue to monitor for communications link activity. Thus, if communications with the base unit cease, the wireless headset can return to the sleep state and periodically check for resumed communications activity. A timer allows the wireless headset to automatically return to the inactive state subsequent to use. Cessation of movement or detected removal of the wireless headset from the user's head can indicate termination of use and trigger a timed power-down. Irvin '332 at 3:53–4:2 The communications circuit 230 provides wireless headset functionality, including audio input and output and wireless communications with the base unit 102. The communications or headset circuit 230 includes a wireless communications interface 232 providing a wireless communications link for sending and receiving information to and from the base unit 102. The wireless communications interface 232 includes at least a wireless receiver and wireless transmitter. Audio input received via microphone 236 is conditioned by the audio interface 234 and then processed by the communications interface 232 for transmittal to the base unit 102. Audio information received from the base unit 102 is processed by the wireless communications interface 232 and then conditioned in the audio interface 234 for output to a user via speaker 238. With reference to FIG. 1A or 1B, the microphone 236 may be located in microphone pickup 120, and speaker 238 may be located in earpiece 130. Irvin '332 at 4:39–67 FIG. 3A illustrates a preferred embodiment for the wireless headset 100. In FIG. 3A, the power control circuit 210 independently enables the wireless communications interface 232 and audio interface 234. Thus, select portions of communications circuit 230 may be enabled in response to the sensor output signal. Once the wireless communications interface 232 is enabled, it provides a signal, termed a "link active" signal, to the power control circuit 210 based on detecting a wireless signal received from the base unit 102. Based on the assertion of the link active signal, the power control circuit 210 enables the audio interface 234. FIG. 3B provides more functional details regarding the power control circuit 210 of FIG. 3A. Again, the control logic 212 is responsive to a sensor output signal from sensor 220. However, in response to the sensor output signal, the control logic 212 turns on switch 214 while switch 216 remains off, thereby enabling the wireless communications interface 232. As with the previously discussed embodiment, power control circuit 210 includes the timer 218. In a preferred embodiment, control logic 212 starts timer 218 upon enabling the wireless communications interface 232, and resets timer 218 based on subsequent

Claims	Prior Art
	or continued assertion of the sensor output signal. If the wireless communications interface 232 asserts the link active signal, the control logic 212 turns on switch 216, thereby enabling the audio interface 234. If the timer 218 expires, the control logic 212 turns off switches 214 and 216, thereby disabling the wireless communications interface 232 and the audio interface 234. Irvin '332 at 5:1–23 Because the wireless headset 100 of the present invention automatically enables and disables its communication functions based on use, the sensor 220 may be based on a variety of technologies. In general, its purpose is to provide a signal responsive to a natural stimulus associated with use of the headset by a user. Movement or vibration of the wireless headset 100, or placement of the wireless headset 100 upon the user's body indicates usage. Movement may be detected based on vibration or by sensing acceleration, such as with an accelerometer. Mechanical or liquid-based switches represent alternate mechanisms for sensing movement. In such switches, movement causes an electrical connection to be established between contact pairs. Further, the particular sensor 220 employed may be tuned or configured such that only stimulus consistent with actual use actuates the sensor, thus avoiding inadvertent or unintended enabling of the wireless headset 100. In such configurations, the sensor 220 preferably employs output conditioning that prevents assertion of the sensor output signal for stimulus below a defined threshold. Alternatively, the power control circuit 210 may include such conditioning as part of its interface to the sensor 220. FIGS. 4A–4D illustrate possible sensor embodiments. Irvin '332 at 5:25–52 In FIG. 4A, the power control circuit 210 is operatively associated with a MEMS device, with the MEMS device functioning as the sensor 220. Devices based on MEMS technology may be responsive to general vibration or motion, or may be configured to respond only to specific acceleration along defined axes. As MEMS devices may easily include output conditioning electronics, the sensitivity or responsiveness of the sensor 220 incorporating the MEMS device may be tailored such that the sensor output signal is asserted only for motion or vibration above a certain threshold. A typical MEMS employs modified microelectronics fabrication techniques and includes small mechanical elements responsive to movement or vibration, such as cantilever beams formed by selectively etching a silicon wafer. In a preferred embodiment of the present invention, sensor 220 includes a MEMS device simultaneously fulfilling the requirements of low power consumption, relative low-cost, and adequate signal discrimination. In this context, signal discrimination means that the sensor 220 is not prone to nuisance assertions of its sensor output signal caused by minute movement or vibration. Although the body of work associated with MEMS technology is quite comprehensive, significant insight into the basic structures and techniques of MEMS technology may be gained from U.S. Pat. No. 5,659,195 to Kaiser et al., U.S. Pat. No. 5,663,507

Claims	Prior Art
	to Westervelt et al., and U.S. Pat. No. 5,76,480 to Pister, the disclosures of which are incorporated herein by reference. Irvin '332 at 5:53–6:2 FIG. 4B illustrates the power control circuit 210 coupled to a liquid-based switch functioning as the sensor 220. The sensor 220 may be a mercury-filled switch, or may employ other conductive liquids. Depending upon its configuration, the sensor 220, implemented as a liquid-based switch, may function as a motion sensor or as an attitude sensor. As a motion sensor, the sensor 220 includes first and second contacts disposed in a manner such that motion of the contained liquid places the first and second contacts in electrical connection. As an attitude sensor, sensor 220 includes first and second contacts disposed in a manner such that one or more specific physical orientations of the wireless headset 100 causes the contained liquid in sensor 220 to place the first and second contacts in electrical connection. The power control circuit 210 connects to the first and second contacts of sensor 220, and is responsive to the electrical connection completed by the contained liquid. Irvin '332 at 6:20–33 FIG. 4D illustrates the power control circuit 210 coupled with a proximity sensor 220 not based on mechanical actuation. The proximity sensor 220 may be an active or passive IR sensor, may be a resistive or other type of thermal sensor, or may be an acoustic sensor. As a proximity sensor, sensor 220 provides indication that a user has placed the wireless headset 100 upon their body. As such, any of the foregoing or other presence sensing techniques may be used to implement sensor 220. Preferably, when configured as a proximity sensor, sensor 220 requires minimal power and provides a sensor output signal based on proximity to the user's body. Depending upon the sensing technology chosen, the control circuit 210 may be required to periodically stimulate sensor 220 to generate a detection response. Irvin '332 at 7:1–8:3 Note that the foregoing diagrams illustrate various configurations for the present invention, with these configurations allowing the wireless headset 100 to automatically enable and disable select portions of its electronic circuitry based on user stimulus. Enabling and disabling may constitute physical connection and disconnection of power between the power source 240 and the communications or headset circuit 230, or may simply represent the assertion and de-assertion of specific enabling signals. Thus, the foregoing diagrams should not be construed as limiting in any way regarding the specific circuit implementation of the wireless headset 100. FIGS. 2–5 illustrate functional diagrams and these various functions may have corresponding separate circuit elements, or may be included in integrated fashion in

Claims	Prior Art
	one or more devices. For example, a microprocessor in a sleep or halt mode may be directly connected to a battery and configured to wake up in response to an input from the sensor 220. Thus, the microprocessor could serve as the power control circuit 210, as well as providing functions related to the communications interface 232 and audio interface 234. FIGS. 8 and 9, in particular, illustrate an exemplary embodiment of the present invention wherein an integrated controller provides the functionality of the power control circuit 210. In FIG. 8, the power control circuit 210 includes an integrated controller 300. The integrated controller 300 provides power control functionality associated with the timer 218, switches 214 and 216, and control logic 212. In this embodiment, the controller 300 provides both power and control/signal interconnections for the wireless communications interface 232 and audio interface 234. The controller 300 independently enables the wireless communications interface 232 and audio interface 234 in response to the sensor output signal from sensor 220. As with other embodiments, the controller 300 may enable both the wireless communication interface 232 and audio interface 234 in response to the sensor output signal, or may only enable the wireless communications interface 232, or a portion thereof. In this latter, case, the controller 300 enables the audio interface 234 in response to receiving the link signal from the enabled portion of the wireless communications interface 232. FIG. 9 provides more detail regarding the controller 300 shown in FIG. 8. A main power controller 310 provides power/control outputs to power controllers 330 and 340, which, in turn, provide power control outputs to the wireless communications interface 232 and audio interface 234, respectively. The main power controller 310 additionally interfaces with and provides power to a functional controller 350 and a sensor controller 320. The functional controller 350 provides signal and control interfaces with both the wireless communications interface 232 and the audio interface 234. In an exemplary embodiment, the main power controller initially enables only the sensor controller 320. Then, in response to the sensor output signal, the main controller 310 enables power controller 330 at least a portion of the functional controller 350. In response, power controller 330 enables at least a portion of the wireless communications interface 232. Then, in response to receiving the link signal from the wireless communications interface 232—the link signal may be received via the functional controller 350—the main power controller 310 enables the power controller 340 associated with the audio interface 234. The power controllers 330 and 340 may comprise FET switches combined with control logic responsive to control signals asserted by the main power controller 310, the functional controller 350, and/or the wireless communications interface 232. Irvin ’332 at 8:11–50 FIGS. 6 and 7 illustrate operation of the wireless headset 100. FIG. 6 is a state diagram for one exemplary embodiment of the present invention. When the wireless headset 100 is not in use, it automatically enters an inactive state (610). As explained, this inactive state may constitute disconnecting the communications

Claims	Prior Art
	circuit 230 from the power source 240, or may simply represent placing the communications circuit 230 in a non-functional, low-power condition. Absent user stimulus, such as motion of the wireless headset 100 or placement of the wireless headset 100 upon the user's body, the wireless headset 100 remains in the inactive state (610). In response to user stimulus, as detected by sensor 220, the power control circuit 210 enables the communications circuit 230, with this enabling representing a transition from the inactive state to an active state (620). Upon entering the active state, the power control circuit 210 initializes and starts the timer 218. The timer 218 incrementally counts from a starting value to an ending value, with the progression from starting to ending values representing a defined interval of time. Upon expiration of the timer 218, the power control circuit 210 disables the communications circuit 230. This interval of time may be preprogrammed to a convenient value, or may be selectable based on input from the base unit 102. For example, a timeout interval of five minutes may provide a reasonable compromise between user convenience and battery life. While in the active state (620), the power control circuit 210 resets the timer 218 based on the reassertion or continued assertion of the sensor output signal from sensor 220. Such resetting prevents expiration of the timer 218 and, as such, causes the power control circuit 210 to leave the communications or headset circuit 230 enabled. Thus, the power control circuit 210 is designed to leave the wireless headset 100 in the active state (620) while the wireless headset is in use by a user. Absent user stimulus, the timer 218 of power control circuit 210 expires, thereby causing the wireless headset 100 to transition from the active state (620) to the inactive state (610) based on the power control circuit 210 disabling the communications circuit 230. Irvin ’332 at 8:51–9:12 FIG. 7 is a state diagram for a preferred embodiment of the present invention. Operation of the wireless headset 100 illustrated in FIG. 7 is distinguished from that shown in FIG. 6 by inclusion of an additional state, denoted as the sleep state (720). Inclusion of the sleep state provides an additional opportunity to control the power consumption of wireless headset 100 based on specific operating conditions. As before, the wireless headset 100 remains in the inactive state (710) absent user stimulus. Upon detecting user stimulus, the wireless headset 100 transitions from the inactive state (710) to the sleep state (720). In this state, the power control circuit 210 enables only a portion of the communications circuit 230. Specifically, the power control circuit 210 enables the wireless communications interface 232 or a portion thereof. Then, using a signal output from the wireless communications interface 232, the power control circuit 210 determines if the base unit 102 is active, or if the base unit 102 is attempting to communicate with the wireless headset 100. In some embodiments, the wireless headset 100 infers activity by detecting, via its wireless communications interface, a carrier signal from the base unit 102. In other embodiments, the wireless headset detects activity based on receiving a “wake-up” signal from the base unit 102. Note that monitoring for the base unit carrier signal may be performed continuously by the wireless headset 100

Claims	Prior Art
	while in the sleep state, or may be performed periodically; thereby further reducing sleep state power consumption. For periodic carrier monitoring, the wireless headset 100 may employ an exemplary monitoring interval of 0.5 seconds. Irvin '332 at 9:13–65 Upon detecting the carrier signal or wake-up signal from the base unit 102, as indicated by the link signal shown in FIG. 7, the wireless headset 100 transitions from the sleep state (720) to the active state (730). To further reduce power consumption, the wireless headset 100 may only monitor for the external signal on a periodic basis. If the wireless headset 100 is configured to monitor for the external signal on a periodic basis and the base unit 102 is configured to emit a periodic wake-up signal, the periodic monitoring of the wireless headset 100 is set such that its monitoring frequency is not an integer multiple of the wake-up signal frequency. Upon causing the wireless headset 100 to transition from the inactive state (710) to the sleep state (720), the power control circuit 210 initializes and starts the timer 218. While in the sleep state (720), subsequent or continued assertion of the sensor output signal from the sensor 220 causes the power control circuit 210 to reset its timer 218. Absent such user stimulus, the timer 218 expires and the power control circuit 210 disables the communications circuit 230. After transitioning from the sleep state (720) to the active state (730), based on detection of the signal from the base unit 102, the power control circuit 210 continues resetting its timer 218 based on user stimulus, as done in the sleep state (720). Thus, continued user stimulus causes the power control circuit 210 to leave the wireless headset 100 fully functional in the active state (730). The present invention provides methods and apparatus allowing the wireless headset 100 to conveniently transition from a non-functional inactive state to a fully functional active state, based on its detection of certain user stimulus. In a preferred embodiment, the wireless headset 100 transitions from the inactive state to the intermediate sleep state, thereby conserving power. Upon detection of the carrier or the wake-up signal from the base unit 102, the wireless headset 100 transitions from the sleep state to the fully functional active state. The wireless headset 100 includes a sensor 220 for detecting the user stimulus. As the sensor 220 may be a motion sensor, a vibration sensor, an attitude sensor, or a proximity sensor, the specific user stimulus may include the user moving and/or placing the wireless headset 100 upon their body. The operation of the wireless headset 100 in accordance with the present invention admits tremendous flexibility with respect to implementation. As noted, many different circuit implementations may provide the inventive features of the present invention. These implementations may include hardware and software, and can reflect varying degrees of integration between the functional circuit blocks discussed. Indeed, all such variations for providing a wireless headset 100 that automatically controls its

Claims	Prior Art
	power consumption or operating state based on detection of a user stimulus are within the scope of the present invention. Iuliis '007 discloses "connector unit 102 may also include sensors such as a heart monitor, light sensor, temperature sensor, motion sensor (e.g., accelerometer), etc. that provide external information about the user" (example of the claimed a "being worn" sensor at least partially contained within the head-worn structure and configured to detect data indicative of whether the head-worn structure of the head-worn personal electronic apparatus is being worn). Iuliis '007 at 9:62–10:2 The connector unit 102 may also include sensors such as a heart monitor, light sensor, temperature sensor, motion sensor (e.g., accelerometer), etc. that provide external information about the user or the user's surroundings that can be used by the handheld electronic device. Examples of sensors that can be used may be found in U.S. patent application Ser. Nos. 10/402,311, 10/997,479, 60/658,777, and 60/663,345, which are herein incorporated by reference. A POSITA would have been motivated to combine the Jabra BT800 with Irvin '332, and Jabra BT800 with Iuliis '007, and reasonably expected success in doing so, for the reasons explained above for claims 12–15. *Supra* claims 12–15. To the extent that the Jabra BT800, Irvin '332, and Iuliis '007 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Irvin '332, and Iuliis '007, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[35h] electronic circuitry contained within the head-worn structure, the electronic circuitry being electrically connected to at least one or more of the first microphone, the second microphone, the rechargeable battery and the "being worn" sensor, the electronic circuitry being configured to at least process the audio input from at least the user via the first microphone to remove at least a portion of the	The Jabra BT800, Phonak Perseo, Irvin '332, and Griffin '456, and Miller '585 expressly or inherently disclose "electronic circuitry contained within the head-worn structure, the electronic circuitry being electrically connected to at least one or more of the first microphone, the second microphone, the rechargeable battery and the "being worn" sensor, the electronic circuitry being configured to at least process the audio input from at least the user via the first microphone to remove at least a portion of the environmental audio input associated with the environment picked up via the second microphone, the electronic circuitry being configured to process at least the detected data captured by the "being worn" sensor." For example: *See* above at claim [18h]. To the extent that the Jabra BT800, Phonak Perseo, Irvin '332, and Griffin '456, and Miller '585 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Phonak Perseo, Irvin '332, and Griffin '456, and

Claims	Prior Art
environmental audio input associated with the environment picked up via the second microphone, the electronic circuitry being configured to process at least the detected data captured by the "being worn" sensor;	Miller '585, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[35i] wireless communication circuitry at least partially contained within the head-worn structure, the wireless communication circuitry being electrically connected to at least the rechargeable battery; and	The Jabra BT800 expressly or inherently discloses "wireless communication circuitry at least partially contained within the head-worn structure, the wireless communication circuitry being electrically connected to at least the rechargeable battery." For example: *See* above at claim [1g]. To the extent that Jabra BT800 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[35j] at least one conductive element at least partially included within the head-worn structure, the at least one conductive element being at least partially exposed to enable interconnection therewith, the at least one conductive element being electrically connected to at least the rechargeable battery; and	The Jabra BT800, Jabra FreeSpeak, and Griffin '456 expressly or inherently disclose "at least one conductive element at least partially included within the head-worn structure, the at least one conductive element being at least partially exposed to enable interconnection therewith, the at least one conductive element being electrically connected to at least the rechargeable battery." For example: *See* above at claim [1h]. To the extent that the Jabra BT800, Jabra FreeSpeak, and Griffin '456 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Jabra FreeSpeak, and Griffin '456, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[35k] a charging apparatus having at least a charging connector,	The Jabra BT800, Jabra FreeSpeak, and Griffin '456 expressly or inherently disclose "a charging apparatus having at least a charging connector." For example: *See* above at claim [1i]. To the extent that the Jabra BT800, Jabra FreeSpeak, and Griffin '456 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the

Claims	Prior Art
	teachings of the Jabra BT800, Jabra FreeSpeak, and Griffin ’456, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[35l] wherein on placement of the head-worn personal electronic apparatus in the charging apparatus, electrical connection results at least from the at least one conductive element connecting with the charging connector, and thereby the rechargeable battery of the head-worn personal electronic apparatus is able to be recharged while the head-worn personal electronic apparatus is placed in the charging apparatus.	The Jabra BT800, Jabra FreeSpeak, and Griffin ’456 expressly or inherently disclose “wherein on placement of the head-worn personal electronic apparatus in the charging apparatus, electrical connection results at least from the at least one conductive element connecting with the charging connector, and thereby the rechargeable battery of the head-worn personal electronic apparatus is able to be recharged while the head-worn personal electronic apparatus is placed in the charging apparatus.” For example: *See* above at claim [1j]. To the extent that the Jabra BT800, Jabra FreeSpeak, and Griffin ’456 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Jabra FreeSpeak, and Griffin ’456, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
36. A system as recited in claim 35, wherein the detected data by the “being worn” sensor is dependent on a physical characteristic of the user.	The Jabra BT800, Irvin ’332, and Griffin ’456 expressly or inherently disclose “[a] system as recited in claim 35, wherein the detected data by the “being worn” sensor is dependent on a physical characteristic of the user.” For example: *See* above at claim 8. To the extent that the Jabra BT800, Irvin ’332, and Griffin ’456 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Irvin ’332, and Griffin ’456, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
37. A system as recited in claim 35, wherein the head-worn structure comprises: an accelerometer, operatively connected to the rechargeable battery, at least partially contained within the head-worn structure and configured to sense movement data.	The Jabra BT800 and Irvin ’332 expressly or inherently disclose “[a] system as recited in claim 35, wherein the detected data by the “being worn” sensor is dependent on a physical characteristic of the user.” For example: Irvin ’332 discloses “[m]ovement may be detected based on vibration or by sensing acceleration, such as with an accelerometer” (example of the claimed accelerometer) by the “wireless headset.” The following citations show examples of where the Irvin ‘332 discloses this limitation. Irvin ’332 at Abstract A wireless headset for use with a separate communications device, such as a cellular telephone, includes

Claims	Prior Art
	automatic on/off capabilities to maximize battery life. By detecting a user's interaction, such as picking up the headset or placing it upon the user's body, the wireless headset automatically transitions from an inactive state to an active state. Techniques for automatic headset enabling include but are not limited to motion sensors, attitude or position sensors, proximity sensors, and contact sensors. These techniques may be used individually or in any combination. An internal timer allows the wireless headset to return to its inactive state a defined interval after cessation of movement or removal of the wireless headset. Including an optional sleep state further optimizes battery life. In the sleep state, only a portion of the wireless headset circuitry is enabled. Rather than transitioning from inactive to active, the headset transitions from inactive to sleep. In sleep, the headset periodically monitors for a signal from the separate communications device. Upon detection of such a signal, the wireless headset transitions to its active state, thereby providing full functionality to the user. Irvin '332 at 5:1–23 Because the wireless headset 100 of the present invention automatically enables and disables its communication functions based on use, the sensor 220 may be based on a variety of technologies. In general, its purpose is to provide a signal responsive to a natural stimulus associated with use of the headset by a user. Movement or vibration of the wireless headset 100, or placement of the wireless headset 100 upon the user's body indicates usage. Movement may be detected based on vibration or by sensing acceleration, such as with an accelerometer. Mechanical or liquid-based switches represent alternate mechanisms for sensing movement. In such switches, movement causes an electrical connection to be established between contact pairs. Further, the particular sensor 220 employed may be tuned or configured such that only stimulus consistent with actual use actuates the sensor, thus avoiding inadvertent or unintended enabling of the wireless headset 100. In such configurations, the sensor 220 preferably employs output conditioning that prevents assertion of the sensor output signal for stimulus below a defined threshold. Alternatively, the power control circuit 210 may include such conditioning as part of its interface to the sensor 220. FIGS. 4A–4D illustrate possible sensor embodiments. Irvin '332 at 5:25–52 In FIG. 4A, the power control circuit 210 is operatively associated with a MEMS device, with the MEMS device functioning as the sensor 220. Devices based on MEMS technology may be responsive to general vibration or motion, or may be configured to respond only to specific acceleration along defined axes. As MEMS devices may easily include output conditioning electronics, the sensitivity or responsiveness of the sensor 220 incorporating the MEMS device may be tailored such that the sensor output signal is asserted only for motion or vibration above a certain threshold. A typical MEMS employs modified

Claims	Prior Art
	microelectronics fabrication techniques and includes small mechanical elements responsive to movement or vibration, such as cantilever beams formed by selectively etching a silicon wafer. In a preferred embodiment of the present invention, sensor 220 includes a MEMS device simultaneously fulfilling the requirements of low power consumption, relative low-cost, and adequate signal discrimination. In this context, signal discrimination means that the sensor 220 is not prone to nuisance assertions of its sensor output signal caused by minute movement or vibration. Although the body of work associated with MEMS technology is quite comprehensive, significant insight into the basic structures and techniques of MEMS technology may be gained from U.S. Pat. No. 5,659,195 to Kaiser et al., U.S. Pat. No. 5,663,507 to Westervelt et al., and U.S. Pat. No. 5,76,480 to Pister, the disclosures of which are incorporated herein by reference. Irvin '332 at 6:20–33 FIG. 4D illustrates the power control circuit 210 coupled with a proximity sensor 220 not based on mechanical actuation. The proximity sensor 220 may be an active or passive IR sensor, may be a resistive or other type of thermal sensor, or may be an acoustic sensor. As a proximity sensor, sensor 220 provides indication that a user has placed the wireless headset 100 upon their body. As such, any of the foregoing or other presence sensing techniques may be used to implement sensor 220. Preferably, when configured as a proximity sensor, sensor 220 requires minimal power and provides a sensor output signal based on proximity to the user's body. Depending upon the sensing technology chosen, the control circuit 210 may be required to periodically stimulate sensor 220 to generate a detection response. Irvin '332 at 8:11–50 FIGS. 6 and 7 illustrate operation of the wireless headset 100. FIG. 6 is a state diagram for one exemplary embodiment of the present invention. When the wireless headset 100 is not in use, it automatically enters an inactive state (610). As explained, this inactive state may constitute disconnecting the communications circuit 230 from the power source 240, or may simply represent placing the communications circuit 230 in a non-functional, low-power condition. Absent user stimulus, such as motion of the wireless headset 100 or placement of the wireless headset 100 upon the user's body, the wireless headset 100 remains in the inactive state (610). In response to user stimulus, as detected by sensor 220, the power control circuit 210 enables the communications circuit 230, with this enabling representing a transition from the inactive state to an active state (620). Upon entering the active state, the power control circuit 210 initializes and starts the timer 218. The timer 218 incrementally counts from a starting value to an ending value, with the progression from starting to ending values representing a defined interval of time. Upon expiration of the

Claims	Prior Art
	timer 218, the power control circuit 210 disables the communications circuit 230. This interval of time may be preprogrammed to a convenient value, or may be selectable based on input from the base unit 102. For example, a timeout interval of five minutes may provide a reasonable compromise between user convenience and battery life. While in the active state (620), the power control circuit 210 resets the timer 218 based on the reassertion or continued assertion of the sensor output signal from sensor 220. Such resetting prevents expiration of the timer 218 and, as such, causes the power control circuit 210 to leave the communications or headset circuit 230 enabled. Thus, the power control circuit 210 is designed to leave the wireless headset 100 in the active state (620) while the wireless headset is in use by a user. Absent user stimulus, the timer 218 of power control circuit 210 expires, thereby causing the wireless headset 100 to transition from the active state (620) to the inactive state (610) based on the power control circuit 210 disabling the communications circuit 230. Irvin '332 at 9:13–65 Upon detecting the carrier signal or wake-up signal from the base unit 102, as indicated by the link signal shown in FIG. 7, the wireless headset 100 transitions from the sleep state (720) to the active state (730). To further reduce power consumption, the wireless headset 100 may only monitor for the external signal on a periodic basis. If the wireless headset 100 is configured to monitor for the external signal on a periodic basis and the base unit 102 is configured to emit a periodic wake-up signal, the periodic monitoring of the wireless headset 100 is set such that its monitoring frequency is not an integer multiple of the wake-up signal frequency. Upon causing the wireless headset 100 to transition from the inactive state (710) to the sleep state (720), the power control circuit 210 initializes and starts the timer 218. While in the sleep state (720), subsequent or continued assertion of the sensor output signal from the sensor 220 causes the power control circuit 210 to reset its timer 218. Absent such user stimulus, the timer 218 expires and the power control circuit 210 disables the communications circuit 230. After transitioning from the sleep state (720) to the active state (730), based on detection of the signal from the base unit 102, the power control circuit 210 continues resetting its timer 218 based on user stimulus, as done in the sleep state (720). Thus, continued user stimulus causes the power control circuit 210 to leave the wireless headset 100 fully functional in the active state (730). The present invention provides methods and apparatus allowing the wireless headset 100 to conveniently transition from a non-functional inactive state to a fully functional active state, based on its detection of certain user stimulus. In a preferred embodiment, the wireless headset 100 transitions from the inactive state to the intermediate sleep state, thereby conserving power. Upon detection of the carrier or the wake-up signal from the base unit 102, the wireless headset 100 transitions from the sleep state to the fully functional active state. The wireless headset 100 includes a sensor 220 for detecting the user stimulus. As the sensor 220 may be a motion sensor, a vibration sensor, an attitude sensor, or a proximity sensor, the specific user stimulus may include the user moving and/or placing the wireless headset 100 upon their

Claims	Prior Art
	body. The operation of the wireless headset 100 in accordance with the present invention admits tremendous flexibility with respect to implementation. As noted, many different circuit implementations may provide the inventive features of the present invention. These implementations may include hardware and software, and can reflect varying degrees of integration between the functional circuit blocks discussed. Indeed, all such variations for providing a wireless headset 100 that automatically controls its power consumption or operating state based on detection of a user stimulus are within the scope of the present invention. A POSITA would have been motivated to combine an accelerometer into the Jabra BT800, with reasonable expectation of success, for the reasons explained above for claims 12–15, for example, to save power when the headset is not being worn. *Supra* claims 12–15. A POSITA would have looked to Irvin '332 because Irvin '332 describes a headset integrated with sensors used to monitor motion, such as an accelerometer. Irvin '332, 5:8–11 ("Movement may be detected based on vibration or by sensing acceleration, such as with an accelerometer"). And a POSITA would have been motivated to implement other sensors that would have indicated whether or not Griffin '456s second communication module was in use. A POSITA would have been motivated to implement an accelerometer because a POSITA would have realized that accelerometers were inexpensive and compact types of motion sensors, which would have been important in headset devices where space was limited. A POSITA would have reasonably expected success in combining Irvin '332's being worn sensors into the Jabra BT800 because accelerometers were conventional components that operate in Irvin '322's headset which is analogous to the Jabra BT800. Thus, using Irvin '332's acceleration sensor as the motion sensor in the Jabra BT800 would have used known features according to their known functions (known accelerometers), to achieve predictable results (Jabra BT800 includes an accelerometer). To the extent that the Jabra BT800 and Irvin '332 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800 and Irvin '332, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
38[pre]. A system, comprising:	The Jabra BT800 expressly or inherently discloses "[a] system." For example: *See* above at claim 1[pre]. To the extent that the Jabra BT800 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.

Claims	Prior Art
[38a] a head-worn personal electronic apparatus, including at least:	The Jabra BT800 expressly or inherently discloses "a head-worn personal electronic apparatus, including at least." For example: *See* above at claim [1a]. To the extent that the Jabra BT800 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[38b] a head-worn structure configured to be worn by a user;	The Jabra BT800 expressly or inherently discloses "a head-worn structure configured to be worn by a user." For example: *See* above at claim [1b]. To the extent that the Jabra BT800 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[38c] a speaker at least partially contained within the head-worn structure, the speaker being configured to be at or adjacent to an ear of the user when the head-worn structure is being worn by the user;	The Jabra BT800 expressly or inherently discloses "a speaker at least partially contained within the head-worn structure, the speaker being configured to be at or adjacent to an ear of the user when the head-worn structure is being worn by the user." For example: *See* above at claim [1c]. To the extent that the Jabra BT800 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[38d] a motion detector at least partially contained within the head-worn structure and configured to provide motion data pertaining to the head-worn personal electronic apparatus;	The Jabra BT800, Irvin '332, and Iuliis '007, expressly or inherently disclose "a motion detector at least partially contained within the head-worn structure and configured to provide motion data pertaining to the head-worn personal electronic apparatus." For example: Irvin discloses a "wireless headset" (wireless wearable device) including an "accelerometer" to detect "[m]ovement" (example of the claimed motion sensor). The following citations show examples of where the Irvin '332 discloses this limitation. Irvin '332 at Abstract A wireless headset for use with a separate communications device, such as a cellular telephone, includes automatic on/off capabilities to maximize battery life. By detecting a user's interaction, such as picking up the headset or placing it upon the user's body, the wireless headset automatically transitions from an

Claims	Prior Art
	inactive state to an active state. Techniques for automatic headset enabling include but are not limited to motion sensors, attitude or position sensors, proximity sensors, and contact sensors. These techniques may be used individually or in any combination. An internal timer allows the wireless headset to return to its inactive state a defined interval after cessation of movement or removal of the wireless headset. Including an optional sleep state further optimizes battery life. In the sleep state, only a portion of the wireless headset circuitry is enabled. Rather than transitioning from inactive to active, the headset transitions from inactive to sleep. In sleep, the headset periodically monitors for a signal from the separate communications device. Upon detection of such a signal, the wireless headset transitions to its active state, thereby providing full functionality to the user. Irvin '332 at 2:16–34 The present invention includes both a method and apparatus allowing a wireless headset to automatically control its operating state to minimize power consumption, thereby maximizing the life of its power source, such as a battery. The wireless headset serves as a communication accessory to a base unit, such as a cellular telephone. When not in use, the wireless headset reverts to an inactive state and draws essentially no power. A power control circuit imparts automatic enabling capability to the wireless headset. Preferably, the power control circuit employs a sensor responsive to a natural stimulus associated with a person preparing to use the wireless headset. The wireless headset may sense motion, physical orientation, or user proximity. Sensing techniques include but are not limited to micro-electro-mechanical-systems (MEMS), mercury switches, attitude switches, and IR or acoustic proximity sensors. In some embodiments, the wireless headset transitions from the inactive state to an active state in response to a user picking it up or mounting the wireless headset upon their head. Irvin '332 at 5:1–23 Because the wireless headset 100 of the present invention automatically enables and disables its communication functions based on use, the sensor 220 may be based on a variety of technologies. In general, its purpose is to provide a signal responsive to a natural stimulus associated with use of the headset by a user. Movement or vibration of the wireless headset 100, or placement of the wireless headset 100 upon the user's body indicates usage. Movement may be detected based on vibration or by sensing acceleration, such as with an accelerometer. Mechanical or liquid-based switches represent alternate mechanisms for sensing movement. In such switches, movement causes an electrical connection to be established between contact pairs. Further, the particular sensor 220 employed may be tuned or configured such that only stimulus consistent with actual use actuates the sensor, thus avoiding inadvertent or unintended enabling of the wireless headset 100. In such configurations, the sensor 220

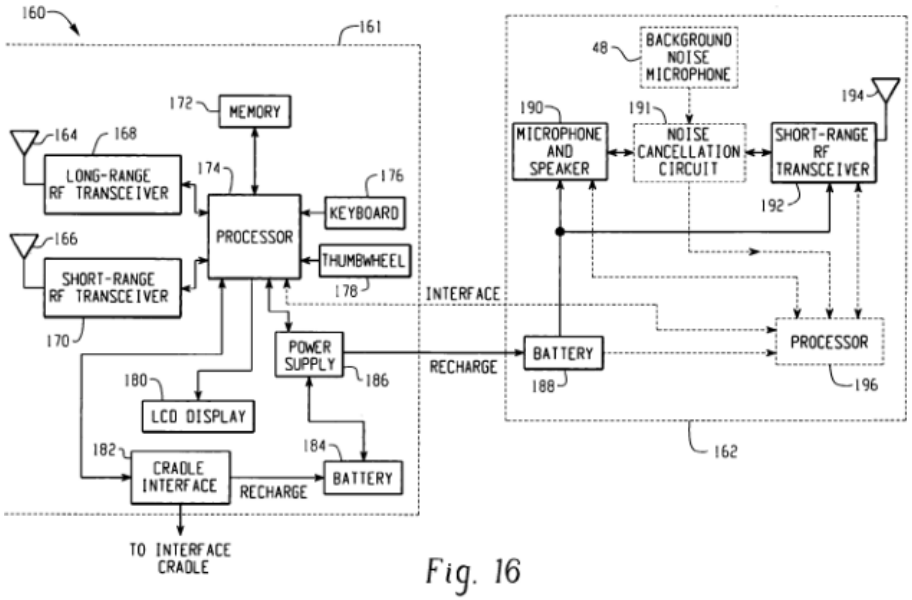
Claims	Prior Art
	preferably employs output conditioning that prevents assertion of the sensor output signal for stimulus below a defined threshold. Alternatively, the power control circuit 210 may include such conditioning as part of its interface to the sensor 220. FIGS. 4A–4D illustrate possible sensor embodiments. Irvin '332 at 5:25–52 In FIG. 4A, the power control circuit 210 is operatively associated with a MEMS device, with the MEMS device functioning as the sensor 220. Devices based on MEMS technology may be responsive to general vibration or motion, or may be configured to respond only to specific acceleration along defined axes. As MEMS devices may easily include output conditioning electronics, the sensitivity or responsiveness of the sensor 220 incorporating the MEMS device may be tailored such that the sensor output signal is asserted only for motion or vibration above a certain threshold. A typical MEMS employs modified microelectronics fabrication techniques and includes small mechanical elements responsive to movement or vibration, such as cantilever beams formed by selectively etching a silicon wafer. In a preferred embodiment of the present invention, sensor 220 includes a MEMS device simultaneously fulfilling the requirements of low power consumption, relative low-cost, and adequate signal discrimination. In this context, signal discrimination means that the sensor 220 is not prone to nuisance assertions of its sensor output signal caused by minute movement or vibration. Although the body of work associated with MEMS technology is quite comprehensive, significant insight into the basic structures and techniques of MEMS technology may be gained from U.S. Pat. No. 5,659,195 to Kaiser et al., U.S. Pat. No. 5,663,507 to Westervelt et al., and U.S. Pat. No. 5,76,480 to Pister, the disclosures of which are incorporated herein by reference. Irvin '332 at 5:53–6:2 FIG. 4B illustrates the power control circuit 210 coupled to a liquid-based switch functioning as the sensor 220. The sensor 220 may be a mercury-filled switch, or may employ other conductive liquids. Depending upon its configuration, the sensor 220, implemented as a liquid-based switch, may function as a motion sensor or as an attitude sensor. As a motion sensor, the sensor 220 includes first and second contacts disposed in a manner such that motion of the contained liquid places the first and second contacts in electrical connection. As an attitude sensor, sensor 220 includes first and second contacts disposed in a manner such that one or more specific physical orientations of the wireless headset 100 causes the contained liquid in sensor 220 to place the first and second contacts in electrical connection. The power control circuit 210 connects to the first and second contacts of sensor 220, and is responsive to the electrical connection completed by the contained liquid.

Claims	Prior Art
	Irvin ’332 at 8:11–50 FIGS. 6 and 7 illustrate operation of the wireless headset 100. FIG. 6 is a state diagram for one exemplary embodiment of the present invention. When the wireless headset 100 is not in use, it automatically enters an inactive state (610). As explained, this inactive state may constitute disconnecting the communications circuit 230 from the power source 240, or may simply represent placing the communications circuit 230 in a non-functional, low-power condition. Absent user stimulus, such as motion of the wireless headset 100 or placement of the wireless headset 100 upon the user's body, the wireless headset 100 remains in the inactive state (610). In response to user stimulus, as detected by sensor 220, the power control circuit 210 enables the communications circuit 230, with this enabling representing a transition from the inactive state to an active state (620). Upon entering the active state, the power control circuit 210 initializes and starts the timer 218. The timer 218 incrementally counts from a starting value to an ending value, with the progression from starting to ending values representing a defined interval of time. Upon expiration of the timer 218, the power control circuit 210 disables the communications circuit 230. This interval of time may be preprogrammed to a convenient value, or may be selectable based on input from the base unit 102. For example, a timeout interval of five minutes may provide a reasonable compromise between user convenience and battery life. While in the active state (620), the power control circuit 210 resets the timer 218 based on the reassertion or continued assertion of the sensor output signal from sensor 220. Such resetting prevents expiration of the timer 218 and, as such, causes the power control circuit 210 to leave the communications or headset circuit 230 enabled. Thus, the power control circuit 210 is designed to leave the wireless headset 100 in the active state (620) while the wireless headset is in use by a user. Absent user stimulus, the timer 218 of power control circuit 210 expires, thereby causing the wireless headset 100 to transition from the active state (620) to the inactive state (610) based on the power control circuit 210 disabling the communications circuit 230. Irvin ’332 at 9:13–65 Upon detecting the carrier signal or wake-up signal from the base unit 102, as indicated by the link signal shown in FIG. 7, the wireless headset 100 transitions from the sleep state (720) to the active state (730). To further reduce power consumption, the wireless headset 100 may only monitor for the external signal on a periodic basis. If the wireless headset 100 is configured to monitor for the external signal on a periodic basis and the base unit 102 is configured to emit a periodic wake-up signal, the periodic monitoring of the wireless headset 100 is set such that its monitoring frequency is not an integer multiple of the wake-up signal frequency. Upon causing the wireless headset 100 to transition from the inactive state (710) to the sleep state (720), the power control circuit 210 initializes and starts the timer 218. While in the sleep state (720), subsequent or continued assertion of the sensor output signal from the sensor 220 causes the power control circuit 210 to reset its timer 218. Absent such user stimulus, the timer

Claims	Prior Art
	218 expires and the power control circuit 210 disables the communications circuit 230. After transitioning from the sleep state (720) to the active state (730), based on detection of the signal from the base unit 102, the power control circuit 210 continues resetting its timer 218 based on user stimulus, as done in the sleep state (720). Thus, continued user stimulus causes the power control circuit 210 to leave the wireless headset 100 fully functional in the active state (730). The present invention provides methods and apparatus allowing the wireless headset 100 to conveniently transition from a non-functional inactive state to a fully functional active state, based on its detection of certain user stimulus. In a preferred embodiment, the wireless headset 100 transitions from the inactive state to the intermediate sleep state, thereby conserving power. Upon detection of the carrier or the wake-up signal from the base unit 102, the wireless headset 100 transitions from the sleep state to the fully functional active state. The wireless headset 100 includes a sensor 220 for detecting the user stimulus. As the sensor 220 may be a motion sensor, a vibration sensor, an attitude sensor, or a proximity sensor, the specific user stimulus may include the user moving and/or placing the wireless headset 100 upon their body. The operation of the wireless headset 100 in accordance with the present invention admits tremendous flexibility with respect to implementation. As noted, many different circuit implementations may provide the inventive features of the present invention. These implementations may include hardware and software, and can reflect varying degrees of integration between the functional circuit blocks discussed. Indeed, all such variations for providing a wireless headset 100 that automatically controls its power consumption or operating state based on detection of a user stimulus are within the scope of the present invention. Iuliis ’007 discloses “connector unit 102 may also include sensors such as a heart monitor, light sensor, temperature sensor, motion sensor (e.g., accelerometer), etc. that provide external information about the user” (example of the claimed a motion detector at least partially contained within the head-worn structure and configured to provide motion data pertaining to the head-worn personal electronic apparatus). Iuliis ’007 at 9:62–10:2 The connector unit 102 may also include sensors such as a heart monitor, light sensor, temperature sensor, motion sensor (e.g., accelerometer), etc. that provide external information about the user or the user's surroundings that can be used by the handheld electronic device. Examples of sensors that can be used may be found in U.S. patent application Ser. Nos. 10/402,311, 10/997,479, 60/658,777, and 60/663,345, which are herein incorporated by reference.

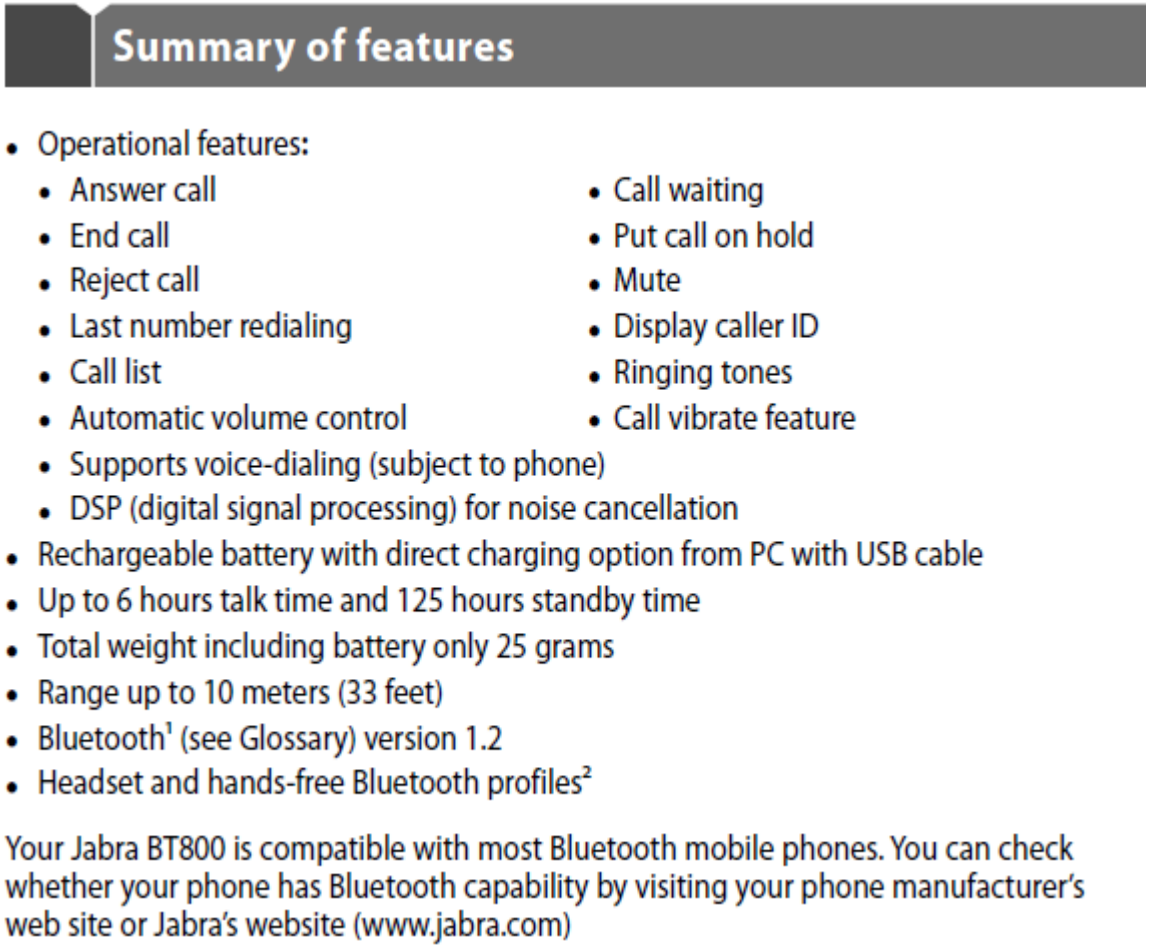
Claims	Prior Art
	A POSITA would have been motivated to combine the Jabra BT800 with Irvin '332, and Jabra BT800 with Iuliis '007, to reach a motion sensor, and reasonably expected success in doing so, at least for the same reasons explained for claims [18h], [35h], and claim 37. *Supra* claims [18h], [35h], 37. To the extent that the Jabra BT800, Irvin '332, and Iuliis '007 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Irvin '332, and Iuliis '007, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[38e] a first microphone at least partially contained within the head-worn structure, the first microphone being positioned to pick up at least audio input from at least the user;	The Jabra BT800, Phonak Perseo, Griffin '456, and Miller '585 expressly or inherently disclose "a first microphone at least partially contained within the head-worn structure, the first microphone being positioned to pick up at least audio input from at least the user." For example: *See* above at claim [10a]. To the extent that the Jabra BT800, Griffin '456, and Miller '585 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Griffin '456, and Miller '585, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[38f] a second microphone at least partially contained within the head-worn structure, the second microphone being positioned to pick up at least environmental audio input associated with an environment around the head-worn personal electronic apparatus;	The Jabra BT800, Phonak Perseo, Griffin '456, and Miller '585 expressly or inherently disclose "a second microphone at least partially contained within the head-worn structure, the second microphone being positioned to pick up at least environmental audio input associated with an environment around the head-worn personal electronic apparatus." For example: *See* above at claim [18e]. To the extent that the Jabra BT800, Phonak Perseo, Griffin '456, and Miller '585 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Phonak Perseo, Griffin '456, and Miller '585, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[38g] a touch sensitive surface at least partially contained within the head-worn structure and configured to sense a touch input associated with the user, wherein the sensed touch input operating to at least alter operation of the head-	The Jabra BT800, Hollemans '490, Zadesky '230, and Iuliis '007 expressly or inherently disclose "a touch sensitive surface at least partially contained within the head-worn structure and configured to sense a touch input associated with the user, wherein the sensed touch input operating to at least alter operation of the head-worn electronic personal audio apparatus." For example: *See* above at claim 2.

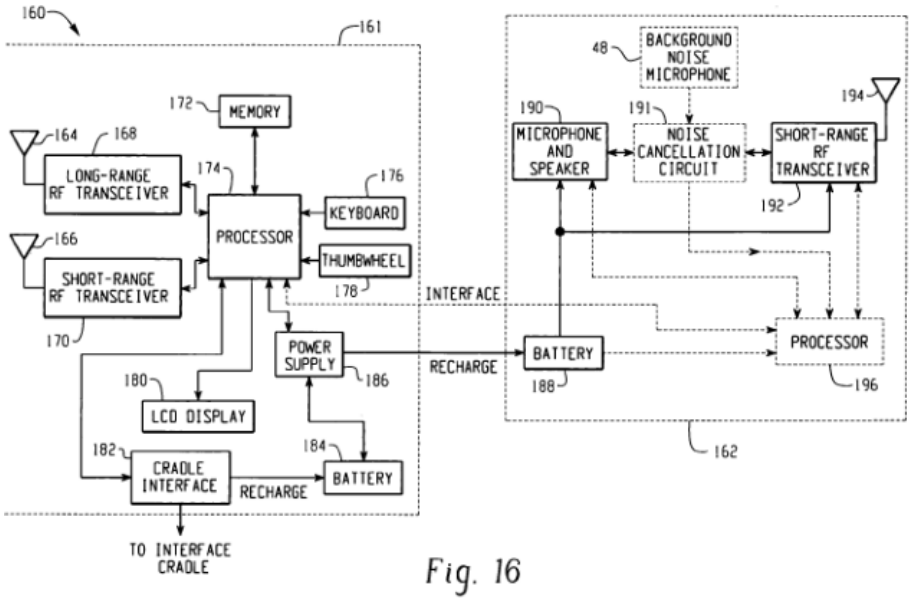
Claims	Prior Art
worn electronic personal audio apparatus;	To the extent that the Jabra BT800, Hollemans '490, Zadesky '230, and Iuliis '007 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Hollemans '490, Zadesky '230, and Iuliis '007 those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[38h] a rechargeable battery contained within the head-worn structure;	The Jabra BT800 expressly or inherently discloses "a rechargeable battery contained within the head-worn structure." For example: *See* above at claim [1e]. To the extent that the Jabra BT800 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[38i] electronic circuitry contained within the head-worn structure, the electronic circuitry being electrically connected to at least the rechargeable battery;	The Jabra BT800 expressly or inherently discloses "electronic circuitry contained within the head-worn structure, the electronic circuitry being electrically connected to at least the rechargeable battery." For example: On information and belief, the Jabra BT800 includes electronic circuitry connected to at least the rechargeable battery. Griffin '456 discloses a "processor" and "noise cancellation circuit" (example of the claimed electronic circuitry) that is electrically connected to a rechargeable "battery," as shown in Figure 16, for example. *Supra* [1f]. The following citations show examples of where the Griffin '456 discloses this limitation.

Claims	Prior Art
	Griffin ’456 at Figure 16  Fig. 16 Griffin ’456 at [0023]–[0025] FIG. 16 is an exemplary electrical block diagram of the multi-module communication devices shown in FIGS. 1-15; FIG. 17 illustrates one contemplated implementation of the communication device described above; FIG. 18 illustrates a further embodiment of a communication device that includes wireless communication between the device modules and a third module, such as an RF interface cradle; and Griffin ’456 at [0053] FIG. 16 is an exemplary electrical block diagram 160 of the multi-module communication devices shown in FIGS. 1-15. Another type of communication device that could be modified for use with this system is described in co-pending U.S. patent applications Ser. Nos. 09/106,585, 09/344,432, 09/543,231, 09/634,774 and 09/663,972. These applications, which are co-owned with the present application, are hereby incorporated herein by reference. The communication devices described in these applications include only a single wireless RF component for communicating over a single communication path to a long-range wireless network. The devices shown in FIGS. 1-15 are similar to these devices in that they can communicate over a long-range wireless network, but also preferably include an RF interface for

Claims	Prior Art
	communicating over a short-range wireless network or link. To the extent that Jabra BT800 and Griffin ’456 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[38j] wireless communication circuitry at least partially contained within the head-worn structure, the wireless communication circuitry being electrically connected to at least the rechargeable battery; and	The Jabra BT800 expressly or inherently discloses “wireless communication circuitry at least partially contained within the head-worn structure, the wireless communication circuitry being electrically connected to at least the rechargeable battery.” For example: *See* above at claim [1g]. To the extent that the Jabra BT800 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[38k] at least one conductive element at least partially included within the head-worn structure, the at least one conductive element being at least partially exposed to enable interconnection therewith, the at least one conductive element being electrically connected to at least the rechargeable battery; and	The Jabra BT800, Jabra FreeSpeak, and Griffin ’456 expressly or inherently disclose “at least one conductive element at least partially included within the head-worn structure, the at least one conductive element being at least partially exposed to enable interconnection therewith, the at least one conductive element being electrically connected to at least the rechargeable battery.” For example: *See* above at claim [1h]. To the extent that the Jabra BT800, Jabra FreeSpeak, and Griffin ’456 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Jabra FreeSpeak, and Griffin ’456, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[38l] a charging apparatus having at least a charging connector,	The Jabra BT800, Jabra FreeSpeak, Griffin ’456 expressly or inherently disclose “a charging apparatus having at least a charging connector.” For example: *See* above at claim [1i]. To the extent that the Jabra BT800, Jabra FreeSpeak, and Griffin ’456 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Jabra FreeSpeak, and Griffin ’456, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.

Claims	Prior Art
[38m] wherein on placement of the head-worn personal electronic apparatus in the charging apparatus, electrical connection results at least from the at least one conductive element connecting with the charging connector, and thereby the rechargeable battery of the head-worn personal electronic apparatus is able to be recharged while the head-worn personal electronic apparatus is placed in the charging apparatus.	The Jabra BT800, Jabra FreeSpeak, and Griffin '456 expressly or inherently disclose "wherein on placement of the head-worn personal electronic apparatus in the charging apparatus, electrical connection results at least from the at least one conductive element connecting with the charging connector, and thereby the rechargeable battery of the head-worn personal electronic apparatus is able to be recharged while the head-worn personal electronic apparatus is placed in the charging apparatus." For example: *See* above at claim [1j]. To the extent that the Jabra BT800, Jabra FreeSpeak, and Griffin '456 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Jabra FreeSpeak, and Griffin '456, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[39a] A system as recited in claim 38, wherein the head-worn personal electronic apparatus comprises: wherein the electronic circuitry is configured to process the audio input from at least the user via the first microphone to remove at least a portion of the environmental audio input associated with the environment picked up via the second microphone, and	The Jabra BT800, Griffin '456, and Miller '585 expressly or inherently disclose "wherein the head-worn personal electronic apparatus comprises: wherein the electronic circuitry is configured to process the audio input from at least the user via the first microphone to remove at least a portion of the environmental audio input associated with the environment picked up via the second microphone." For example: On information and belief, the Jabra BT800 discloses [39a] for the same reasons explained for [18h] and [35h], which both also recite "the electronic circuitry being configured to at least process the audio input from at least the user via the first microphone to remove at least a portion of the environmental audio input associated with the environment picked up via the second microphone." *Supra* claims [18h], [35h]. The following citations show examples of where the Jabra BT800 discloses this limitation.

Claims	Prior Art
	Jabra BT800 User Manual at Page 3  **Summary of features** • Operational features: • Answer call • End call • Reject call • Last number redialing • Call list • Automatic volume control • Call waiting • Put call on hold • Mute • Display caller ID • Ringing tones • Call vibrate feature • Supports voice-dialing (subject to phone) • DSP (digital signal processing) for noise cancellation • Rechargeable battery with direct charging option from PC with USB cable • Up to 6 hours talk time and 125 hours standby time • Total weight including battery only 25 grams • Range up to 10 meters (33 feet) • Bluetooth[1] (see Glossary) version 1.2 • Headset and hands-free Bluetooth profiles[2] Your Jabra BT800 is compatible with most Bluetooth mobile phones. You can check whether your phone has Bluetooth capability by visiting your phone manufacturer's web site or Jabra's website (www.jabra.com) Griffin '456 discloses [39a] for the same reasons explained for [18h] and [35h], which both also recite "the electronic circuitry being configured to at least process the audio input from at least the user via the first microphone to remove at least a portion of the environmental audio input associated with the environment picked up via the second microphone." *Supra* claims [18h], [35h]. The following citations show examples of where the Griffin '456 discloses this limitation.

Claims	Prior Art
	Griffin ’456 at Figure 16  Fig. 16 Griffin ’456 at [0032]–[0033] FIG. 4 is a top perspective view of the second communication module 14 shown in FIGS. 1 and 2. The second communication module 14 is preferably a voice communication device that includes a speaker 14a, a main body 14b, a boom 14c and a microphone 14d. Operationally, the speaker 14a is placed in the ear of a communication device user with the boom 14c extending towards the user's mouth. To avoid rotational movement of the second communication module 14 while the speaker 14a is in the user's ear, the center of gravity of the module 14 should preferably be as close to the speaker 14a as possible. Thus, any relatively heavy components located inside the main body portion 14b should preferably be located adjacent the speaker 14a. In this manner, moments about the speaker are minimized, and the second communication module 14 should remain substantially stationary while the speaker is in the communication device user's ear. Optimally, the length of the boom portion 14c should be maximized such that the microphone 14d is located in the proximity of the communication device user's mouth when the module 14 is in use. The moment about the speaker 14a, however, increases in proportion to the length of the boom 14c. Thus, in order to maintain stability, the length of the boom 14c may not be sufficient to position the microphone 14d adjacent to a user's mouth. The microphone 14d will, therefore, likely receive not only a user's speech, but also undesired noise signals from a multitude of sources, such as other speakers in the vicinity

Claims	Prior Art
	or car engine noise. In order to reduce this background noise, the second communication module preferably 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 '456 at [0051] FIGS. 15a and 15b show one alternative design 120 for the second communication module. FIG. 15a shows a top perspective view of the alternative second communication module 120. FIG. 15b shows a side perspective view of the alternative second communication module 120. The alternative communication module 120 preferably includes a housing 128, a speaker 120a, a microphone 120d and a switch 126. The housing 121 preferably includes a substantially oval-shaped top profile, and indentations 122 and 124 that define handles by which a user may grasp and hold the second communication module 120. In addition, the housing 121 preferably has a main body portion with two sections: an upper section 120b that lies substantially to one side of the speaker 120a; and a lower section 120c that lies substantially on the opposite side of the speaker 120a. The microphone 120d is preferably located at a distal end of the lower section 120c. The switch 126 is preferably located on a top portion of the housing 121 and operates similarly to the switch 54 shown in FIG. 5. The module may also include an additional microphone adapted to receive background noise for use in executing noise cancellation operations for the desired but corrupted voice or audio signals received at microphone 120d. Griffin '456 at [0056] The second communication module 162 is preferably an RF-enabled ear-piece that may be connected to (both mechanically and electrically) the first communication module 161 as described above. The second communication module 162 preferably includes a microphone and a speaker 190, a short-range wireless transceiver 192, an antenna 194, a rechargeable battery 188, and possibly an integral processor 196. The second communication module 162 may also include a background noise microphone 48 and a noise cancellation circuit 191 as described above with reference to FIG. 4. When the second communication module 162 is placed into the first communication module 161, a shared secret can be exchanged between the two wireless components of the communication device 160 so that any communications between the first and second communication modules 161/162 may be encrypted. Also, the rechargeable battery 188 of the second module 162 may be recharged by the battery 184 of the first communication module 161 through power supply recharging circuitry 186 when the two modules are in electrical contact.

Claims	Prior Art
	Miller ’585 discloses that the “use of more than one microphone in various positions to improve sound pickup directionality allows the wearer's voice to be sensed more clearly and extraneous background noises to more easily be canceled” (example of the claimed wireless wearable device configured to cancel at least a portion of the sound captured by the another microphone to produce the audio outputs). The following citations show examples of where the Miller ’585 discloses this limitation. Miller ’585 at [0048] To assist picking up the wearer's voice, housing 124 is located on earstem 104 to be close to the wearer's mouth. In other instances, however, housing 124 is located elsewhere on eyeglasses 100 (e.g., on support loop 118, on a frame surrounding one of the lenses (FIG. 4)). In FIG. 1, microphone housing 124 is shown extending from temple portion 116. In other instances in which temple portion 116 is sufficiently large, or the microphone is sufficiently small, housing 124 is coextensive with temple portion 116 so that there is no significant change in the cross section of the earstem in the microphone housing portion. Making the microphone housing coextensive with the shape of the earstem reduces accidental wear on or breakage of the housing. Additional microphones are used in some embodiments to improve sound pickup quality. Such additional microphones are placed in various positions, such as on the same earstem, the opposite earstem, or on a frame supporting the lenses. The use of more than one microphone in various positions to improve sound pickup directionality allows the wearer's voice to be sensed more clearly and extraneous background noises to more easily be canceled. Consequently, enhanced directionality improves performance of, for example, voice recognition software executed by digital signal processors described below, and improves the quality of the wearer's voice for remote conversation or for recording as dictation. Miller ’585 at [0065] FIG. 11 is a side cutaway view showing a microphone mounting embodiment. Microphone 1102 is shown positioned within microphone housing 124. One microphone terminal 1104 is coupled to wire 910. Another microphone terminal 1106 is coupled to wire 912. Microphone case opening 1108 to the microphone pickup element is positioned to be aligned with opening 126 in earstem 104. Openings 126, 1108 are oriented to pick up the sound originating from the wearer's mouth. It is known that microphone directionality is achieved by various microphone case shapes and various positions of openings allowing primary and secondary sound pressure to reach the microphone pickup element (e.g., holes positioned on opposite sides of the microphone casing). Therefore, microphone opening 1108 and earstem opening 126 are illustrative of microphone 1102 directionality that picks up the user's voice while attenuating

Claims	Prior Art
	background noise (i.e., directional microphone pointed at the wearer's mouth). Miller ’585 at [0079] FIGS. 19A and 19B illustrate microphone directionality in embodiments of eyeglasses 1502. As seen in FIG. 19A, lower directional opening 1808 provides a primary pickup zone 1902 towards the wearer's mouth. Upper directional opening 1520 provides a secondary pickup zone 1904 up and away from the wearer in a direction from which little sound originates. FIG. 19B shows another view of zones 1902, 1904. FIG. 19B also shows a benefit of using two microphones symmetrically mounted on the eyeglasses. Primary pickup zones 1902 and 1906 may be additive, providing an additional boost over sounds detected in secondary pickup zones 1904 and 1908. Thus pickup of the wearer's voice is further enhanced while unwanted background noise is reduced. The one or more microphones may be used in combination with conventional noise cancellation software which is easily modified for use in these embodiments. Miller ’585 at [0089] DSP 2206 processes the BLUETOOTH stack software and applications software such as echo cancellation, voice recognition, command and control, speech compression, and speech synthesis. In one instance DSP 2206 is a Texas Instruments DSP part no. TMS320VC5402PGE100. In some instances DSP 2206 executes noise reduction software (e.g., echo canceling) that improves the sound quality originating at the one or more microphones mounted on the eyewear. Noise cancellation software is commercially available (e.g., from Texas Instruments, Incorporated), and modification of such software for this application is easily accomplished in light of this disclosure. A POSITA would have been motivated to combine the Jabra BT800 with Griffin ’456 and the Jabra BT800 with Miller ’585, and reasonably expected success in doing so, for the reasons explained above for [18h] and [35h]. *Supra* [18h], [35h]. To the extent that the Jabra BT800, Griffin ’456, and Miller ’585 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Griffin ’456, and Miller ’585, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[39b] wherein the head-worn personal electronic apparatus is configured to receive a voice input via the first microphone, determine	The Jabra BT800, Griffin ’456, and Miller ’585 expressly or inherently disclose “wherein the head-worn personal electronic apparatus is configured to receive a voice input via the first microphone, determine or

Claims	Prior Art
or receive a determination of a requested operation from the voice input using voice recognition, and control an operation by the head-worn personal electronic apparatus based on the requested operation.	receive a determination of a requested operation from the voice input using voice recognition, and control an operation by the head-worn personal electronic apparatus based on the requested operation." For example: *See* above at claim [10b]. To the extent that the Jabra BT800, Griffin '456, and Miller '585 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Griffin '456, and Miller '585, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
40. A system as recited in claim 39, wherein the head-worn personal electronic apparatus comprises: at least one magnetic element at least partially contained within the head-worn structure and configured to support a magnetic force that facilitates an electrical connection.	The Jabra BT800, Lowles '045, and Spitzer '456 expressly or inherently disclose "wherein the head-worn personal electronic apparatus comprises: at least one magnetic element at least partially contained within the head-worn structure and configured to support a magnetic force that facilitates an electrical connection." For example: *See* above at claim 9. To the extent that the Jabra BT800, Lowles '045, and Spitzer '456 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Lowles '045, and Spitzer '456, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[41a] A system as recited in claim 39, wherein the head-worn personal electronic apparatus comprises: a sensor at least partially contained within the head-worn structure and configured to sense data indicative of whether the head-worn personal electronic apparatus is being worn by the user,	The Jabra BT800 and Irvin '332 expressly or inherently disclose "wherein the head-worn personal electronic apparatus comprises: a sensor at least partially contained within the head-worn structure and configured to sense data indicative of whether the head-worn personal electronic apparatus is being worn by the user." For example: *See* above at claim 12. To the extent that the Jabra BT800 and Irvin '332 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800 and Irvin '332, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[41b] wherein the head-worn personal electronic apparatus is configured to at least alter operation of the head-worn personal electronic apparatus	The Jabra BT800 and Irvin '332 expressly or inherently disclose "wherein the head-worn personal electronic apparatus is configured to at least alter operation of the head-worn personal electronic apparatus based at least in part on the sensed data from the sensor." For example: *See* above at claim 26.

Claims	Prior Art
based at least in part on the sensed data from the sensor.	To the extent that the Jabra BT800 and Irvin ’332 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800 and Irvin ’332, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[42a]. A system as recited in claim 41, wherein the head-worn personal electronic apparatus is configured to support audio output to the user via the speaker, and	The Jabra BT800 expressly or inherently discloses “[a] system as recited in claim 41, wherein the head-worn personal electronic apparatus is configured to support audio output to the user via the speaker.” For example: *See* above at claim 4[a]. To the extent that the Jabra BT800 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[42b] wherein the operation of the head-worn personal electronic apparatus being altered concerns control of the audio output being provided to the user.	The Jabra BT800 and Irvin ’332 expressly or inherently disclose “wherein the operation of the head-worn personal electronic apparatus being altered concerns control of the audio output being provided to the user.” For example: *See* above at claim [14b]. To the extent that the Jabra BT800 and Irvin ’332 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800 and Irvin ’332, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[43a]. A system as recited in claim 41, wherein the head-worn personal electronic apparatus is configured to support a low power operational mode, and	The Jabra BT800 and Irvin ’332 expressly or inherently disclose “[a] system as recited in claim 41, wherein the head-worn personal electronic apparatus is configured to support a low power operational mode.” For example: *See* above at claim [15a]. To the extent that the Jabra BT800 and Irvin ’332 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800 and Irvin ’332, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[43b] wherein the operation of the head-worn personal electronic apparatus being altered concerns	The Jabra BT800 and Irvin ’332 expressly or inherently disclose “wherein the operation of the head-worn personal electronic apparatus being altered concerns operation of the head-worn personal electronic apparatus in the low power operational mode.” For example:

Claims	Prior Art
operation of the head-worn personal electronic apparatus in the low power operational mode.	*See* above at claim [15b]. To the extent that the Jabra BT800 and Irvin '332 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800 and Irvin '332, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
44[pre]. A system, comprising:	The Jabra BT800 expressly or inherently discloses "[a] system." For example: *See* above at claim 1[pre]. To the extent that the Jabra BT800 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[44a] a head-worn personal electronic apparatus, including at least:	The Jabra BT800 expressly or inherently discloses "a head-worn personal electronic apparatus, including at least." For example: *See* above at claim [1a]. To the extent that the Jabra BT800 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[44b] a head-worn structure configured to be worn by a user;	The Jabra BT800 expressly or inherently discloses "a head-worn structure configured to be worn by a user." For example: *See* above at claim [1b]. To the extent that the Jabra BT800 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[44c] a speaker at least partially contained within the head-worn structure, the speaker being configured to be at or adjacent to an ear of the user when the head-worn structure is being worn by the user;	The Jabra BT800 expressly or inherently discloses "a speaker at least partially contained within the head-worn structure, the speaker being configured to be at or adjacent to an ear of the user when the head-worn structure is being worn by the user." For example: *See* above at claim [1c].

Claims	Prior Art
	To the extent that the Jabra BT800 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[44d] a motion detector at least partially contained within the head-worn structure and configured to provide motion data pertaining to the head-worn personal electronic apparatus;	The Jabra BT800, Irvin '332, and Iullis '007 expressly or inherently disclose "a motion detector at least partially contained within the head-worn structure and configured to provide motion data pertaining to the head-worn personal electronic apparatus." For example: *See* above at claim [38d]. To the extent that the Jabra BT800, Irvin '332, and Iuliis '007 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Irvin '332, and Iuliis '007, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[44e] a first microphone at least partially contained within the head-worn structure, the first microphone being positioned to pick up at least audio input from at least the user;	The Jabra BT800, Phonak Perseo, Griffin '456, and Miller '585 expressly or inherently disclose "a first microphone at least partially contained within the head-worn structure, the first microphone being positioned to pick up at least audio input from at least the user." For example: *See* above at claim [10a]. To the extent that the Jabra BT800, Phonak Perseo, Griffin '456, and Miller '585 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Phonak Perseo, Griffin '456, and Miller '585, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[44f] a second microphone at least partially contained within the head-worn structure;	The Jabra BT800, Phonak Perseo, Griffin '456, and Miller '585 expressly or inherently disclose "a second microphone at least partially contained within the head-worn structure." For example: *See* above at claim [18e]. To the extent that the Jabra BT800, Phonak Perseo, Griffin '456, and Miller '585 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Phonak Perseo, Griffin '456, and Miller '585, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[44g] a rechargeable battery contained within the head-worn structure;	The Jabra BT800 expressly or inherently discloses "a rechargeable battery contained within the head-worn structure." For example: *See* above at claim [1e].

Claims	Prior Art
	To the extent that the Jabra BT800 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[44h] electronic circuitry contained within the head-worn structure, the electronic circuitry being electrically connected to at least the rechargeable battery;	The Jabra BT800 and Griffin ’456 expressly or inherently disclose “electronic circuitry contained within the head-worn structure, the electronic circuitry being electrically connected to at least the rechargeable battery.” For example: *See* above at claim [38i]. To the extent that the Jabra BT800 and Griffin ’456 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800 and Griffin ’456, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[44i] wireless communication circuitry at least partially contained within the head-worn structure, the wireless communication circuitry being electrically connected to at least the rechargeable battery;	The Jabra BT800 expressly or inherently discloses “wireless communication circuitry at least partially contained within the head-worn structure, the wireless communication circuitry being electrically connected to at least the rechargeable battery.” For example: *See* above at claim [1g]. To the extent that the Jabra BT800 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[44j] a radiation emitter at least partially contained within the head-worn structure and configured to at least direct radiation towards the user when at least the head-worn structure of the head-worn personal electronic apparatus is being worn;	The Jabra BT800 and Irvin ’332 expressly or inherently disclose “a radiation emitter at least partially contained within the head-worn structure and configured to at least direct radiation towards the user when at least the head-worn structure of the head-worn personal electronic apparatus is being worn.” For example: Irvin ’332 discloses a “wireless headset” (example of the claimed head–worn structure) including an “active ... IR sensor” (example of the claimed radiation emitter), which a POSITA would have understood included an IR emitter and detector. A POSITA further would have understood that Irvin ’332’s “active ... IR sensor” directed radiation towards the user when at least the head-worn structure of the head-worn personal electronic apparatus is being worn because it “provides indication that a user has placed the wireless headset 100 upon their body” (example of the claimed configured to at least direct radiation towards the user when at least the head-worn structure of the head-worn personal electronic apparatus is being worn). The following citations show examples of where the Irvin ’332 discloses this limitation.

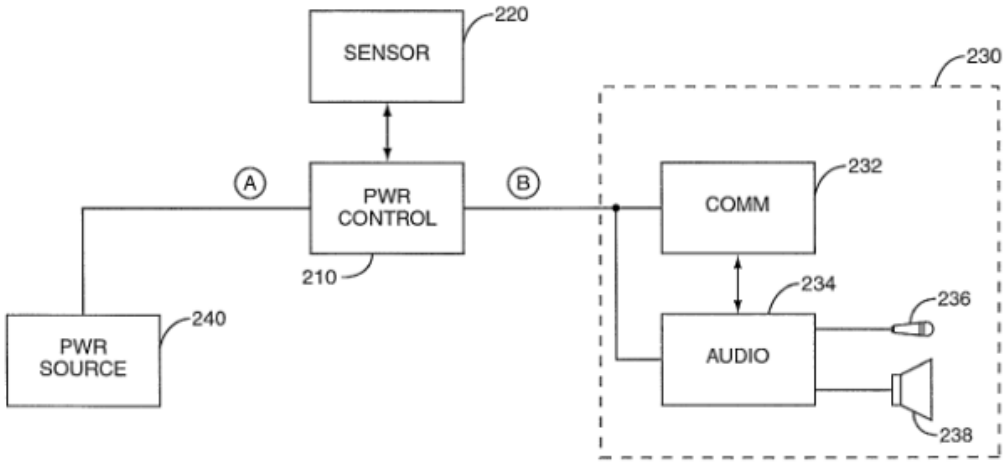
Claims	Prior Art
	Irvin ’332 at 6:20–33 FIG. 4D illustrates the power control circuit 210 coupled with a proximity sensor 220 not based on mechanical actuation. The proximity sensor 220 may be an active or passive IR sensor, may be a resistive or other type of thermal sensor, or may be an acoustic sensor. As a proximity sensor, sensor 220 provides indication that a user has placed the wireless headset 100 upon their body. As such, any of the foregoing or other presence sensing techniques may be used to implement sensor 220. Preferably, when configured as a proximity sensor, sensor 220 requires minimal power and provides a sensor output signal based on proximity to the user's body. Depending upon the sensing technology chosen, the control circuit 210 may be required to periodically stimulate sensor 220 to generate a detection response. A POSITA would have been motivated to combine the Jabra BT800 with Irvin ’332 to implement the IR emitters of Irvin ’332 into the Jabra BT800 because active IR sensors are effective and advantageous means for precisely detecting the presence of a user at close range. A POSITA would have been motivated to include an IR emitter in order to implement an active IR sensor, as explained for [44k] below. *Infra* [44k]. A POSITA would have recognized the advantage of including a radiation emitter because active IR sensors (including an IR emitter and detector) were more accurate and less prone to false alarms than passive IR detectors (those that include only a detector). A POSITA would have reasonably expected success in implementing the IR emitters of Irvin ’332 into the Jabra BT800 because active IR sensors were well–known, routine, and conventional components that Irvin ’332 implements on an analogous headset device. Moreover, the prior art, such as Jannard ’488, teaches that “[s]uch techniques are well known to those of skill in the art, and include methods of measuring reflected flight off of a wearer’s eye.” Jannard ’488, 23, 60–67; see also Abreu ’960. To the extent that the Jabra BT800 and Irvin ’332 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800 and Irvin ’332, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[44k] a radiation detector at least partially contained within the head-worn structure and configured to detect at least a portion of the radiation from the radiation emitter that is reflected back from the user when at least	The Jabra BT800, Irvin ’332, and Iuliis ’007 expressly or inherently disclose “a radiation detector at least partially contained within the head-worn structure and configured to detect at least a portion of the radiation from the radiation emitter that is reflected back from the user when at least the head-worn structure of the head-worn personal electronic apparatus is being worn.” For example: Irvin ’332 discloses a “wireless headset” (example of the claimed head–worn structure) including an “active ... IR sensor” (example of the claimed radiation emitter), A POSITA would have understood an “active ... IR sensor” included an IR emitter and a detector to detect the reflected radiation, hence making it

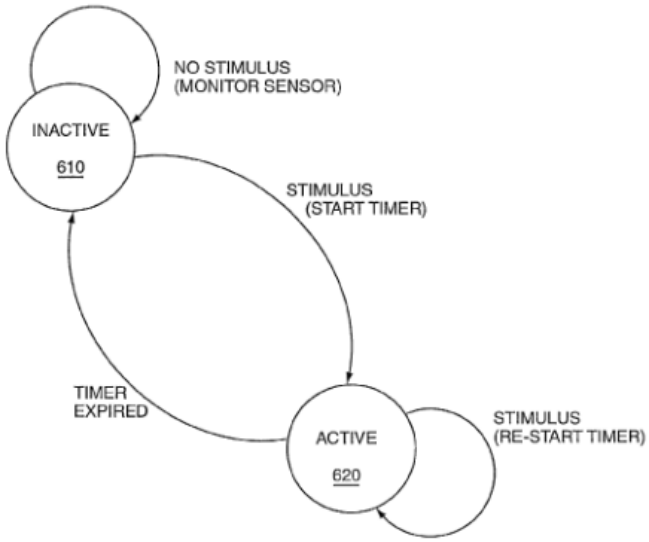
Claims	Prior Art
the head-worn structure of the head-worn personal electronic apparatus is being worn; and	an active IR sensor versus a passive IR sensor (example of the claimed configured to detect at least a portion of the radiation from the radiation emitter that is reflected back from the user when at least the head-worn structure of the head-worn personal electronic apparatus is being worn). The following citations show examples of where the Irvin ’332 discloses this limitation. Irvin ’332 at 6:20–33 FIG. 4D illustrates the power control circuit 210 coupled with a proximity sensor 220 not based on mechanical actuation. The proximity sensor 220 may be an active or passive IR sensor, may be a resistive or other type of thermal sensor, or may be an acoustic sensor. As a proximity sensor, sensor 220 provides indication that a user has placed the wireless headset 100 upon their body. As such, any of the foregoing or other presence sensing techniques may be used to implement sensor 220. Preferably, when configured as a proximity sensor, sensor 220 requires minimal power and provides a sensor output signal based on proximity to the user's body. Depending upon the sensing technology chosen, the control circuit 210 may be required to periodically stimulate sensor 220 to generate a detection response. Iuliis ’007 discloses “connector unit 102 may also include sensors such as a heart monitor, light sensor, temperature sensor, motion sensor (e.g., accelerometer), etc. that provide external information about the user” (example of the claimed a radiation detector at least partially contained within the head-worn structure and configured to detect at least a portion of the radiation from the radiation emitter that is reflected back from the user when at least the head-worn structure of the head-worn personal electronic apparatus is being worn). Iuliis ’007 at 9:62–10:2 The connector unit 102 may also include sensors such as a heart monitor, light sensor, temperature sensor, motion sensor (e.g., accelerometer), etc. that provide external information about the user or the user's surroundings that can be used by the handheld electronic device. Examples of sensors that can be used may be found in U.S. patent application Ser. Nos. 10/402,311, 10/997,479, 60/658,777, and 60/663,345, which are herein incorporated by reference. A POSITA would have been motivated to combine the Jabra BT800 with Irvin ’322 to implement the IR detectors of Irvin ’332, and reasonably expected success in doing so, for the same reasons explained for [44j] above. *Supra* [44j]. A POSITA further would have expected success because a POSITA would have known, as taught by the art such as Jannard ’488, that “[s]uch techniques are well known to those of skill in the art, and include methods of measuring reflected flight off of a wearer’s eye.” Jannard ’488, 23, 60–67.

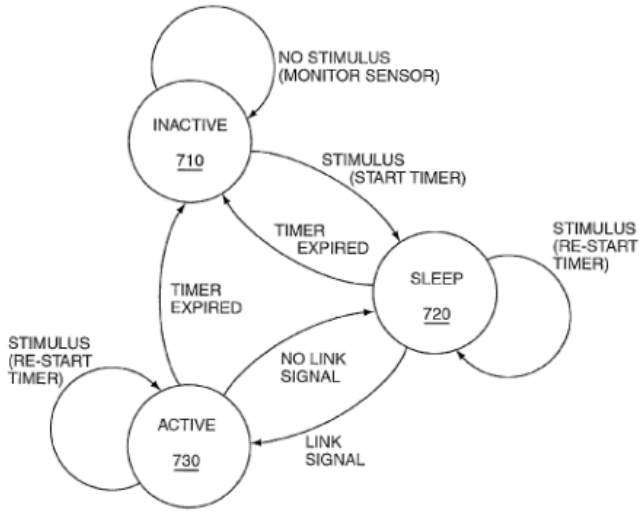
Claims	Prior Art
	A POSITA would have been motivated to combine the Jabra BT800 with Iuliis '007, and reasonably expected success in doing so, for the same reasons discussed above for the other references. To the extent that that the Jabra BT800, Irvin '332, and Iuliis '007 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Irvin '332, and Iuliis '007 those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[44l] at least one conductive element at least partially included within the head-worn structure, the at least one conductive element being at least partially exposed to enable interconnection therewith, the at least one conductive element being electrically connected to at least the rechargeable battery; and	The Jabra BT800, Jabra FreeSpeak, and Griffin '456 expressly or inherently disclose "at least one conductive element at least partially included within the head-worn structure, the at least one conductive element being at least partially exposed to enable interconnection therewith, the at least one conductive element being electrically connected to at least the rechargeable battery." For example: *See* above at claim [1h]. To the extent that the Jabra BT800, Jabra FreeSpeak, and Griffin '456 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Jabra FreeSpeak, and Griffin '456, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[44m] a charging apparatus having at least a charging connector,	The Jabra BT800, Jabra FreeSpeak, and Griffin '456 expressly or inherently disclose "a charging apparatus having at least a charging connector." For example: *See* above at claim [1i]. To the extent that the Jabra BT800, Jabra FreeSpeak, and Griffin '456 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800 and Griffin '456, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[44n] wherein on placement of the head-worn personal electronic apparatus in the charging apparatus, electrical connection results at least from the at least one conductive element connecting with the charging connector, and thereby the rechargeable battery of	The Jabra BT800, Jabra FreeSpeak, and Griffin '456 expressly or inherently disclose "wherein on placement of the head-worn personal electronic apparatus in the charging apparatus, electrical connection results at least from the at least one conductive element connecting with the charging connector, and thereby the rechargeable battery of the head-worn personal electronic apparatus is able to be recharged while the head-worn personal electronic apparatus is placed in the charging apparatus." For example: *See* above at claim [1j].

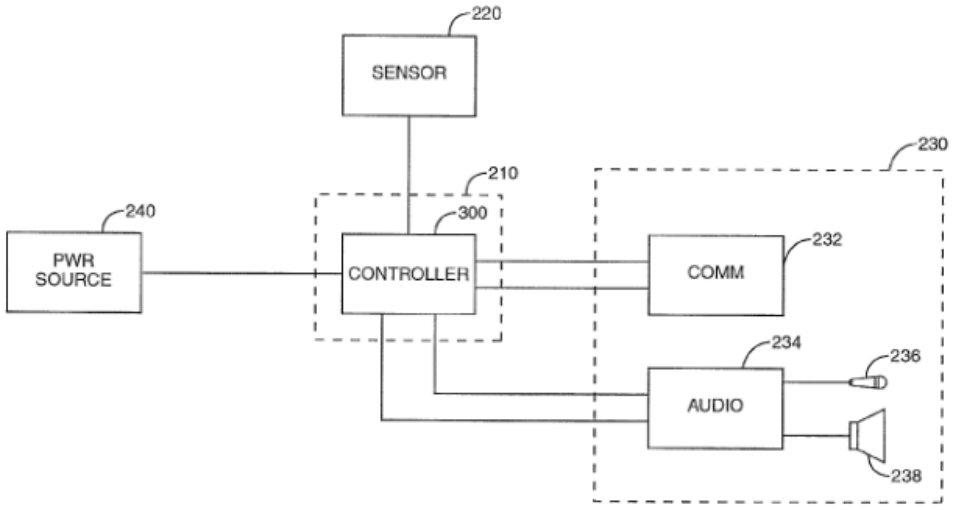
Claims	Prior Art
the head-worn personal electronic apparatus is able to be recharged while the head-worn personal electronic apparatus is placed in the charging apparatus.	To the extent that the Jabra BT800, Jabra FreeSpeak, and Griffin ’456 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Jabra FreeSpeak, and Griffin ’456, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[45a] A system as recited in claim 44, wherein the radiation detector is operatively connected to the electronic circuitry, and	The Jabra BT800 and Irvin ’332 expressly or inherently disclose “wherein electronic circuitry within the head-worn structure is configured to facilitate determining whether the head-worn structure of the head-worn personal electronic apparatus is being worn by the user.” For example: Irvin ’332’s “power control circuit 220” (example of the claimed electronic circuitry) is “coupled with” (example of the claimed operatively connected to) “with a proximity sensor 220,” which includes the “active ... IR sensor” (example of the claimed radiation detector). The following citations show examples of where the Irvin ’332 discloses this limitation. Irvin ’332 at 6:20–33 FIG. 4D illustrates the power control circuit 210 coupled with a proximity sensor 220 not based on mechanical actuation. The proximity sensor 220 may be an active or passive IR sensor, may be a resistive or other type of thermal sensor, or may be an acoustic sensor. As a proximity sensor, sensor 220 provides indication that a user has placed the wireless headset 100 upon their body. As such, any of the foregoing or other presence sensing techniques may be used to implement sensor 220. Preferably, when configured as a proximity sensor, sensor 220 requires minimal power and provides a sensor output signal based on proximity to the user's body. Depending upon the sensing technology chosen, the control circuit 210 may be required to periodically stimulate sensor 220 to generate a detection response. A POSITA would have been motived to combine the Jabra BT800 with Irvin ’332 to implement Irvin ’332’s radiation detectors connected to electronic circuitry into the Jabra BT800 to allow the processing elements to access the data from the radiation detector. A POSITA would have reasonably expected success for the reasons explained in [44j] and [44k]. *Supra* [44j] and [44k]. A POSITA further would have been motivated to electrically connect the radiation detector to the electronic circuitry to enable the electronic circuitry, such as the processor, to receive the data from the radiation detector and use it to make determinations. This would have required no more than conventional circuit connection techniques to yield predictable results. To the extent that the Jabra BT800 and Irvin ’332 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the

Claims	Prior Art
	Jabra BT800 and Irvin ’332, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[45b] wherein electronic circuitry within the head-worn structure is configured to facilitate determining whether the head-worn structure of the head-worn personal electronic apparatus is being worn by the user.	The Jabra BT800 and Irvin ’332 expressly or inherently disclose “wherein electronic circuitry within the head-worn structure is configured to facilitate determining whether the head-worn structure of the head-worn personal electronic apparatus is being worn by the user.” For example: Irvin ’332’s “proximity sensor, sensor 220,” which may be an “active ... IR sensor,” “provides indication that a user has placed the wireless headset 100 upon their body” (example of the claimed wherein electronic circuitry within the head-worn structure is configured to facilitate determining whether the head-worn structure of the head-worn personal electronic apparatus is being worn by the user). The following citations show examples of where the Irvin ’332 discloses this limitation. Irvin ’332 at Abstract A wireless headset for use with a separate communications device, such as a cellular telephone, includes automatic on/off capabilities to maximize battery life. By detecting a user's interaction, such as picking up the headset or placing it upon the user's body, the wireless headset automatically transitions from an inactive state to an active state. Techniques for automatic headset enabling include but are not limited to motion sensors, attitude or position sensors, proximity sensors, and contact sensors. These techniques may be used individually or in any combination. An internal timer allows the wireless headset to return to its inactive state a defined interval after cessation of movement or removal of the wireless headset. Including an optional sleep state further optimizes battery life. In the sleep state, only a portion of the wireless headset circuitry is enabled. Rather than transitioning from inactive to active, the headset transitions from inactive to sleep. In sleep, the headset periodically monitors for a signal from the separate communications device. Upon detection of such a signal, the wireless headset transitions to its active state, thereby providing full functionality to the user.

Claims	Prior Art
	Irvin ’332 at Figure 2A  *FIG. 2A*

Claims	Prior Art
	Irvin ’332 at Figure 6  *FIG. 6*

Claims	Prior Art
	Irvin ’332 at Figure 7  FIG. 7

Claims	Prior Art
	Irvin ’332 at Figure 8  *FIG. 8* Irvin ’332 at 2:16–34 The present invention includes both a method and apparatus allowing a wireless headset to automatically control its operating state to minimize power consumption, thereby maximizing the life of its power source, such as a battery. The wireless headset serves as a communication accessory to a base unit, such as a cellular telephone. When not in use, the wireless headset reverts to an inactive state and draws essentially no power. A power control circuit imparts automatic enabling capability to the wireless headset. Preferably, the power control circuit employs a sensor responsive to a natural stimulus associated with a person preparing to use the wireless headset. The wireless headset may sense motion, physical orientation, or user proximity. Sensing techniques include but are not limited to micro-electro-mechanical-systems (MEMS), mercury switches, attitude switches, and IR or acoustic proximity sensors. In some embodiments, the wireless headset transitions from the inactive state to an active state in response to a user picking it up or mounting the wireless headset upon their head. Irvin ’332 at 2:35–50 In a more sophisticated embodiment, the wireless headset may transition from the inactive state to a sleep state, based on user stimulus. In the sleep state, only a portion of the headset circuitry is enabled, thus

Claims	Prior Art
	conserving power. While in the sleep state, the wireless headset monitors for a signal from the base unit, and, when such a signal is received, it transitions from the sleep state to the active state. Further, once active, the wireless headset can continue to monitor for communications link activity. Thus, if communications with the base unit cease, the wireless headset can return to the sleep state and periodically check for resumed communications activity. A timer allows the wireless headset to automatically return to the inactive state subsequent to use. Cessation of movement or detected removal of the wireless headset from the user's head can indicate termination of use and trigger a timed power-down. Irvin '332 at 3:53–4:2 The communications circuit 230 provides wireless headset functionality, including audio input and output and wireless communications with the base unit 102. The communications or headset circuit 230 includes a wireless communications interface 232 providing a wireless communications link for sending and receiving information to and from the base unit 102. The wireless communications interface 232 includes at least a wireless receiver and wireless transmitter. Audio input received via microphone 236 is conditioned by the audio interface 234 and then processed by the communications interface 232 for transmittal to the base unit 102. Audio information received from the base unit 102 is processed by the wireless communications interface 232 and then conditioned in the audio interface 234 for output to a user via speaker 238. With reference to FIG. 1A or 1B, the microphone 236 may be located in microphone pickup 120, and speaker 238 may be located in earpiece 130. Irvin '332 at 4:39–67 FIG. 3A illustrates a preferred embodiment for the wireless headset 100. In FIG. 3A, the power control circuit 210 independently enables the wireless communications interface 232 and audio interface 234. Thus, select portions of communications circuit 230 may be enabled in response to the sensor output signal. Once the wireless communications interface 232 is enabled, it provides a signal, termed a "link active" signal, to the power control circuit 210 based on detecting a wireless signal received from the base unit 102. Based on the assertion of the link active signal, the power control circuit 210 enables the audio interface 234. FIG. 3B provides more functional details regarding the power control circuit 210 of FIG. 3A. Again, the control logic 212 is responsive to a sensor output signal from sensor 220. However, in response to the sensor output signal, the control logic 212 turns on switch 214 while switch 216 remains off, thereby enabling the wireless communications interface 232. As with the previously discussed embodiment, power control circuit 210 includes the timer 218. In a preferred embodiment, control logic 212 starts timer 218 upon enabling the wireless communications interface 232, and resets timer 218 based on subsequent

Claims	Prior Art
	or continued assertion of the sensor output signal. If the wireless communications interface 232 asserts the link active signal, the control logic 212 turns on switch 216, thereby enabling the audio interface 234. If the timer 218 expires, the control logic 212 turns off switches 214 and 216, thereby disabling the wireless communications interface 232 and the audio interface 234. Irvin '332 at 5:1–23 Because the wireless headset 100 of the present invention automatically enables and disables its communication functions based on use, the sensor 220 may be based on a variety of technologies. In general, its purpose is to provide a signal responsive to a natural stimulus associated with use of the headset by a user. Movement or vibration of the wireless headset 100, or placement of the wireless headset 100 upon the user's body indicates usage. Movement may be detected based on vibration or by sensing acceleration, such as with an accelerometer. Mechanical or liquid-based switches represent alternate mechanisms for sensing movement. In such switches, movement causes an electrical connection to be established between contact pairs. Further, the particular sensor 220 employed may be tuned or configured such that only stimulus consistent with actual use actuates the sensor, thus avoiding inadvertent or unintended enabling of the wireless headset 100. In such configurations, the sensor 220 preferably employs output conditioning that prevents assertion of the sensor output signal for stimulus below a defined threshold. Alternatively, the power control circuit 210 may include such conditioning as part of its interface to the sensor 220. FIGS. 4A–4D illustrate possible sensor embodiments. Irvin '332 at 5:25–52 In FIG. 4A, the power control circuit 210 is operatively associated with a MEMS device, with the MEMS device functioning as the sensor 220. Devices based on MEMS technology may be responsive to general vibration or motion, or may be configured to respond only to specific acceleration along defined axes. As MEMS devices may easily include output conditioning electronics, the sensitivity or responsiveness of the sensor 220 incorporating the MEMS device may be tailored such that the sensor output signal is asserted only for motion or vibration above a certain threshold. A typical MEMS employs modified microelectronics fabrication techniques and includes small mechanical elements responsive to movement or vibration, such as cantilever beams formed by selectively etching a silicon wafer. In a preferred embodiment of the present invention, sensor 220 includes a MEMS device simultaneously fulfilling the requirements of low power consumption, relative low-cost, and adequate signal discrimination. In this context, signal discrimination means that the sensor 220 is not prone to nuisance assertions of its sensor output signal caused by minute movement or vibration. Although the body of work associated with MEMS technology is quite comprehensive, significant insight into the basic structures and techniques of MEMS technology may be gained from U.S. Pat. No. 5,659,195 to Kaiser et al., U.S. Pat. No. 5,663,507

Claims	Prior Art
	to Westervelt et al., and U.S. Pat. No. 5,76,480 to Pister, the disclosures of which are incorporated herein by reference. Irvin '332 at 5:53–6:2 FIG. 4B illustrates the power control circuit 210 coupled to a liquid-based switch functioning as the sensor 220. The sensor 220 may be a mercury-filled switch, or may employ other conductive liquids. Depending upon its configuration, the sensor 220, implemented as a liquid-based switch, may function as a motion sensor or as an attitude sensor. As a motion sensor, the sensor 220 includes first and second contacts disposed in a manner such that motion of the contained liquid places the first and second contacts in electrical connection. As an attitude sensor, sensor 220 includes first and second contacts disposed in a manner such that one or more specific physical orientations of the wireless headset 100 causes the contained liquid in sensor 220 to place the first and second contacts in electrical connection. The power control circuit 210 connects to the first and second contacts of sensor 220, and is responsive to the electrical connection completed by the contained liquid. Irvin '332 at 6:20–33 FIG. 4D illustrates the power control circuit 210 coupled with a proximity sensor 220 not based on mechanical actuation. The proximity sensor 220 may be an active or passive IR sensor, may be a resistive or other type of thermal sensor, or may be an acoustic sensor. As a proximity sensor, sensor 220 provides indication that a user has placed the wireless headset 100 upon their body. As such, any of the foregoing or other presence sensing techniques may be used to implement sensor 220. Preferably, when configured as a proximity sensor, sensor 220 requires minimal power and provides a sensor output signal based on proximity to the user's body. Depending upon the sensing technology chosen, the control circuit 210 may be required to periodically stimulate sensor 220 to generate a detection response. Irvin '332 at 7:1–8:3 Note that the foregoing diagrams illustrate various configurations for the present invention, with these configurations allowing the wireless headset 100 to automatically enable and disable select portions of its electronic circuitry based on user stimulus. Enabling and disabling may constitute physical connection and disconnection of power between the power source 240 and the communications or headset circuit 230, or may simply represent the assertion and de-assertion of specific enabling signals. Thus, the foregoing diagrams should not be construed as limiting in any way regarding the specific circuit implementation of the wireless headset 100. FIGS. 2–5 illustrate functional diagrams and these various functions may have corresponding separate circuit elements, or may be included in integrated fashion in

Claims	Prior Art
	one or more devices. For example, a microprocessor in a sleep or halt mode may be directly connected to a battery and configured to wake up in response to an input from the sensor 220. Thus, the microprocessor could serve as the power control circuit 210, as well as providing functions related to the communications interface 232 and audio interface 234. FIGS. 8 and 9, in particular, illustrate an exemplary embodiment of the present invention wherein an integrated controller provides the functionality of the power control circuit 210. In FIG. 8, the power control circuit 210 includes an integrated controller 300. The integrated controller 300 provides power control functionality associated with the timer 218, switches 214 and 216, and control logic 212. In this embodiment, the controller 300 provides both power and control/signal interconnections for the wireless communications interface 232 and audio interface 234. The controller 300 independently enables the wireless communications interface 232 and audio interface 234 in response to the sensor output signal from sensor 220. As with other embodiments, the controller 300 may enable both the wireless communication interface 232 and audio interface 234 in response to the sensor output signal, or may only enable the wireless communications interface 232, or a portion thereof. In this latter, case, the controller 300 enables the audio interface 234 in response to receiving the link signal from the enabled portion of the wireless communications interface 232. FIG. 9 provides more detail regarding the controller 300 shown in FIG. 8. A main power controller 310 provides power/control outputs to power controllers 330 and 340, which, in turn, provide power control outputs to the wireless communications interface 232 and audio interface 234, respectively. The main power controller 310 additionally interfaces with and provides power to a functional controller 350 and a sensor controller 320. The functional controller 350 provides signal and control interfaces with both the wireless communications interface 232 and the audio interface 234. In an exemplary embodiment, the main power controller initially enables only the sensor controller 320. Then, in response to the sensor output signal, the main controller 310 enables power controller 330 at least a portion of the functional controller 350. In response, power controller 330 enables at least a portion of the wireless communications interface 232. Then, in response to receiving the link signal from the wireless communications interface 232—the link signal may be received via the functional controller 350—the main power controller 310 enables the power controller 340 associated with the audio interface 234. The power controllers 330 and 340 may comprise FET switches combined with control logic responsive to control signals asserted by the main power controller 310, the functional controller 350, and/or the wireless communications interface 232. Irvin ’332 at 8:11–50 FIGS. 6 and 7 illustrate operation of the wireless headset 100. FIG. 6 is a state diagram for one exemplary embodiment of the present invention. When the wireless headset 100 is not in use, it automatically enters an inactive state (610). As explained, this inactive state may constitute disconnecting the communications

Claims	Prior Art
	circuit 230 from the power source 240, or may simply represent placing the communications circuit 230 in a non-functional, low-power condition. Absent user stimulus, such as motion of the wireless headset 100 or placement of the wireless headset 100 upon the user's body, the wireless headset 100 remains in the inactive state (610). In response to user stimulus, as detected by sensor 220, the power control circuit 210 enables the communications circuit 230, with this enabling representing a transition from the inactive state to an active state (620). Upon entering the active state, the power control circuit 210 initializes and starts the timer 218. The timer 218 incrementally counts from a starting value to an ending value, with the progression from starting to ending values representing a defined interval of time. Upon expiration of the timer 218, the power control circuit 210 disables the communications circuit 230. This interval of time may be preprogrammed to a convenient value, or may be selectable based on input from the base unit 102. For example, a timeout interval of five minutes may provide a reasonable compromise between user convenience and battery life. While in the active state (620), the power control circuit 210 resets the timer 218 based on the reassertion or continued assertion of the sensor output signal from sensor 220. Such resetting prevents expiration of the timer 218 and, as such, causes the power control circuit 210 to leave the communications or headset circuit 230 enabled. Thus, the power control circuit 210 is designed to leave the wireless headset 100 in the active state (620) while the wireless headset is in use by a user. Absent user stimulus, the timer 218 of power control circuit 210 expires, thereby causing the wireless headset 100 to transition from the active state (620) to the inactive state (610) based on the power control circuit 210 disabling the communications circuit 230. Irvin ’332 at 8:51–9:12 FIG. 7 is a state diagram for a preferred embodiment of the present invention. Operation of the wireless headset 100 illustrated in FIG. 7 is distinguished from that shown in FIG. 6 by inclusion of an additional state, denoted as the sleep state (720). Inclusion of the sleep state provides an additional opportunity to control the power consumption of wireless headset 100 based on specific operating conditions. As before, the wireless headset 100 remains in the inactive state (710) absent user stimulus. Upon detecting user stimulus, the wireless headset 100 transitions from the inactive state (710) to the sleep state (720). In this state, the power control circuit 210 enables only a portion of the communications circuit 230. Specifically, the power control circuit 210 enables the wireless communications interface 232 or a portion thereof. Then, using a signal output from the wireless communications interface 232, the power control circuit 210 determines if the base unit 102 is active, or if the base unit 102 is attempting to communicate with the wireless headset 100. In some embodiments, the wireless headset 100 infers activity by detecting, via its wireless communications interface, a carrier signal from the base unit 102. In other embodiments, the wireless headset detects activity based on receiving a “wake-up” signal from the base unit 102. Note that monitoring for the base unit carrier signal may be performed continuously by the wireless headset 100

Claims	Prior Art
	while in the sleep state, or may be performed periodically; thereby further reducing sleep state power consumption. For periodic carrier monitoring, the wireless headset 100 may employ an exemplary monitoring interval of 0.5 seconds. Irvin '332 at 9:13–65 Upon detecting the carrier signal or wake-up signal from the base unit 102, as indicated by the link signal shown in FIG. 7, the wireless headset 100 transitions from the sleep state (720) to the active state (730). To further reduce power consumption, the wireless headset 100 may only monitor for the external signal on a periodic basis. If the wireless headset 100 is configured to monitor for the external signal on a periodic basis and the base unit 102 is configured to emit a periodic wake-up signal, the periodic monitoring of the wireless headset 100 is set such that its monitoring frequency is not an integer multiple of the wake-up signal frequency. Upon causing the wireless headset 100 to transition from the inactive state (710) to the sleep state (720), the power control circuit 210 initializes and starts the timer 218. While in the sleep state (720), subsequent or continued assertion of the sensor output signal from the sensor 220 causes the power control circuit 210 to reset its timer 218. Absent such user stimulus, the timer 218 expires and the power control circuit 210 disables the communications circuit 230. After transitioning from the sleep state (720) to the active state (730), based on detection of the signal from the base unit 102, the power control circuit 210 continues resetting its timer 218 based on user stimulus, as done in the sleep state (720). Thus, continued user stimulus causes the power control circuit 210 to leave the wireless headset 100 fully functional in the active state (730). The present invention provides methods and apparatus allowing the wireless headset 100 to conveniently transition from a non-functional inactive state to a fully functional active state, based on its detection of certain user stimulus. In a preferred embodiment, the wireless headset 100 transitions from the inactive state to the intermediate sleep state, thereby conserving power. Upon detection of the carrier or the wake-up signal from the base unit 102, the wireless headset 100 transitions from the sleep state to the fully functional active state. The wireless headset 100 includes a sensor 220 for detecting the user stimulus. As the sensor 220 may be a motion sensor, a vibration sensor, an attitude sensor, or a proximity sensor, the specific user stimulus may include the user moving and/or placing the wireless headset 100 upon their body. The operation of the wireless headset 100 in accordance with the present invention admits tremendous flexibility with respect to implementation. As noted, many different circuit implementations may provide the inventive features of the present invention. These implementations may include hardware and software, and can reflect varying degrees of integration between the functional circuit blocks discussed. Indeed, all such variations for providing a wireless headset 100 that automatically controls its

Claims	Prior Art
	power consumption or operating state based on detection of a user stimulus are within the scope of the present invention. A POSITA would have been motived to combine the Jabra BT800 with Irvin '332 to implement the being worn determinations of Irvin '332 into the Jabra BT800, and reasonably expected success in doing so, for the reasons discussed at least in claims 12, 13, and [35g]. *Supra* claims 12, 13, [35g]. To the extent that the Jabra BT800 and Irvin '332 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800 and Irvin '332, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
46. A system as recited in claim 45, wherein the head-worn personal electronic apparatus comprises: at least one magnetic element at least partially contained within the head-worn structure and configured to support a magnetic force that facilitates an electrical connection.	The Jabra BT800, Lowles '045, and Jakob '001 expressly or inherently disclose "wherein electronic circuitry within the head-worn structure is configured to facilitate determining whether the head-worn structure of the head-worn personal electronic apparatus is being worn by the user." For example: *See* above at claim 9. To the extent that the Jabra BT800, Lowles '045, and Jakob '001 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Lowles '045, and Jakob '001, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
47. A system as recited in claim 45, wherein the head-worn personal electronic apparatus is configured to at least alter operation of the head-worn personal electronic apparatus based at least in part on the determination of whether the head-worn structure of the head-worn personal electronic apparatus is being worn by the user based on at least the motion data.	The Jabra BT800 and Irvin '332 expressly or inherently disclose "wherein electronic circuitry within the head-worn structure is configured to facilitate determining whether the head-worn structure of the head-worn personal electronic apparatus is being worn by the user." For example: Irvin '332 discloses that "[i]n response to user stimulus, as detected by sensor 220" (example of the claimed based at least in part on the determination of whether the head-worn structure of the head-worn personal electronic apparatus is being worn by the user), which may be from an "accelerometer" (example of the claimed based on at least the motion data), "the power control circuit 210" enables "a transition from the inactive state to an active state (620)" (example of the claimed at least alter operation of the head-worn personal electronic apparatus). The following citations show examples of where the Irvin '332 discloses this limitation. Irvin '332 at Abstract A wireless headset for use with a separate communications device, such as a cellular telephone, includes automatic on/off capabilities to maximize battery life. By detecting a user's interaction, such as picking up

Claims	Prior Art
	the headset or placing it upon the user's body, the wireless headset automatically transitions from an inactive state to an active state. Techniques for automatic headset enabling include but are not limited to motion sensors, attitude or position sensors, proximity sensors, and contact sensors. These techniques may be used individually or in any combination. An internal timer allows the wireless headset to return to its inactive state a defined interval after cessation of movement or removal of the wireless headset. Including an optional sleep state further optimizes battery life. In the sleep state, only a portion of the wireless headset circuitry is enabled. Rather than transitioning from inactive to active, the headset transitions from inactive to sleep. In sleep, the headset periodically monitors for a signal from the separate communications device. Upon detection of such a signal, the wireless headset transitions to its active state, thereby providing full functionality to the user. Irvin '332 at 2:16–34 The present invention includes both a method and apparatus allowing a wireless headset to automatically control its operating state to minimize power consumption, thereby maximizing the life of its power source, such as a battery. The wireless headset serves as a communication accessory to a base unit, such as a cellular telephone. When not in use, the wireless headset reverts to an inactive state and draws essentially no power. A power control circuit imparts automatic enabling capability to the wireless headset. Preferably, the power control circuit employs a sensor responsive to a natural stimulus associated with a person preparing to use the wireless headset. The wireless headset may sense motion, physical orientation, or user proximity. Sensing techniques include but are not limited to micro-electro-mechanical-systems (MEMS), mercury switches, attitude switches, and IR or acoustic proximity sensors. In some embodiments, the wireless headset transitions from the inactive state to an active state in response to a user picking it up or mounting the wireless headset upon their head. Irvin '332 at 2:35–50 In a more sophisticated embodiment, the wireless headset may transition from the inactive state to a sleep state, based on user stimulus. In the sleep state, only a portion of the headset circuitry is enabled, thus conserving power. While in the sleep state, the wireless headset monitors for a signal from the base unit, and, when such a signal is received, it transitions from the sleep state to the active state. Further, once active, the wireless headset can continue to monitor for communications link activity. Thus, if communications with the base unit cease, the wireless headset can return to the sleep state and periodically check for resumed communications activity. A timer allows the wireless headset to automatically return to the inactive state subsequent to use. Cessation of movement or detected removal of

Claims	Prior Art
	the wireless headset from the user's head can indicate termination of use and trigger a timed power-down. Irvin ’332 at 5:1–23 Because the wireless headset 100 of the present invention automatically enables and disables its communication functions based on use, the sensor 220 may be based on a variety of technologies. In general, its purpose is to provide a signal responsive to a natural stimulus associated with use of the headset by a user. Movement or vibration of the wireless headset 100, or placement of the wireless headset 100 upon the user's body indicates usage. Movement may be detected based on vibration or by sensing acceleration, such as with an accelerometer. Mechanical or liquid-based switches represent alternate mechanisms for sensing movement. In such switches, movement causes an electrical connection to be established between contact pairs. Further, the particular sensor 220 employed may be tuned or configured such that only stimulus consistent with actual use actuates the sensor, thus avoiding inadvertent or unintended enabling of the wireless headset 100. In such configurations, the sensor 220 preferably employs output conditioning that prevents assertion of the sensor output signal for stimulus below a defined threshold. Alternatively, the power control circuit 210 may include such conditioning as part of its interface to the sensor 220. FIGS. 4A–4D illustrate possible sensor embodiments. Irvin ’332 at 5:25–52 In FIG. 4A, the power control circuit 210 is operatively associated with a MEMS device, with the MEMS device functioning as the sensor 220. Devices based on MEMS technology may be responsive to general vibration or motion, or may be configured to respond only to specific acceleration along defined axes. As MEMS devices may easily include output conditioning electronics, the sensitivity or responsiveness of the sensor 220 incorporating the MEMS device may be tailored such that the sensor output signal is asserted only for motion or vibration above a certain threshold. A typical MEMS employs modified microelectronics fabrication techniques and includes small mechanical elements responsive to movement or vibration, such as cantilever beams formed by selectively etching a silicon wafer. In a preferred embodiment of the present invention, sensor 220 includes a MEMS device simultaneously fulfilling the requirements of low power consumption, relative low-cost, and adequate signal discrimination. In this context, signal discrimination means that the sensor 220 is not prone to nuisance assertions of its sensor output signal caused by minute movement or vibration. Although the body of work associated with MEMS technology is quite comprehensive, significant insight into the basic structures and techniques of MEMS technology may be gained from U.S. Pat. No. 5,659,195 to Kaiser et al., U.S. Pat. No. 5,663,507 to Westervelt et al., and U.S. Pat. No. 5,76,480 to Pister, the disclosures of which are incorporated herein

Claims	Prior Art
	by reference. Irvin ’332 at 5:53–6:2 FIG. 4B illustrates the power control circuit 210 coupled to a liquid-based switch functioning as the sensor 220. The sensor 220 may be a mercury-filled switch, or may employ other conductive liquids. Depending upon its configuration, the sensor 220, implemented as a liquid-based switch, may function as a motion sensor or as an attitude sensor. As a motion sensor, the sensor 220 includes first and second contacts disposed in a manner such that motion of the contained liquid places the first and second contacts in electrical connection. As an attitude sensor, sensor 220 includes first and second contacts disposed in a manner such that one or more specific physical orientations of the wireless headset 100 causes the contained liquid in sensor 220 to place the first and second contacts in electrical connection. The power control circuit 210 connects to the first and second contacts of sensor 220, and is responsive to the electrical connection completed by the contained liquid. Irvin ’332 at 6:20–33 FIG. 4D illustrates the power control circuit 210 coupled with a proximity sensor 220 not based on mechanical actuation. The proximity sensor 220 may be an active or passive IR sensor, may be a resistive or other type of thermal sensor, or may be an acoustic sensor. As a proximity sensor, sensor 220 provides indication that a user has placed the wireless headset 100 upon their body. As such, any of the foregoing or other presence sensing techniques may be used to implement sensor 220. Preferably, when configured as a proximity sensor, sensor 220 requires minimal power and provides a sensor output signal based on proximity to the user's body. Depending upon the sensing technology chosen, the control circuit 210 may be required to periodically stimulate sensor 220 to generate a detection response. Irvin ’332 at 7:1–8:3 Note that the foregoing diagrams illustrate various configurations for the present invention, with these configurations allowing the wireless headset 100 to automatically enable and disable select portions of its electronic circuitry based on user stimulus. Enabling and disabling may constitute physical connection and disconnection of power between the power source 240 and the communications or headset circuit 230, or may simply represent the assertion and de-assertion of specific enabling signals. Thus, the foregoing diagrams should not be construed as limiting in any way regarding the specific circuit implementation of the wireless headset 100. FIGS. 2–5 illustrate functional diagrams and these various functions may have corresponding separate circuit elements, or may be included in integrated fashion in one or more devices. For example, a microprocessor in a sleep or halt mode may be directly connected to

Claims	Prior Art
	a battery and configured to wake up in response to an input from the sensor 220. Thus, the microprocessor could serve as the power control circuit 210, as well as providing functions related to the communications interface 232 and audio interface 234. FIGS. 8 and 9, in particular, illustrate an exemplary embodiment of the present invention wherein an integrated controller provides the functionality of the power control circuit 210. In FIG. 8, the power control circuit 210 includes an integrated controller 300. The integrated controller 300 provides power control functionality associated with the timer 218, switches 214 and 216, and control logic 212. In this embodiment, the controller 300 provides both power and control/signal interconnections for the wireless communications interface 232 and audio interface 234. The controller 300 independently enables the wireless communications interface 232 and audio interface 234 in response to the sensor output signal from sensor 220. As with other embodiments, the controller 300 may enable both the wireless communication interface 232 and audio interface 234 in response to the sensor output signal, or may only enable the wireless communications interface 232, or a portion thereof. In this latter, case, the controller 300 enables the audio interface 234 in response to receiving the link signal from the enabled portion of the wireless communications interface 232. FIG. 9 provides more detail regarding the controller 300 shown in FIG. 8. A main power controller 310 provides power/control outputs to power controllers 330 and 340, which, in turn, provide power control outputs to the wireless communications interface 232 and audio interface 234, respectively. The main power controller 310 additionally interfaces with and provides power to a functional controller 350 and a sensor controller 320. The functional controller 350 provides signal and control interfaces with both the wireless communications interface 232 and the audio interface 234. In an exemplary embodiment, the main power controller initially enables only the sensor controller 320. Then, in response to the sensor output signal, the main controller 310 enables power controller 330 at least a portion of the functional controller 350. In response, power controller 330 enables at least a portion of the wireless communications interface 232. Then, in response to receiving the link signal from the wireless communications interface 232—the link signal may be received via the functional controller 350—the main power controller 310 enables the power controller 340 associated with the audio interface 234. The power controllers 330 and 340 may comprise FET switches combined with control logic responsive to control signals asserted by the main power controller 310, the functional controller 350, and/or the wireless communications interface 232. Irvin ’332 at 8:11–50 FIGS. 6 and 7 illustrate operation of the wireless headset 100. FIG. 6 is a state diagram for one exemplary embodiment of the present invention. When the wireless headset 100 is not in use, it automatically enters an inactive state (610). As explained, this inactive state may constitute disconnecting the communications circuit 230 from the power source 240, or may simply represent placing the communications circuit 230 in

Claims	Prior Art
	a non-functional, low-power condition. Absent user stimulus, such as motion of the wireless headset 100 or placement of the wireless headset 100 upon the user's body, the wireless headset 100 remains in the inactive state (610). In response to user stimulus, as detected by sensor 220, the power control circuit 210 enables the communications circuit 230, with this enabling representing a transition from the inactive state to an active state (620). Upon entering the active state, the power control circuit 210 initializes and starts the timer 218. The timer 218 incrementally counts from a starting value to an ending value, with the progression from starting to ending values representing a defined interval of time. Upon expiration of the timer 218, the power control circuit 210 disables the communications circuit 230. This interval of time may be preprogrammed to a convenient value, or may be selectable based on input from the base unit 102. For example, a timeout interval of five minutes may provide a reasonable compromise between user convenience and battery life. While in the active state (620), the power control circuit 210 resets the timer 218 based on the reassertion or continued assertion of the sensor output signal from sensor 220. Such resetting prevents expiration of the timer 218 and, as such, causes the power control circuit 210 to leave the communications or headset circuit 230 enabled. Thus, the power control circuit 210 is designed to leave the wireless headset 100 in the active state (620) while the wireless headset is in use by a user. Absent user stimulus, the timer 218 of power control circuit 210 expires, thereby causing the wireless headset 100 to transition from the active state (620) to the inactive state (610) based on the power control circuit 210 disabling the communications circuit 230. Irvin '332 at 8:51–9:12 FIG. 7 is a state diagram for a preferred embodiment of the present invention. Operation of the wireless headset 100 illustrated in FIG. 7 is distinguished from that shown in FIG. 6 by inclusion of an additional state, denoted as the sleep state (720). Inclusion of the sleep state provides an additional opportunity to control the power consumption of wireless headset 100 based on specific operating conditions. As before, the wireless headset 100 remains in the inactive state (710) absent user stimulus. Upon detecting user stimulus, the wireless headset 100 transitions from the inactive state (710) to the sleep state (720). In this state, the power control circuit 210 enables only a portion of the communications circuit 230. Specifically, the power control circuit 210 enables the wireless communications interface 232 or a portion thereof. Then, using a signal output from the wireless communications interface 232, the power control circuit 210 determines if the base unit 102 is active, or if the base unit 102 is attempting to communicate with the wireless headset 100. In some embodiments, the wireless headset 100 infers activity by detecting, via its wireless communications interface, a carrier signal from the base unit 102. In other embodiments, the wireless headset detects activity based on receiving a "wake-up" signal from the base unit 102. Note that monitoring for the base unit carrier signal may be performed continuously by the wireless headset 100 while in the sleep state, or may be performed periodically; thereby further reducing sleep state power

Claims	Prior Art
	consumption. For periodic carrier monitoring, the wireless headset 100 may employ an exemplary monitoring interval of 0.5 seconds. Irvin '332 at 9:13–65 Upon detecting the carrier signal or wake-up signal from the base unit 102, as indicated by the link signal shown in FIG. 7, the wireless headset 100 transitions from the sleep state (720) to the active state (730). To further reduce power consumption, the wireless headset 100 may only monitor for the external signal on a periodic basis. If the wireless headset 100 is configured to monitor for the external signal on a periodic basis and the base unit 102 is configured to emit a periodic wake-up signal, the periodic monitoring of the wireless headset 100 is set such that its monitoring frequency is not an integer multiple of the wake-up signal frequency. Upon causing the wireless headset 100 to transition from the inactive state (710) to the sleep state (720), the power control circuit 210 initializes and starts the timer 218. While in the sleep state (720), subsequent or continued assertion of the sensor output signal from the sensor 220 causes the power control circuit 210 to reset its timer 218. Absent such user stimulus, the timer 218 expires and the power control circuit 210 disables the communications circuit 230. After transitioning from the sleep state (720) to the active state (730), based on detection of the signal from the base unit 102, the power control circuit 210 continues resetting its timer 218 based on user stimulus, as done in the sleep state (720). Thus, continued user stimulus causes the power control circuit 210 to leave the wireless headset 100 fully functional in the active state (730). The present invention provides methods and apparatus allowing the wireless headset 100 to conveniently transition from a non-functional inactive state to a fully functional active state, based on its detection of certain user stimulus. In a preferred embodiment, the wireless headset 100 transitions from the inactive state to the intermediate sleep state, thereby conserving power. Upon detection of the carrier or the wake-up signal from the base unit 102, the wireless headset 100 transitions from the sleep state to the fully functional active state. The wireless headset 100 includes a sensor 220 for detecting the user stimulus. As the sensor 220 may be a motion sensor, a vibration sensor, an attitude sensor, or a proximity sensor, the specific user stimulus may include the user moving and/or placing the wireless headset 100 upon their body. The operation of the wireless headset 100 in accordance with the present invention admits tremendous flexibility with respect to implementation. As noted, many different circuit implementations may provide the inventive features of the present invention. These implementations may include hardware and software, and can reflect varying degrees of integration between the functional circuit blocks discussed. Indeed, all such variations for providing a wireless headset 100 that automatically controls its power consumption or operating state based on detection of a user stimulus are within the scope of the present invention.

Claims	Prior Art
	A POSITA would have been motivated to combine the Jabra BT800 with 'Irvin 332 to implement the being worn determinations of Irvin '332 into the Jabra BT800, and reasonably expected success in doing so, for the reasons explained for claim 26. *Supra* claim 26. Specifically, a POSITA would have understood that motion data indicated that the device was being worn by the user. *E.g.*, Irvin '332, 5:1–24 ("Movement or vibration of the wireless headset 100, or placement of the wireless headset 100 upon the user's body indicates usage."). To the extent that the Jabra BT800 and Irvin '332 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800 and Irvin '332, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[48a]. A system as recited in claim 47, wherein the head-worn personal electronic apparatus is configured to support audio output to the user via the speaker, and	The Jabra BT800 expressly or inherently discloses "[a] system as recited in claim 47, wherein the head-worn personal electronic apparatus is configured to support audio output to the user via the speaker." For example: *See* above at claim 4[a]. To the extent that the Jabra BT800 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[48b] wherein the operation of the head-worn personal electronic apparatus being altered concerns control of the audio output being provided to the user.	The Jabra BT800 and Irvin '332 expressly or inherently disclose "wherein the operation of the head-worn personal electronic apparatus being altered concerns control of the audio output being provided to the user." For example: Irvin '332 discloses [48b] for the same reasons explained for [42b] because one of Irvin '332's sensors is an "accelerometer" based on movement data. The following citations show examples of where the Irvin '332 discloses this limitation. Irvin '332 at 2:16–34 The present invention includes both a method and apparatus allowing a wireless headset to automatically control its operating state to minimize power consumption, thereby maximizing the life of its power source, such as a battery. The wireless headset serves as a communication accessory to a base unit, such as a cellular telephone. When not in use, the wireless headset reverts to an inactive state and draws essentially no power. A power control circuit imparts automatic enabling capability to the wireless headset. Preferably, the power control circuit employs a sensor responsive to a natural stimulus associated with a person preparing to use the wireless headset. The wireless headset may sense motion, physical orientation, or user proximity. Sensing techniques include but are not limited to micro-electro-mechanical-systems (MEMS), mercury switches, attitude switches, and IR or acoustic proximity sensors.

Claims	Prior Art
	In some embodiments, the wireless headset transitions from the inactive state to an active state in response to a user picking it up or mounting the wireless headset upon their head. Irvin '332 at 2:35–50 In a more sophisticated embodiment, the wireless headset may transition from the inactive state to a sleep state, based on user stimulus. In the sleep state, only a portion of the headset circuitry is enabled, thus conserving power. While in the sleep state, the wireless headset monitors for a signal from the base unit, and, when such a signal is received, it transitions from the sleep state to the active state. Further, once active, the wireless headset can continue to monitor for communications link activity. Thus, if communications with the base unit cease, the wireless headset can return to the sleep state and periodically check for resumed communications activity. A timer allows the wireless headset to automatically return to the inactive state subsequent to use. Cessation of movement or detected removal of the wireless headset from the user's head can indicate termination of use and trigger a timed power-down. Irvin '332 at 3:53–4:2 The communications circuit 230 provides wireless headset functionality, including audio input and output and wireless communications with the base unit 102. The communications or headset circuit 230 includes a wireless communications interface 232 providing a wireless communications link for sending and receiving information to and from the base unit 102. The wireless communications interface 232 includes at least a wireless receiver and wireless transmitter. Audio input received via microphone 236 is conditioned by the audio interface 234 and then processed by the communications interface 232 for transmittal to the base unit 102. Audio information received from the base unit 102 is processed by the wireless communications interface 232 and then conditioned in the audio interface 234 for output to a user via speaker 238. With reference to FIG. 1A or 1B, the microphone 236 may be located in microphone pickup 120, and speaker 238 may be located in earpiece 130. Irvin '332 at 4:39–67 FIG. 3A illustrates a preferred embodiment for the wireless headset 100. In FIG. 3A, the power control circuit 210 independently enables the wireless communications interface 232 and audio interface 234. Thus, select portions of communications circuit 230 may be enabled in response to the sensor output signal. Once the wireless communications interface 232 is enabled, it provides a signal, termed a "link active" signal, to the power control circuit 210 based on detecting a wireless signal received from the base unit 102. Based on the assertion of the link active signal, the power control circuit 210 enables the audio interface 234.

Claims	Prior Art
	FIG. 3B provides more functional details regarding the power control circuit 210 of FIG. 3A. Again, the control logic 212 is responsive to a sensor output signal from sensor 220. However, in response to the sensor output signal, the control logic 212 turns on switch 214 while switch 216 remains off, thereby enabling the wireless communications interface 232. As with the previously discussed embodiment, power control circuit 210 includes the timer 218. In a preferred embodiment, control logic 212 starts timer 218 upon enabling the wireless communications interface 232, and resets timer 218 based on subsequent or continued assertion of the sensor output signal. If the wireless communications interface 232 asserts the link active signal, the control logic 212 turns on switch 216, thereby enabling the audio interface 234. If the timer 218 expires, the control logic 212 turns off switches 214 and 216, thereby disabling the wireless communications interface 232 and the audio interface 234. Irvin '332 at 5:1–23 Because the wireless headset 100 of the present invention automatically enables and disables its communication functions based on use, the sensor 220 may be based on a variety of technologies. In general, its purpose is to provide a signal responsive to a natural stimulus associated with use of the headset by a user. Movement or vibration of the wireless headset 100, or placement of the wireless headset 100 upon the user's body indicates usage. Movement may be detected based on vibration or by sensing acceleration, such as with an accelerometer. Mechanical or liquid-based switches represent alternate mechanisms for sensing movement. In such switches, movement causes an electrical connection to be established between contact pairs. Further, the particular sensor 220 employed may be tuned or configured such that only stimulus consistent with actual use actuates the sensor, thus avoiding inadvertent or unintended enabling of the wireless headset 100. In such configurations, the sensor 220 preferably employs output conditioning that prevents assertion of the sensor output signal for stimulus below a defined threshold. Alternatively, the power control circuit 210 may include such conditioning as part of its interface to the sensor 220. FIGS. 4A–4D illustrate possible sensor embodiments. Irvin '332 at 5:25–52 In FIG. 4A, the power control circuit 210 is operatively associated with a MEMS device, with the MEMS device functioning as the sensor 220. Devices based on MEMS technology may be responsive to general vibration or motion, or may be configured to respond only to specific acceleration along defined axes. As MEMS devices may easily include output conditioning electronics, the sensitivity or responsiveness of the sensor 220 incorporating the MEMS device may be tailored such that the sensor output signal is asserted only for motion or vibration above a certain threshold. A typical MEMS employs modified microelectronics fabrication techniques and includes small mechanical elements responsive to movement or vibration, such as cantilever beams formed by selectively etching a silicon wafer. In a preferred

Claims	Prior Art
	embodiment of the present invention, sensor 220 includes a MEMS device simultaneously fulfilling the requirements of low power consumption, relative low-cost, and adequate signal discrimination. In this context, signal discrimination means that the sensor 220 is not prone to nuisance assertions of its sensor output signal caused by minute movement or vibration. Although the body of work associated with MEMS technology is quite comprehensive, significant insight into the basic structures and techniques of MEMS technology may be gained from U.S. Pat. No. 5,659,195 to Kaiser et al., U.S. Pat. No. 5,663,507 to Westervelt et al., and U.S. Pat. No. 5,76,480 to Pister, the disclosures of which are incorporated herein by reference. Irvin '332 at 5:53–6:2 FIG. 4B illustrates the power control circuit 210 coupled to a liquid-based switch functioning as the sensor 220. The sensor 220 may be a mercury-filled switch, or may employ other conductive liquids. Depending upon its configuration, the sensor 220, implemented as a liquid-based switch, may function as a motion sensor or as an attitude sensor. As a motion sensor, the sensor 220 includes first and second contacts disposed in a manner such that motion of the contained liquid places the first and second contacts in electrical connection. As an attitude sensor, sensor 220 includes first and second contacts disposed in a manner such that one or more specific physical orientations of the wireless headset 100 causes the contained liquid in sensor 220 to place the first and second contacts in electrical connection. The power control circuit 210 connects to the first and second contacts of sensor 220, and is responsive to the electrical connection completed by the contained liquid. Irvin '332 at 7:1–8:3 Note that the foregoing diagrams illustrate various configurations for the present invention, with these configurations allowing the wireless headset 100 to automatically enable and disable select portions of its electronic circuitry based on user stimulus. Enabling and disabling may constitute physical connection and disconnection of power between the power source 240 and the communications or headset circuit 230, or may simply represent the assertion and de-assertion of specific enabling signals. Thus, the foregoing diagrams should not be construed as limiting in any way regarding the specific circuit implementation of the wireless headset 100. FIGS. 2–5 illustrate functional diagrams and these various functions may have corresponding separate circuit elements, or may be included in integrated fashion in one or more devices. For example, a microprocessor in a sleep or halt mode may be directly connected to a battery and configured to wake up in response to an input from the sensor 220. Thus, the microprocessor could serve as the power control circuit 210, as well as providing functions related to the communications interface 232 and audio interface 234.

Claims	Prior Art
	FIGS. 8 and 9, in particular, illustrate an exemplary embodiment of the present invention wherein an integrated controller provides the functionality of the power control circuit 210. In FIG. 8, the power control circuit 210 includes an integrated controller 300. The integrated controller 300 provides power control functionality associated with the timer 218, switches 214 and 216, and control logic 212. In this embodiment, the controller 300 provides both power and control/signal interconnections for the wireless communications interface 232 and audio interface 234. The controller 300 independently enables the wireless communications interface 232 and audio interface 234 in response to the sensor output signal from sensor 220. As with other embodiments, the controller 300 may enable both the wireless communication interface 232 and audio interface 234 in response to the sensor output signal, or may only enable the wireless communications interface 232, or a portion thereof. In this latter, case, the controller 300 enables the audio interface 234 in response to receiving the link signal from the enabled portion of the wireless communications interface 232. FIG. 9 provides more detail regarding the controller 300 shown in FIG. 8. A main power controller 310 provides power/control outputs to power controllers 330 and 340, which, in turn, provide power control outputs to the wireless communications interface 232 and audio interface 234, respectively. The main power controller 310 additionally interfaces with and provides power to a functional controller 350 and a sensor controller 320. The functional controller 350 provides signal and control interfaces with both the wireless communications interface 232 and the audio interface 234. In an exemplary embodiment, the main power controller initially enables only the sensor controller 320. Then, in response to the sensor output signal, the main controller 310 enables power controller 330 at least a portion of the functional controller 350. In response, power controller 330 enables at least a portion of the wireless communications interface 232. Then, in response to receiving the link signal from the wireless communications interface 232—the link signal may be received via the functional controller 350—the main power controller 310 enables the power controller 340 associated with the audio interface 234. The power controllers 330 and 340 may comprise FET switches combined with control logic responsive to control signals asserted by the main power controller 310, the functional controller 350, and/or the wireless communications interface 232. Irvin ’332 at 8:11–50 FIGS. 6 and 7 illustrate operation of the wireless headset 100. FIG. 6 is a state diagram for one exemplary embodiment of the present invention. When the wireless headset 100 is not in use, it automatically enters an inactive state (610). As explained, this inactive state may constitute disconnecting the communications circuit 230 from the power source 240, or may simply represent placing the communications circuit 230 in a non-functional, low-power condition. Absent user stimulus, such as motion of the wireless headset 100 or placement of the wireless headset 100 upon the user's body, the wireless headset 100 remains in the inactive state (610).

Claims	Prior Art
	In response to user stimulus, as detected by sensor 220, the power control circuit 210 enables the communications circuit 230, with this enabling representing a transition from the inactive state to an active state (620). Upon entering the active state, the power control circuit 210 initializes and starts the timer 218. The timer 218 incrementally counts from a starting value to an ending value, with the progression from starting to ending values representing a defined interval of time. Upon expiration of the timer 218, the power control circuit 210 disables the communications circuit 230. This interval of time may be preprogrammed to a convenient value, or may be selectable based on input from the base unit 102. For example, a timeout interval of five minutes may provide a reasonable compromise between user convenience and battery life. While in the active state (620), the power control circuit 210 resets the timer 218 based on the reassertion or continued assertion of the sensor output signal from sensor 220. Such resetting prevents expiration of the timer 218 and, as such, causes the power control circuit 210 to leave the communications or headset circuit 230 enabled. Thus, the power control circuit 210 is designed to leave the wireless headset 100 in the active state (620) while the wireless headset is in use by a user. Absent user stimulus, the timer 218 of power control circuit 210 expires, thereby causing the wireless headset 100 to transition from the active state (620) to the inactive state (610) based on the power control circuit 210 disabling the communications circuit 230. Irvin '332 at 8:51–9:12 FIG. 7 is a state diagram for a preferred embodiment of the present invention. Operation of the wireless headset 100 illustrated in FIG. 7 is distinguished from that shown in FIG. 6 by inclusion of an additional state, denoted as the sleep state (720). Inclusion of the sleep state provides an additional opportunity to control the power consumption of wireless headset 100 based on specific operating conditions. As before, the wireless headset 100 remains in the inactive state (710) absent user stimulus. Upon detecting user stimulus, the wireless headset 100 transitions from the inactive state (710) to the sleep state (720). In this state, the power control circuit 210 enables only a portion of the communications circuit 230. Specifically, the power control circuit 210 enables the wireless communications interface 232 or a portion thereof. Then, using a signal output from the wireless communications interface 232, the power control circuit 210 determines if the base unit 102 is active, or if the base unit 102 is attempting to communicate with the wireless headset 100. In some embodiments, the wireless headset 100 infers activity by detecting, via its wireless communications interface, a carrier signal from the base unit 102. In other embodiments, the wireless headset detects activity based on receiving a "wake-up" signal from the base unit 102. Note that monitoring for the base unit carrier signal may be performed continuously by the wireless headset 100 while in the sleep state, or may be performed periodically; thereby further reducing sleep state power consumption. For periodic carrier monitoring, the wireless headset 100 may employ an exemplary

Claims	Prior Art
	monitoring interval of 0.5 seconds. Irvin ’332 at 9:13–65 Upon detecting the carrier signal or wake-up signal from the base unit 102, as indicated by the link signal shown in FIG. 7, the wireless headset 100 transitions from the sleep state (720) to the active state (730). To further reduce power consumption, the wireless headset 100 may only monitor for the external signal on a periodic basis. If the wireless headset 100 is configured to monitor for the external signal on a periodic basis and the base unit 102 is configured to emit a periodic wake-up signal, the periodic monitoring of the wireless headset 100 is set such that its monitoring frequency is not an integer multiple of the wake-up signal frequency. Upon causing the wireless headset 100 to transition from the inactive state (710) to the sleep state (720), the power control circuit 210 initializes and starts the timer 218. While in the sleep state (720), subsequent or continued assertion of the sensor output signal from the sensor 220 causes the power control circuit 210 to reset its timer 218. Absent such user stimulus, the timer 218 expires and the power control circuit 210 disables the communications circuit 230. After transitioning from the sleep state (720) to the active state (730), based on detection of the signal from the base unit 102, the power control circuit 210 continues resetting its timer 218 based on user stimulus, as done in the sleep state (720). Thus, continued user stimulus causes the power control circuit 210 to leave the wireless headset 100 fully functional in the active state (730). The present invention provides methods and apparatus allowing the wireless headset 100 to conveniently transition from a non-functional inactive state to a fully functional active state, based on its detection of certain user stimulus. In a preferred embodiment, the wireless headset 100 transitions from the inactive state to the intermediate sleep state, thereby conserving power. Upon detection of the carrier or the wake-up signal from the base unit 102, the wireless headset 100 transitions from the sleep state to the fully functional active state. The wireless headset 100 includes a sensor 220 for detecting the user stimulus. As the sensor 220 may be a motion sensor, a vibration sensor, an attitude sensor, or a proximity sensor, the specific user stimulus may include the user moving and/or placing the wireless headset 100 upon their body. The operation of the wireless headset 100 in accordance with the present invention admits tremendous flexibility with respect to implementation. As noted, many different circuit implementations may provide the inventive features of the present invention. These implementations may include hardware and software, and can reflect varying degrees of integration between the functional circuit blocks discussed. Indeed, all such variations for providing a wireless headset 100 that automatically controls its power consumption or operating state based on detection of a user stimulus are within the scope of the present invention.

Claims	Prior Art
	A POSITA would have been motivated to combine the Jabra BT800 with Irvin '322 to implement the audio operation alterations of Irvin '322 in the Jabra BT800, and reasonably expected success in doing so, for the same reasons explained for claim [42b]. *Supra* [42b]. To the extent that the Jabra BT800 and Irvin '332 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800 and Irvin '332, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[49a] A system as recited in claim 47, wherein the head-worn personal electronic apparatus is configured to support a low power operational mode, and	The Jabra BT800 and Irvin '332 expressly or inherently disclose "[a] system as recited in claim 47, wherein the head-worn personal electronic apparatus is configured to support a low power operational mode." For example: *See* above at claim [15a]. To the extent that the Jabra BT800 and Irvin '332 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800 and Irvin '332, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[49b] wherein the operation of the head-worn personal electronic apparatus being altered concerns operation of the head-worn personal electronic apparatus in the low power operational mode.	The Jabra BT800 and Irvin '332 expressly or inherently disclose "wherein the operation of the head-worn personal electronic apparatus being altered concerns operation of the head-worn personal electronic apparatus in the low power operational mode." For example: *See* above at claim [15b]. To the extent that the Jabra BT800 and Irvin '332 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800 and Irvin '332, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[50a] A system as recited in claim 45, wherein the second microphone is positioned to pick up at least environmental audio input associated with an environment around the head-worn personal electronic apparatus,	The Jabra BT800, Phonak Perseo, Griffin '456, and Miller '585 expressly or inherently disclose "wherein the second microphone is positioned to pick up at least environmental audio input associated with an environment around the head-worn personal electronic apparatus." For example: *See* above at claim [18e]. To the extent that the Jabra BT800, Phonak Persero, Griffin '456, and Miller '585 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to

Claims	Prior Art
	combine, with the teachings of the Jabra BT800, Phonak Perseo, Griffin ’456, and Miller ’585, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[50b] wherein the electronic circuitry is configured to process the audio input from at least the user via the first microphone to remove at least a portion of the environmental audio input associated with the environment picked up via the second microphone, and	The Jabra BT800, Phonak Perseo, Griffin ’456, and Miller ’585 expressly or inherently disclose “wherein the electronic circuitry is configured to process the audio input from at least the user via the first microphone to remove at least a portion of the environmental audio input associated with the environment picked up via the second microphone.” For example: *See* above at claim [39a]. To the extent that the Jabra BT800, Phonak Perseo, Griffin ’456, and Miller ’585 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Phonak Perseo, Griffin ’456, and Miller ’585, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[50c] wherein the head-worn personal electronic apparatus is configured to receive a voice input via the first microphone, determine or receive a determination of a requested operation from the voice input using voice recognition, and control an operation by the head-worn personal electronic apparatus based on the requested operation.	The Jabra BT800, Griffin ’456, and Miller ’585 expressly or inherently disclose “wherein the head-worn personal electronic apparatus is configured to receive a voice input via the first microphone, determine or receive a determination of a requested operation from the voice input using voice recognition, and control an operation by the head-worn personal electronic apparatus based on the requested operation.” For example: *See* above at claim [10b]. To the extent that the Jabra BT800, Griffin ’456, and Miller ’585 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Griffin ’456, and Miller ’585, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
51. A system as recited in claim 45, wherein the radiation detector is an infrared radiation detector, and wherein the radiation being detected by the radiation detector includes infrared radiation.	The Jabra BT800 and Irvin ’332 expressly or inherently disclose “[a] system as recited in claim 45, wherein the radiation detector is an infrared radiation detector, and wherein the radiation being detected by the radiation detector includes infrared radiation.” For example: Irvin ’332’s “active ... IR sensor” uses “IR,” or infrared, radiation (example of the claimed wherein the radiation detector is an infrared radiation detector, and wherein the radiation being detected by the radiation detector includes infrared radiation). The following citations show examples of where the Irvin ’332 discloses this limitation. Irvin ’332 at 6:20–33 FIG. 4D illustrates the power control circuit 210 coupled with a proximity sensor 220 not based on mechanical actuation. The proximity sensor 220 may be an active or passive IR sensor, may be a resistive

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	or other type of thermal sensor, or may be an acoustic sensor. As a proximity sensor, sensor 220 provides indication that a user has placed the wireless headset 100 upon their body. As such, any of the foregoing or other presence sensing techniques may be used to implement sensor 220. Preferably, when configured as a proximity sensor, sensor 220 requires minimal power and provides a sensor output signal based on proximity to the user's body. Depending upon the sensing technology chosen, the control circuit 210 may be required to periodically stimulate sensor 220 to generate a detection response. A POSITA would have been motivated to combine the Jabra BT800 with Irvin '332, and reasonably expected success in doing so, for the reasons explained above for [44j] and [44k]. Supra [44j], [44k]. To the extent that the Jabra BT800 and Irvin '332 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800 and Irvin '332, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
52. A system as recited in claim 51, wherein the first microphone is positioned to be directed forward towards the user's front when the head-worn structure is being worn by the user, and the second microphone is positioned to be directed outward away from the user's head when the head-worn structure is being worn by the user.	The Jabra BT800, Phonak Perseo, Griffin '456, and Miller '585 expressly or inherently disclose "[a] system as recited in claim 51, wherein the first microphone is positioned to be directed forward towards the user's front when the head-worn structure is being worn by the user, and the second microphone is positioned to be directed outward away from the user's head when the head-worn structure is being worn by the user." For example: *See* above at claim 19. To the extent that the Jabra BT800, Phonak Perseo, Griffin '456, and Miller '585 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Phonak Perseo, Griffin '456, and Miller '585, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
53. A system as recited in claim 52, wherein the head-worn personal electronic apparatus is configured to at least alter operation of the head-worn personal electronic apparatus based at least in part on the determination of whether the head-worn structure of the head-worn	The Jabra BT800 and Irvin '332 expressly or inherently disclose "[a] system as recited in claim 52, wherein the head-worn personal electronic apparatus is configured to at least alter operation of the head-worn personal electronic apparatus based at least in part on the determination of whether the head-worn structure of the head-worn personal electronic apparatus is being worn by the user." For example: *See* above at claim 26. To the extent that the Jabra BT800 and Irvin '332 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the

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personal electronic apparatus is being worn by the user.	Jabra BT800 and Irvin ’332, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[54a] A system as recited in claim 53, wherein the second microphone is positioned to pick up at least environmental audio input associated with an environment around the head-worn personal electronic apparatus,	The Jabra BT800, Phonak Perseo, Griffin ’332, and Miller ’585 expressly or inherently disclose “wherein the second microphone is positioned to pick up at least environmental audio input associated with an environment around the head-worn personal electronic apparatus.” For example: *See* above at claim [18e]. To the extent that the Jabra BT800, Phonak Perseo, Griffin ’456, and Miller ’585 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Phonak Perseo, Griffin ’456, and Miller ’585, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[54b] wherein the electronic circuitry is configured to process the audio input from at least the user via the first microphone to remove at least a portion of the environmental audio input associated with the environment picked up via the second microphone, and	The Jabra BT800, Phonak Perseo, Griffin ’456, and Miller ’585 expressly or inherently disclose “wherein the electronic circuitry is configured to process the audio input from at least the user via the first microphone to remove at least a portion of the environmental audio input associated with the environment picked up via the second microphone.” For example: *See* above at claim [39a]. To the extent that the Jabra BT800, Phonak Perseo, Griffin ’456, and Miller ’585 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Phonak Persero, Griffin ’456, and Miller ’585, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[54c] wherein the head-worn personal electronic apparatus is configured to receive a voice input via the first microphone, determine or receive a determination of a requested operation from the voice input using voice recognition, and control an operation by the head-worn personal electronic apparatus based on the requested operation.	The Jabra BT800, Griffin ’456, and Miller ’585 expressly or inherently disclose “wherein the head-worn personal electronic apparatus is configured to receive a voice input via the first microphone, determine or receive a determination of a requested operation from the voice input using voice recognition, and control an operation by the head-worn personal electronic apparatus based on the requested operation.” For example: *See* above at claim [10b]. To the extent that Jabra BT800, Griffin ’456, and Miller ’585 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Griffin ’456, and Miller ’585, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.

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[55a] A system as recited in claim 54, wherein the motion detector comprises an accelerometer, and	The Jabra BT800 and Irvin ’332 expressly or inherently disclose “wherein the motion detector comprises an accelerometer.” For example: *See* above at claim 37. To the extent that Jabra BT800 and Irvin ’332 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800 and Irvin ’332, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[55b] wherein the system comprises a Hall effect detector.	The Jabra BT800, Spitzer ’001, Ritter ’100 expressly or inherently disclose “wherein the system comprises a Hall effect detector.” For example: *See* above at claim 16. To the extent that the Jabra BT800, Spitzer ’001, Ritter ’100 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Spitzer ’001, Ritter ’100, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
56. A system as recited in claim 44, wherein the head-worn personal electronic apparatus comprises: a force sensor at least partially contained within the head-worn structure and configured to sense a force input associated with the user, wherein the sensed force input operating to at least alter operation of the head-worn electronic personal audio apparatus.	The Jabra BT800, Hollemans ’490, Zadesky ’230, and Irvin ’332 expressly or inherently disclose “wherein the head-worn personal electronic apparatus comprises: a force sensor at least partially contained within the head-worn structure and configured to sense a force input associated with the user, wherein the sensed force input operating to at least alter operation of the head-worn electronic personal audio apparatus.” For example: Hollemans ’490’s “touch-sensitive area” can be “an ordinary pressure sensor” (example of the claimed wherein the head-worn personal electronic apparatus comprises: a force sensor at least partially contained within the head-worn structure and configured to sense a force input associated with the user). Hollemans ’490’s “touch-sensitive area” alters audio operation as explained for claim 2 (example of the claimed wherein the sensed force input operating to at least alter operation of the head-worn electronic personal audio apparatus). *Supra* claim 2. The following citations show examples of where the Hollemans ’490 discloses this limitation. Hollemans ’490 at 4:24–5:7 The controller 120 is used for commanding the device 110 to perform one or more of its functions or capabilities. The basic assumption is that the device 110 is remote or tucked away in a pocket or clamped to a belt or clothing, such that operating it becomes relatively hard. The controller 120 makes it possible to operate the device 110. The controller 120 is generally wired to the device 110 by means of a wire 140 (see figure 2) and a plug (not shown) that fits into a socket (not shown) of the device 110.

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	The remote controller 120 has an outer surface 121, see also figure 2. The outer surface 121 is just the physical outer side of the controller 120. A part of this outer surface 121 is sensitive to being touched and is referred to as the touch-sensitive area 122. Optionally, the controller 120 comprises a second area that is sensitive to being touched, referred to as the further touch-sensitive area 123. The touch-sensitive area 122 can be realized in many ways, including a sensor for changes in capacity or induced voltages or currents, a grid of conducting parts between which changes in resistance are measured and detected, or an ordinary pressure sensor, button or temperature sensor. Another possibility is to measure and detect changes in either a passive or an active electromagnetic field. With the passive variant, the controller 120 relies on, for example, nearby power lines to generate measurable fields when being touched. With the active variant, the controller 120 generates an electromagnetic field of its own. Zadesky '230 discloses that a touchpad of a head-worn device includes "zones" with an associated pressure sensor, which may be, e.g., a strain gauge (example of the claimed wherein the head-worn personal electronic apparatus comprises: a force sensor at least partially contained within the head-worn structure and configured to sense a force input associated with the user). A POSITA would have understood that a strain gauge is a force sensor, at least because the POSITA would understand a strain gauge to be a sensor whose output varies with applied force. Zadesky '230's pressure sensor can be used to detect the presence of the user's finger and to alter the operation of the head-worn device accordingly, e.g., by "vary[ing] a characteristic of the media player," such as changing the volume (example of the claimed wherein the sensed force input operating to at least alter operation of the head-worn electronic personal audio apparatus). The following citations show examples of where the Zadesky '230 discloses this limitation. Zadesky '230 at 5:61–6:19 The media player 100 also includes a touch pad 110. The touch pad 110 is configured to provide one or more control functions for controlling various applications associated with the media player 100. For example, the touch initiated control function may be used to move an object or perform an action on the display screen 104 or to make selections or issue commands associated with operating the media player 100. In most cases, the touch pad 110 is arranged to receive input from a finger moving across the surface of the touch pad 110 in order to implement the touch initiated control function. The touch pad may be widely varied. For example, the touch pad be a conventional touch pad based on the Cartesian coordinate system, or the touch pad may be a touch pad based on a polar coordinate system (the later will be described in greater detail below). The manner in which the touch pad 110 receives input may be widely varied. In one embodiment, the touch pad 110 is configured receive input from a linear finger motion. In another embodiment, the touch pad 110 is configured receive input from a rotary or swirling finger motion. In yet another embodiment, the touch pad 110 is configured receive input from a radial finger motion. Additionally or alternatively,

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	the touch pad 110 may be arranged to receive input from a finger tapping on the touch pad 100. By way of example, the tapping finger may initiate a control function for playing a song, opening a menu and the like. Zadesky '230 at 9:39–61 As shown, the touch pad 202 is divided into several independent and spatially distinct zones 210 that are positioned around the periphery of the touch pad 202. Any number of zones may be used. In one embodiment, each of the zones 210 represents a polar angle that specifies the angular position of the zone in the plane of the touch pad 202. By way of example, the zones 210 may be positioned at 2 degree increments all the way around the touch pad 202. Each of the zones 210 has an associated sensor disposed therein for detecting the presence of an object such as a finger. The sensors may be widely varied. For example, the sensors may be based on resistive sensing, surface acoustic wave sensing, pressure sensing (e.g., strain gauge, pressure plates, piezoelectric transducers or the like), optical sensing, capacitive sensing and the like. In general, when an object approaches a zone 210, and more particularly a sensor, a position signal is generated that informs the media system 200 that the object is at a specific angular position on the touch pad 202. When an object is moved between zones 210 or over multiple zones 210, multiple position signals are generated. These multiple position signals may be used to determine the angular location, direction, speed and acceleration of the object as its moved around the touch pad 202. Zadesky '230 at 10:34–51 Additionally or alternatively, the system via the touch pad may be configured to transform radial motion an object such as a finger (as shown in FIG. 3B) into translational or linear motion on the display screen. By radial, it is meant that the object moves in a substantially radial direction from the center of the touch pad to an outer perimeter of the touch pad. In one embodiment, the touch pad is arranged to continuously determine the radial position of a finger relative to the planar surface of the touch pad. This allows a user to linearly scroll through a media list on the display screen by moving the object at least partially between the center and outer perimeter of the touch pad. For example, by moving the object between a small and large radius (e.g., 0–3 cm) on the touch pad. This may also allow a user to vary a characteristic of the media player. For example, by moving radially, the user may be able to change the volume of sound being played on the media player (i.e., acts like a potentiometer). Irvin '332 discloses that one of its sensors is a "resistive ... sensor," which can control switching of the "audio interface" or a active/inactive state (example of the claimed a force sensor at least partially contained within

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	the head-worn structure and configured to sense a force input associated with the user, wherein the sensed force input operating to at least alter operation of the head-worn electronic personal audio apparatus). The following citations show examples of where the Irvin ’332 discloses this limitation. Irvin ’332 at 4:39–67 FIG. 3A illustrates a preferred embodiment for the wireless headset 100. In FIG. 3A, the power control circuit 210 independently enables the wireless communications interface 232 and audio interface 234. Thus, select portions of communications circuit 230 may be enabled in response to the sensor output signal. Once the wireless communications interface 232 is enabled, it provides a signal, termed a “link active” signal, to the power control circuit 210 based on detecting a wireless signal received from the base unit 102. Based on the assertion of the link active signal, the power control circuit 210 enables the audio interface 234. FIG. 3B provides more functional details regarding the power control circuit 210 of FIG. 3A. Again, the control logic 212 is responsive to a sensor output signal from sensor 220. However, in response to the sensor output signal, the control logic 212 turns on switch 214 while switch 216 remains off, thereby enabling the wireless communications interface 232. As with the previously discussed embodiment, power control circuit 210 includes the timer 218. In a preferred embodiment, control logic 212 starts timer 218 upon enabling the wireless communications interface 232, and resets timer 218 based on subsequent or continued assertion of the sensor output signal. If the wireless communications interface 232 asserts the link active signal, the control logic 212 turns on switch 216, thereby enabling the audio interface 234. If the timer 218 expires, the control logic 212 turns off switches 214 and 216, thereby disabling the wireless communications interface 232 and the audio interface 234. Irvin ’332 at 6:20–33 FIG. 4D illustrates the power control circuit 210 coupled with a proximity sensor 220 not based on mechanical actuation. The proximity sensor 220 may be an active or passive IR sensor, may be a resistive or other type of thermal sensor, or may be an acoustic sensor. As a proximity sensor, sensor 220 provides indication that a user has placed the wireless headset 100 upon their body. As such, any of the foregoing or other presence sensing techniques may be used to implement sensor 220. Preferably, when configured as a proximity sensor, sensor 220 requires minimal power and provides a sensor output signal based on proximity to the user's body. Depending upon the sensing technology chosen, the control circuit 210 may be required to periodically stimulate sensor 220 to generate a detection response. Irvin ’332 at 8:11–50 FIGS. 6 and 7 illustrate operation of the wireless headset 100. FIG. 6 is a state diagram for one exemplary

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	embodiment of the present invention. When the wireless headset 100 is not in use, it automatically enters an inactive state (610). As explained, this inactive state may constitute disconnecting the communications circuit 230 from the power source 240, or may simply represent placing the communications circuit 230 in a non-functional, low-power condition. Absent user stimulus, such as motion of the wireless headset 100 or placement of the wireless headset 100 upon the user's body, the wireless headset 100 remains in the inactive state (610). In response to user stimulus, as detected by sensor 220, the power control circuit 210 enables the communications circuit 230, with this enabling representing a transition from the inactive state to an active state (620). Upon entering the active state, the power control circuit 210 initializes and starts the timer 218. The timer 218 incrementally counts from a starting value to an ending value, with the progression from starting to ending values representing a defined interval of time. Upon expiration of the timer 218, the power control circuit 210 disables the communications circuit 230. This interval of time may be preprogrammed to a convenient value, or may be selectable based on input from the base unit 102. For example, a timeout interval of five minutes may provide a reasonable compromise between user convenience and battery life. While in the active state (620), the power control circuit 210 resets the timer 218 based on the reassertion or continued assertion of the sensor output signal from sensor 220. Such resetting prevents expiration of the timer 218 and, as such, causes the power control circuit 210 to leave the communications or headset circuit 230 enabled. Thus, the power control circuit 210 is designed to leave the wireless headset 100 in the active state (620) while the wireless headset is in use by a user. Absent user stimulus, the timer 218 of power control circuit 210 expires, thereby causing the wireless headset 100 to transition from the active state (620) to the inactive state (610) based on the power control circuit 210 disabling the communications circuit 230. Irvin ’332 at 8:51–9:12 FIG. 7 is a state diagram for a preferred embodiment of the present invention. Operation of the wireless headset 100 illustrated in FIG. 7 is distinguished from that shown in FIG. 6 by inclusion of an additional state, denoted as the sleep state (720). Inclusion of the sleep state provides an additional opportunity to control the power consumption of wireless headset 100 based on specific operating conditions. As before, the wireless headset 100 remains in the inactive state (710) absent user stimulus. Upon detecting user stimulus, the wireless headset 100 transitions from the inactive state (710) to the sleep state (720). In this state, the power control circuit 210 enables only a portion of the communications circuit 230. Specifically, the power control circuit 210 enables the wireless communications interface 232 or a portion thereof. Then, using a signal output from the wireless communications interface 232, the power control circuit 210 determines if the base unit 102 is active, or if the base unit 102 is attempting to communicate with the wireless headset 100. In some embodiments, the wireless headset 100 infers activity by detecting, via its wireless communications interface, a carrier signal from the base unit 102. In other embodiments, the

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	wireless headset detects activity based on receiving a "wake-up" signal from the base unit 102. Note that monitoring for the base unit carrier signal may be performed continuously by the wireless headset 100 while in the sleep state, or may be performed periodically; thereby further reducing sleep state power consumption. For periodic carrier monitoring, the wireless headset 100 may employ an exemplary monitoring interval of 0.5 seconds. Irvin '332 at 9:13–65 Upon detecting the carrier signal or wake-up signal from the base unit 102, as indicated by the link signal shown in FIG. 7, the wireless headset 100 transitions from the sleep state (720) to the active state (730). To further reduce power consumption, the wireless headset 100 may only monitor for the external signal on a periodic basis. If the wireless headset 100 is configured to monitor for the external signal on a periodic basis and the base unit 102 is configured to emit a periodic wake-up signal, the periodic monitoring of the wireless headset 100 is set such that its monitoring frequency is not an integer multiple of the wake-up signal frequency. Upon causing the wireless headset 100 to transition from the inactive state (710) to the sleep state (720), the power control circuit 210 initializes and starts the timer 218. While in the sleep state (720), subsequent or continued assertion of the sensor output signal from the sensor 220 causes the power control circuit 210 to reset its timer 218. Absent such user stimulus, the timer 218 expires and the power control circuit 210 disables the communications circuit 230. After transitioning from the sleep state (720) to the active state (730), based on detection of the signal from the base unit 102, the power control circuit 210 continues resetting its timer 218 based on user stimulus, as done in the sleep state (720). Thus, continued user stimulus causes the power control circuit 210 to leave the wireless headset 100 fully functional in the active state (730). The present invention provides methods and apparatus allowing the wireless headset 100 to conveniently transition from a non-functional inactive state to a fully functional active state, based on its detection of certain user stimulus. In a preferred embodiment, the wireless headset 100 transitions from the inactive state to the intermediate sleep state, thereby conserving power. Upon detection of the carrier or the wake-up signal from the base unit 102, the wireless headset 100 transitions from the sleep state to the fully functional active state. The wireless headset 100 includes a sensor 220 for detecting the user stimulus. As the sensor 220 may be a motion sensor, a vibration sensor, an attitude sensor, or a proximity sensor, the specific user stimulus may include the user moving and/or placing the wireless headset 100 upon their body. The operation of the wireless headset 100 in accordance with the present invention admits tremendous flexibility with respect to implementation. As noted, many different circuit implementations may provide the inventive features of the present invention. These implementations may include hardware and software, and can reflect varying degrees of integration between the functional circuit blocks discussed. Indeed, all such variations for providing a wireless headset 100 that automatically controls its

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	power consumption or operating state based on detection of a user stimulus are within the scope of the present invention. A POSITA would have been motivated to combine the Jabra BT800 with Irvin '332, the Jabra BT800 with Zadesky '230, and the Jabra BT800 with Hollemans '490 to implement the force sensors of Irvin '332, Zadesky '230, and Hollemans '490 into the Jabra BT800, and reasonably expected success in doing so, for the same reasons discussed for claims 5–7 and 26. *Supra* claims 5–7, 26. A POSITA further would have been motivated to implement a force sensor, and reasonably expected success in doing so, because Hollemans '490 explains that force sensors, such as a "pressure sensor," would have been an "ordinary" component. Hollemans, 4:24–5:7. To the extent that the Jabra BT800, Irvin '332, Zadesky '230, and Hollemans '490 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Irvin '332, Zadesky '230, and Hollemans '490, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[57a]. A system as recited in claim 56, wherein the head-worn electronic personal audio apparatus is configured to support audio output to the user via the speaker, and	The Jabra BT800 expressly or inherently discloses "[a] system as recited in claim 56, wherein the head-worn electronic personal audio apparatus is configured to support audio output to the user via the speaker." For example: *See* above at claim 4[a]. To the extent that the Jabra BT800 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[57b] wherein the at least one operation of the head-worn electronic personal audio apparatus being altered concerns control of the audio output being provided to the user.	The Jabra BT800, Hollemans '490, Zadesky '230, and Irvin '332 expressly or inherently disclose "wherein the at least one operation of the head-worn electronic personal audio apparatus being altered concerns control of the audio output being provided to the user." For example: Hollemans '490 discloses altering an operation of the head-worn electronic personal audio apparatus that concerns control of the audio output being provided to the user based on Hollemans '490's touch–sensitive area, which may be a force sensor (example of the claimed wherein the at least one operation of the head-worn electronic personal audio apparatus being altered concerns control of the audio output being provided to the user), for the reasons explained above for claims 5–7. *Supra* claims 5–7. The following citations show examples of where the Hollemans '490 discloses this limitation. Hollemans '490 at 4:24–5:7 The controller 120 is used for commanding the device 110 to perform one or more of its functions or

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	capabilities. The basic assumption is that the device 110 is remote or tucked away in a pocket or clamped to a belt or clothing, such that operating it becomes relatively hard. The controller 120 makes it possible to operate the device 110. The controller 120 is generally wired to the device 110 by means of a wire 140 (see figure 2) and a plug (not shown) that fits into a socket (not shown) of the device 110. The remote controller 120 has an outer surface 121, see also figure 2. The outer surface 121 is just the physical outer side of the controller 120. A part of this outer surface 121 is sensitive to being touched and is referred to as the touch-sensitive area 122. Optionally, the controller 120 comprises a second area that is sensitive to being touched, referred to as the further touch-sensitive area 123. The touch-sensitive area 122 can be realized in many ways, including a sensor for changes in capacity or induced voltages or currents, a grid of conducting parts between which changes in resistance are measured and detected, or an ordinary pressure sensor, button or temperature sensor. Another possibility is to measure and detect changes in either a passive or an active electromagnetic field. With the passive variant, the controller 120 relies on, for example, nearby power lines to generate measurable fields when being touched. With the active variant, the controller 120 generates an electromagnetic field of its own. Zadesky ’230 discloses altering an operation of the head-worn electronic personal audio apparatus that concerns control of the audio output being provided to the user based on Zadesky ’230’s touch pad, which may be a force sensor (example of the claimed wherein the at least one operation of the head-worn electronic personal audio apparatus being altered concerns control of the audio output being provided to the user), for the reasons explained above for claims 5–7. *Supra* claims 5–7. The following citations show examples of where the Zadesky ’230 discloses this limitation. Zadesky ’230 at 5:61–6:19 The media player 100 also includes a touch pad 110. The touch pad 110 is configured to provide one or more control functions for controlling various applications associated with the media player 100. For example, the touch initiated control function may be used to move an object or perform an action on the display screen 104 or to make selections or issue commands associated with operating the media player 100. In most cases, the touch pad 110 is arranged to receive input from a finger moving across the surface of the touch pad 110 in order to implement the touch initiated control function. The touch pad may be widely varied. For example, the touch pad be a conventional touch pad based on the Cartesian coordinate system, or the touch pad may be a touch pad based on a polar coordinate system (the later will be described in greater detail below). The manner in which the touch pad 110 receives input may be widely varied. In one embodiment, the touch pad 110 is configured receive input from a linear finger motion. In another embodiment, the touch pad 110 is configured receive input from a rotary or swirling finger motion. In yet another embodiment, the touch pad 110 is configured receive input from a radial finger motion. Additionally or alternatively,

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	the touch pad 110 may be arranged to receive input from a finger tapping on the touch pad 100. By way of example, the tapping finger may initiate a control function for playing a song, opening a menu and the like. Zadesky '230 at 10:34–51 Additionally or alternatively, the system via the touch pad may be configured to transform radial motion an object such as a finger (as shown in FIG. 3B) into translational or linear motion on the display screen. By radial, it is meant that the object moves in a substantially radial direction from the center of the touch pad to an outer perimeter of the touch pad. In one embodiment, the touch pad is arranged to continuously determine the radial position of a finger relative to the planar surface of the touch pad. This allows a user to linearly scroll through a media list on the display screen by moving the object at least partially between the center and outer perimeter of the touch pad. For example, by moving the object between a small and large radius (e.g., 0–3 cm) on the touch pad. This may also allow a user to vary a characteristic of the media player. For example, by moving radially, the user may be able to change the volume of sound being played on the media player (i.e., acts like a potentiometer). Irvin '332 discloses altering an operation of the head-worn electronic personal audio apparatus that concerns control of the audio output being provided to the user based on sensors, which may includes a "resistive" sensor (example of the claimed wherein the at least one operation of the head-worn electronic personal audio apparatus being altered concerns control of the audio output being provided to the user), for the reasons explained above for claim 26. *Supra* claim 26. The following citations show examples of where the Irvin '332 discloses this limitation. Irvin '332 at 3:53–4:2 The communications circuit 230 provides wireless headset functionality, including audio input and output and wireless communications with the base unit 102. The communications or headset circuit 230 includes a wireless communications interface 232 providing a wireless communications link for sending and receiving information to and from the base unit 102. The wireless communications interface 232 includes at least a wireless receiver and wireless transmitter. Audio input received via microphone 236 is conditioned by the audio interface 234 and then processed by the communications interface 232 for transmittal to the base unit 102. Audio information received from the base unit 102 is processed by the wireless communications interface 232 and then conditioned in the audio interface 234 for output to a user via speaker 238. With reference to FIG. 1A or 1B, the microphone 236 may be located in microphone pickup 120, and speaker 238 may be located in earpiece 130.

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	Irvin ’332 at 4:39–67 FIG. 3A illustrates a preferred embodiment for the wireless headset 100. In FIG. 3A, the power control circuit 210 independently enables the wireless communications interface 232 and audio interface 234. Thus, select portions of communications circuit 230 may be enabled in response to the sensor output signal. Once the wireless communications interface 232 is enabled, it provides a signal, termed a “link active” signal, to the power control circuit 210 based on detecting a wireless signal received from the base unit 102. Based on the assertion of the link active signal, the power control circuit 210 enables the audio interface 234. FIG. 3B provides more functional details regarding the power control circuit 210 of FIG. 3A. Again, the control logic 212 is responsive to a sensor output signal from sensor 220. However, in response to the sensor output signal, the control logic 212 turns on switch 214 while switch 216 remains off, thereby enabling the wireless communications interface 232. As with the previously discussed embodiment, power control circuit 210 includes the timer 218. In a preferred embodiment, control logic 212 starts timer 218 upon enabling the wireless communications interface 232, and resets timer 218 based on subsequent or continued assertion of the sensor output signal. If the wireless communications interface 232 asserts the link active signal, the control logic 212 turns on switch 216, thereby enabling the audio interface 234. If the timer 218 expires, the control logic 212 turns off switches 214 and 216, thereby disabling the wireless communications interface 232 and the audio interface 234. Irvin ’332 at 7:1–8:3 Note that the foregoing diagrams illustrate various configurations for the present invention, with these configurations allowing the wireless headset 100 to automatically enable and disable select portions of its electronic circuitry based on user stimulus. Enabling and disabling may constitute physical connection and disconnection of power between the power source 240 and the communications or headset circuit 230, or may simply represent the assertion and de-assertion of specific enabling signals. Thus, the foregoing diagrams should not be construed as limiting in any way regarding the specific circuit implementation of the wireless headset 100. FIGS. 2–5 illustrate functional diagrams and these various functions may have corresponding separate circuit elements, or may be included in integrated fashion in one or more devices. For example, a microprocessor in a sleep or halt mode may be directly connected to a battery and configured to wake up in response to an input from the sensor 220. Thus, the microprocessor could serve as the power control circuit 210, as well as providing functions related to the communications interface 232 and audio interface 234. FIGS. 8 and 9, in particular, illustrate an exemplary embodiment of the present invention wherein an integrated controller provides the functionality of the power control circuit 210. In FIG. 8, the power control circuit 210 includes an integrated controller 300. The integrated controller 300 provides power control functionality associated with the timer 218, switches 214 and 216, and control logic 212. In this

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	embodiment, the controller 300 provides both power and control/signal interconnections for the wireless communications interface 232 and audio interface 234. The controller 300 independently enables the wireless communications interface 232 and audio interface 234 in response to the sensor output signal from sensor 220. As with other embodiments, the controller 300 may enable both the wireless communication interface 232 and audio interface 234 in response to the sensor output signal, or may only enable the wireless communications interface 232, or a portion thereof. In this latter, case, the controller 300 enables the audio interface 234 in response to receiving the link signal from the enabled portion of the wireless communications interface 232. FIG. 9 provides more detail regarding the controller 300 shown in FIG. 8. A main power controller 310 provides power/control outputs to power controllers 330 and 340, which, in turn, provide power control outputs to the wireless communications interface 232 and audio interface 234, respectively. The main power controller 310 additionally interfaces with and provides power to a functional controller 350 and a sensor controller 320. The functional controller 350 provides signal and control interfaces with both the wireless communications interface 232 and the audio interface 234. In an exemplary embodiment, the main power controller initially enables only the sensor controller 320. Then, in response to the sensor output signal, the main controller 310 enables power controller 330 at least a portion of the functional controller 350. In response, power controller 330 enables at least a portion of the wireless communications interface 232. Then, in response to receiving the link signal from the wireless communications interface 232—the link signal may be received via the functional controller 350—the main power controller 310 enables the power controller 340 associated with the audio interface 234. The power controllers 330 and 340 may comprise FET switches combined with control logic responsive to control signals asserted by the main power controller 310, the functional controller 350, and/or the wireless communications interface 232. Irvin ’332 at 8:11–50 FIGS. 6 and 7 illustrate operation of the wireless headset 100. FIG. 6 is a state diagram for one exemplary embodiment of the present invention. When the wireless headset 100 is not in use, it automatically enters an inactive state (610). As explained, this inactive state may constitute disconnecting the communications circuit 230 from the power source 240, or may simply represent placing the communications circuit 230 in a non-functional, low-power condition. Absent user stimulus, such as motion of the wireless headset 100 or placement of the wireless headset 100 upon the user's body, the wireless headset 100 remains in the inactive state (610). In response to user stimulus, as detected by sensor 220, the power control circuit 210 enables the communications circuit 230, with this enabling representing a transition from the inactive state to an active state (620). Upon entering the active state, the power control circuit 210 initializes and starts the timer 218. The timer 218 incrementally counts from a starting value to an ending value, with the

Claims	Prior Art
	progression from starting to ending values representing a defined interval of time. Upon expiration of the timer 218, the power control circuit 210 disables the communications circuit 230. This interval of time may be preprogrammed to a convenient value, or may be selectable based on input from the base unit 102. For example, a timeout interval of five minutes may provide a reasonable compromise between user convenience and battery life. While in the active state (620), the power control circuit 210 resets the timer 218 based on the reassertion or continued assertion of the sensor output signal from sensor 220. Such resetting prevents expiration of the timer 218 and, as such, causes the power control circuit 210 to leave the communications or headset circuit 230 enabled. Thus, the power control circuit 210 is designed to leave the wireless headset 100 in the active state (620) while the wireless headset is in use by a user. Absent user stimulus, the timer 218 of power control circuit 210 expires, thereby causing the wireless headset 100 to transition from the active state (620) to the inactive state (610) based on the power control circuit 210 disabling the communications circuit 230. Irvin '332 at 8:51–9:12 FIG. 7 is a state diagram for a preferred embodiment of the present invention. Operation of the wireless headset 100 illustrated in FIG. 7 is distinguished from that shown in FIG. 6 by inclusion of an additional state, denoted as the sleep state (720). Inclusion of the sleep state provides an additional opportunity to control the power consumption of wireless headset 100 based on specific operating conditions. As before, the wireless headset 100 remains in the inactive state (710) absent user stimulus. Upon detecting user stimulus, the wireless headset 100 transitions from the inactive state (710) to the sleep state (720). In this state, the power control circuit 210 enables only a portion of the communications circuit 230. Specifically, the power control circuit 210 enables the wireless communications interface 232 or a portion thereof. Then, using a signal output from the wireless communications interface 232, the power control circuit 210 determines if the base unit 102 is active, or if the base unit 102 is attempting to communicate with the wireless headset 100. In some embodiments, the wireless headset 100 infers activity by detecting, via its wireless communications interface, a carrier signal from the base unit 102. In other embodiments, the wireless headset detects activity based on receiving a "wake-up" signal from the base unit 102. Note that monitoring for the base unit carrier signal may be performed continuously by the wireless headset 100 while in the sleep state, or may be performed periodically; thereby further reducing sleep state power consumption. For periodic carrier monitoring, the wireless headset 100 may employ an exemplary monitoring interval of 0.5 seconds. Irvin '332 at 9:13–65 Upon detecting the carrier signal or wake-up signal from the base unit 102, as indicated by the link signal shown in FIG. 7, the wireless headset 100 transitions from the sleep state (720) to the active state (730).

Claims	Prior Art
	To further reduce power consumption, the wireless headset 100 may only monitor for the external signal on a periodic basis. If the wireless headset 100 is configured to monitor for the external signal on a periodic basis and the base unit 102 is configured to emit a periodic wake-up signal, the periodic monitoring of the wireless headset 100 is set such that its monitoring frequency is not an integer multiple of the wake-up signal frequency. Upon causing the wireless headset 100 to transition from the inactive state (710) to the sleep state (720), the power control circuit 210 initializes and starts the timer 218. While in the sleep state (720), subsequent or continued assertion of the sensor output signal from the sensor 220 causes the power control circuit 210 to reset its timer 218. Absent such user stimulus, the timer 218 expires and the power control circuit 210 disables the communications circuit 230. After transitioning from the sleep state (720) to the active state (730), based on detection of the signal from the base unit 102, the power control circuit 210 continues resetting its timer 218 based on user stimulus, as done in the sleep state (720). Thus, continued user stimulus causes the power control circuit 210 to leave the wireless headset 100 fully functional in the active state (730). The present invention provides methods and apparatus allowing the wireless headset 100 to conveniently transition from a non-functional inactive state to a fully functional active state, based on its detection of certain user stimulus. In a preferred embodiment, the wireless headset 100 transitions from the inactive state to the intermediate sleep state, thereby conserving power. Upon detection of the carrier or the wake-up signal from the base unit 102, the wireless headset 100 transitions from the sleep state to the fully functional active state. The wireless headset 100 includes a sensor 220 for detecting the user stimulus. As the sensor 220 may be a motion sensor, a vibration sensor, an attitude sensor, or a proximity sensor, the specific user stimulus may include the user moving and/or placing the wireless headset 100 upon their body. The operation of the wireless headset 100 in accordance with the present invention admits tremendous flexibility with respect to implementation. As noted, many different circuit implementations may provide the inventive features of the present invention. These implementations may include hardware and software, and can reflect varying degrees of integration between the functional circuit blocks discussed. Indeed, all such variations for providing a wireless headset 100 that automatically controls its power consumption or operating state based on detection of a user stimulus are within the scope of the present invention. A POSITA would have been motivated to combine the Jabra BT800 with Irvin ’332, the Jabra BT800 with Zadesky ’230, and the Jabra BT800 with Hollemans ’490 to implement a force sensor, and reasonably expected success in doing so, for the reasons explained above in element [48b] and claims 5–7. *Supra* claims 5–7, [48b]. To the extent that the Jabra BT800, Irvin ’332, Zadesky ’230, and Hollemans ’490 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to

Claims	Prior Art
	combine, with the teachings of the Jabra BT800, Irvin ’332, Zadesky ’230, and Hollemans ’490, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[58a]. A system as recited in claim 56, wherein the head-worn personal electronic apparatus is configured to support voice calls to the user, and	The Jabra BT800 expressly or inherently discloses “[a] system as recited in claim 56, wherein the head-worn personal electronic apparatus is configured to support voice calls to the user.” For example: *See* above at claim [3a]. To the extent that the Jabra BT800 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
[58b] wherein the at least one operation of the head-worn personal electronic apparatus being altered concerns at least accepting or declining a voice call to the user.	The Jabra BT800 and Hollemans ’490 expressly or inherently disclose “wherein the at least one operation of the head-worn personal electronic apparatus being altered concerns at least accepting or declining a voice call to the user.” For example: A POSITA would have understood that Hollemans ’490’s “touch–sensitive area” was a force sensor, and Hollemans ’490 discloses “touching the right earpiece could be mapped on answering the call” (example of the claimed wherein the at least one operation of the head-worn personal electronic apparatus being altered concerns at least accepting or declining a voice call to the user). The following citations show examples of where the Hollemans ’490 discloses this limitation. Hollemans ’490 at 4:24–5:7 The controller 120 is used for commanding the device 110 to perform one or more of its functions or capabilities. The basic assumption is that the device 110 is remote or tucked away in a pocket or clamped to a belt or clothing, such that operating it becomes relatively hard. The controller 120 makes it possible to operate the device 110. The controller 120 is generally wired to the device 110 by means of a wire 140 (see figure 2) and a plug (not shown) that fits into a socket (not shown) of the device 110. The remote controller 120 has an outer surface 121, see also figure 2. The outer surface 121 is just the physical outer side of the controller 120. A part of this outer surface 121 is sensitive to being touched and is referred to as the touch-sensitive area 122. Optionally, the controller 120 comprises a second area that is sensitive to being touched, referred to as the further touch-sensitive area 123. The touch-sensitive area 122 can be realized in many ways, including a sensor for changes in capacity or induced voltages or currents, a grid of conducting parts between which changes in resistance are measured and detected, or an ordinary pressure sensor, button or temperature sensor. Another possibility is to measure and detect changes in either a passive or an active electromagnetic field. With the passive variant, the controller 120 relies on,

Claims	Prior Art
	for example, nearby power lines to generate measurable fields when being touched. With the active variant, the controller 120 generates an electromagnetic field of its own. Hollemans '490 at 9:1–17 In a fourth way, the system may be arranged to operate in a plurality of modes, and to switch between the modes. A function that depends on the mode may be invoked in response to an input on the remote control. Each mode may e.g. correspond to an application of the system. The system may switch to another application in response to a command of the user, for example given via the touch-sensitive area. Touching the left earpiece, for example, may cause a move through a circular list of applications, and an application may be activated by touching the right earpiece. Also multiple applications may be active simultaneously, in which case a special command may be used to switch between applications, e.g., hold one earpiece while tapping on the other. Of course, other combinations may be used for this. Another way of switching between applications may not be initiated by the user, but by the system, e.g., on an incoming phone call or some other event. As soon as the incoming phone call is detected, the ring tone may be sounded, potentially mixed with the active sound source e.g. MP3 playback. While the incoming phone call is communicated to the user, the controls are mapped to the phone application rather than the audio playback application. In the phone application, touching the right earpiece could be mapped on answering the call and the left earpiece could be mapped to hanging up. As the user picks up the call, the playback of the music may be paused. A POSITA would have been motivated to combine the Jabra BT800 with Hollemans '490, to implement answering a voice call on the Jabra BT800, and reasonably expected success in doing so, for the reasons explained above for [4b]. Supra [4b]. A POSITA would have understood that the touch sensitive surfaces mapped in [4b] are the same as the force sensors mapped in [48b]. *Supra* [4b]. To the extent that the Jabra BT800 and Hollemans '490 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800 and Hollemans '490, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.
59. A system as recited in claim 44, wherein the first microphone is positioned to be directed forward towards the user's front when the head-worn structure is being worn by the user, and the second	The Jabra BT800, Phonak Perseo, Griffin '456, and Miller '585 expressly or inherently disclose "[a] system as recited in claim 44, wherein the first microphone is positioned to be directed forward towards the user's front when the head-worn structure is being worn by the user, and the second microphone is positioned to be directed outward away from the user's head when the head-worn structure is being worn by the user." For example:

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microphone is positioned to be directed outward away from the user's head when the head-worn structure is being worn by the user.	*See* above at claim 19. To the extent that the Jabra BT800, Phonak Perseo, Griffin ’456, and Miller ’585 does not disclose any elements of this claim limitation, it would have been obvious to a person having ordinary skill in the art to combine, with the teachings of the Jabra BT800, Phonak Perseo, Griffin ’456, and Miller ’585, those elements, as known to them or as disclosed by other prior art identified in the cover pleading.