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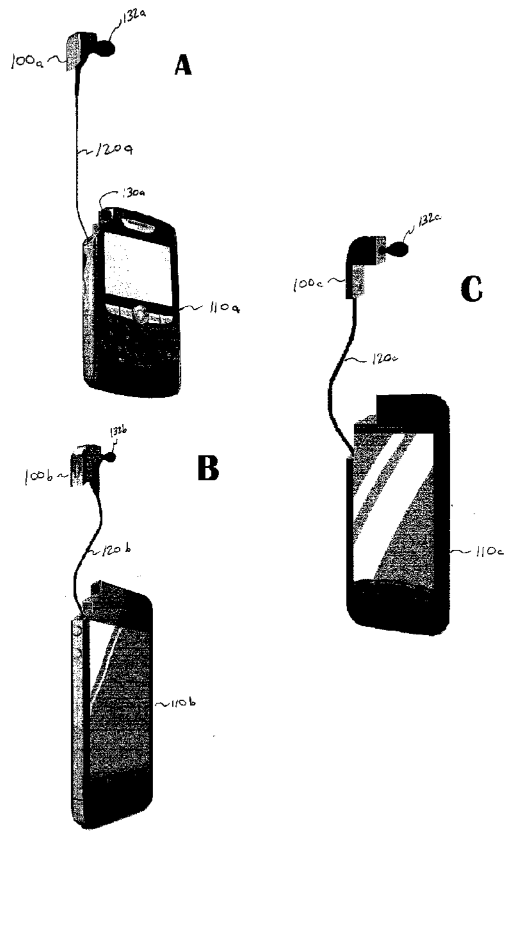
(54) Title: INTEGRATED, DETACHABLE EAR BUD DEVICE FOR A WIRELESS PHONE



(57) Abstract: An integrated, detachable ear bud system that is attached to an associated wireless phone. The integrated, detachable ear bud system may be one ear bud, or pair of ear buds, or ear bud or ear buds including a microphone. In certain embodiments an integrated, detachable, attached auditory device is physically connected to its associated wireless phone via an extendable and retractable electrical cord, and integrated into the case of the associated wireless phone, to forcibly keep with the wireless phone even when not in use, preventing misplacement, loss, or even inadvertent separation from the wireless device. The ear buds may connect to a recharge port on the wireless phone, and be charged when the wireless phone is charging. When in its attached home position, the ear-mountable speaker may tuck into a mating cavity. A latch or magnet may assist in attaching the integrated, detachable ear bud to the wireless phone.

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INTEGRATED, DETACHABLE EAR BUD DEVICE FOR A WIRELESS PHONE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates generally to telecommunications. More particularly, it relates to an audio accessory for a wireless phone.

2. Background of the Related Art

Wireless phones today have the ability to provide very high sound quality and are often used as music players. Conventional wireless phones include one internal speaker for placement against the ear of a user (and sometimes an additional two internal speakers for rudimentary stereo output), and a microphone for picking up voice from the user. Many wireless phones are sold with separately packaged ear buds (and sometimes ear buds with a microphone) to plug into a phono jack on the wireless phone, bypassing an internal speaker, to enjoy personal audio output by their wireless phone. Ear buds are presumably expected to be carried in a clothing pocket, purse, etc. when not in use. In some cases a pouch is provided for a wireless phone to be stored together with a set of ear buds.

Some conventional ear buds include a microphone, permitting use of the wireless phone as a phone via wired ear buds. Wireless earpiece and microphone devices are also known, communicating with the wireless phone via a piconet connection such as BLUETOOTH(TM). Some wireless auditory devices come with a case for storing the wireless auditory device, sometimes including a built-in recharge port (e.g., Plantronics Discovery 975). Wireless phones are suspected by some to emit small levels of radiation. Some experts believe that these levels of radiation may be harmful, while many if not most do not. Though not all experts agree if mobile phones can cause long-term, permanent damage, most generally agree that keeping a wireless phone away from the user's body, especially away from their head and ears, would diminish any possible risk of harm from mobile phone radiation if it exists.

SUMMARY OF THE INVENTION

In accordance with the principles of the present invention, a wireless phone audio system comprises an audio driver, and an internal speaker. An integrated, detachable ear bud physically attaches to a case of an associated wireless phone. A proximity sensor directs audio output from the audio driver to the integrated, detachable ear bud when the integrated, detachable ear bud is physically detached from the case of the associated wireless phone.

BRIEF DESCRIPTION OF THE DRAWINGS

Features and advantages of the present invention will become apparent to those skilled in the art from the following description with reference to the drawings, in which:

Fig. 1A shows a first exemplary style wireless phone with an integrated, detachable, extendable/retractable hardened earphone, microphone, and connection cord (herein after referred to collectably as "retractable device") for use with a mobile phone, in accordance with the principles of the present invention.

Fig. 1B shows another style wireless phone with an integrated, detachable, extendable/retractable hardened earphone, microphone, and connection cord for use with a different style mobile phone, in accordance with the principles of the present invention.

Fig. 1C shows yet another style wireless phone with an integrated, detachable, extendable/retractable hardened earphone, microphone, and connection cord for use with yet another style mobile phone, in accordance with the principles of the present invention.

Fig. 2 shows an embodiment of a wireless phone with a pair of integrated, detachable, retractable ear buds, in accordance with the principles of the present invention.

Fig. 3 shows another embodiment of a wireless phone with an integrated, detachable, retractable ear bud, including an in-line microphone, in accordance with the principles of the present invention.

Fig. 4 shows yet another embodiment of a wireless phone with an integrated, detachable, retractable ear bud, with a separable connector in a wired connection, in accordance with the principles of the present invention.

Fig. 5 shows an embodiment of a wireless phone with an integrated, detachable, singular wireless ear bud, in accordance with the principles of another aspect of the invention.

Fig. 6 shows an embodiment of a wireless phone with a pair of integrated, detachable, dual wireless ear buds, in accordance with the principles of the present invention.

Fig. 7 shows an embodiment of a wireless phone with a pair of integrated, detachable, dual wireless ear buds, that are each mated with a battery recharge port when attached to the mobile phone, to enable recharging of said integrated, detachable, dual wireless ear buds, in accordance with the principles of the present invention.

Fig. 8 shows an exemplary embodiment of a wireless jawbone earpiece/microphone, in accordance with another aspect of the present invention.

Fig. 9 shows an exemplary embodiment of a wireless jawbone earpiece/microphone including a recharge port for recharging the wireless jawbone earpiece/microphone when attached to its mating wireless phone, in accordance with the principles of the present invention.

DETAILED DESCRIPTION OF ILLUSTRATIVE EMBODIMENTS

The present inventors have appreciated that an ear bud, a pair of ear buds, or ear buds including a microphone, are often misplaced, separated from the wireless phone for which they are intended for use with, and/or simply lost. The present invention provides an integrated, detachable ear bud system that is integrated and attached to an associated wireless phone.

In certain embodiments the present invention provides an integrated, detachable, attached auditory device that is physically connected to its associated wireless phone via an extendable and retractable electrical cord, and integrated into the case of the associated wireless phone. By integrating the integrated, detachable ear buds into the case of the wireless phone itself, the integrated, detachable ear buds are forcibly kept with the wireless phone even when not in use, preventing misplacement, loss, or even inadvertent separation from the wireless device.

Fig. 1A shows a first exemplary style mobile phone with an integrated, detachable, extendable/retractable hardened earphone, microphone, and connection cord (herein after referred to collectably as a “retractable device”) for use with a mobile wireless phone, in accordance with the principles of the present invention.

In particular, as shown in Fig. 1A, a wireless phone **110a** includes an integrated, detachable ear bud **100a**. The integrated, detachable ear bud **100a** includes an ear-mountable speaker **132a**, and an electrical cord **120a** between the ear-mountable speaker **132a** and an output driver within the wireless phone **110a**. In the disclosed embodiment, when the integrated, detachable ear bud **100a** is attached to the wireless phone **110a** in its attached home position, the ear-mountable speaker **132a** may tuck into a mating cavity **130a** to assist in physical positioning and attaching of the integrated, detachable ear bud **100a** to the case of the wireless phone **110a**.

Any suitable plastic or metal releasable latch that catches when the integrated, detachable ear bud **100a** is pushed into its attached home position may be implemented. The releasable latch may be released blindly with suitable separation pressure applied to separate or detach the integrated, detachable ear bud **100a** from the wireless phone **110a**. Alternatively the releasable latch may be released when an associated button on the case of the wireless phone **110a** is pressed or otherwise activated. The release latch may alternatively be software activated with an electrical solenoid, magnet, or the like. The integrated, detachable ear buds **100a** may be latched with a suitable rare earth magnet mounted within the case of the wireless phone **110a** and/or within the ear bud **100a**.

In the embodiment of the integrated, detachable ear bud device shown in Fig. 1A, the integrated, detachable ear bud **100a** is physically connected or attached to the case of the wireless phone **110a**, and includes a retractable electrical audio cord connecting the integrated, detachable ear bud **100a** to the respective audio output driver within the wireless phone **110a**.

The retractable, integrated, detachable audio system can be comprised of a single ear bud (e.g., suitable for listening to radio, etc.), or of a pair of ear buds (e.g., left-side and right-side ear buds) suitable for higher-end audio applications (e.g., music entertainment, movies, etc.)

Preferably the wireless phone **110a** includes a home sensor switch that activates internal speaker(s) (and deactivates the speaker within the ear bud **100a**) when the integrated, detachable ear bud **110a** is in an attached home position attached to the wireless phone **110a**, and deactivates internal speaker(s) (and activates audio to the ear bud **100a**) when the integrated, detachable ear bud **100a** is removed or detached from its attached home position. The home sensor switch may be a physical switch, or an inductive sensor switch.

In disclosed embodiments, each integrated, detachable ear bud **100a** is preferably integrated into the case of its associated wireless phone **110a**, e.g., integrated into the overall shape of the wireless phone **110a**. For instance, the integrated, detachable ear bud **100a** may be shaped to fill out a portion of the corner, side, or top edge of the case of the wireless phone **110a**.

Integrated, detachable ear buds assure convenience, availability, and compatibility in an audio experience with respect to an associated wireless device **110a**. Integrated, detachable ear buds also provide a hardened interface between a wireless phone **110a** and an ear-mounted auditory component **100a** via inclusion of an extendable/retractable audio cord **120a** between the integrated, detachable ear bud **100a** and its associated wireless device **110a**.

Fig. 1B shows another style mobile phone with an integrated, detachable, extendable/retractable hardened earphone, (and possibly microphone,) and connection cord for use with a different style mobile phone, in accordance with the principles of the present invention.

In particular, while Fig. 1A depicted a Blackberry(TM) style wireless phone **110a**, the principles of the present invention relates to all styles of wireless phones, e.g., an iPhone(TM) as shown in Fig. 1B.

As shown in Fig. 1B, an integrated, detachable ear bud **100b** including an ear speaker **132b** is wired via an extendable/retractable audio electric cord **120b** to the audio output driver of the wireless phone **110b**.

Fig. 1C shows yet another style mobile phone with an integrated, detachable, extendable/retractable hardened earphone, (and possibly microphone,) and connection cord for use with yet another style mobile phone, in accordance with the principles of the present invention.

In particular, as shown in Fig. 1C, a wireless phone **110c** includes an integrated, detachable ear bud **100c** comprising an ear speaker **132c**. As shown, the integrated, detachable ear bud **100c** is wired to the audio output driver of the wireless phone **110c** via an electrical audio cord **120c**.

Fig. 2 shows an embodiment of a mobile phone with a pair of integrated, detachable, retractable ear buds, in accordance with the principles of the present invention.

In particular, as shown in Fig. 2, a wireless phone **210a**, e.g., of a Blackberry(TM) or any other style wireless phone, includes a pair of integrated, detachable ear buds **200L**, **200R**, that each have a respective extendable, retractable cord **220**, **221** that coil into respective retraction mechanisms within the wireless phone **210a**. Each integrated, detachable ear bud **200L**, **200R**, may have its own respective cord retraction mechanism within a cavity of the case of the wireless phone **210a**. Alternatively, a singular cord retraction mechanism may be mounted within the cavity of the case of the wireless phone **210a** between the two attached home positions **261**, **262** for the integrated, detachable ear buds **200L**, **200R**, respectively such that extension and retraction of the integrated, detachable ear buds **200L**, **200R** are synchronized.

Ideally, separation of either integrated, detachable ear bud **200L**, **200R** from the case of the associated wireless device **210a** causes audio switching between an associated internal speaker (or speakers) **278L**, **278R** of the wireless phone to the integrated, detachable ear bud **200L**, **200R**. For instance, when a left-side integrated, detachable ear bud **200L** is separated from the case of the wireless phone **210a**, audio that was previously routed to a left-side internal speaker **278L** may be re-routed to the detached left-side integrated, detachable ear bud **200L**. In another embodiment, whenever one integrated, detachable ear bud **200L** or **200R** is removed, all audio to any (if just one) or both internal speakers **278L**, **278R** (e.g., left-side and right-side audio) is re-routed to the detached integrated, detachable ear buds **200L**, **200R**.

Fig. 3 shows another embodiment of a mobile phone with an integrated, detachable, retractable ear bud, including an in-line microphone, in accordance with the principles of the present invention.

In particular, as shown in Fig. 3, the integrated, detachable, retractable audio device **100a** may include an in-line microphone **300** at an appropriate position on the retractable cord **320a** (or on the head of the integrated, detachable, retractable audio device **100a**) so that a conversation can be conducted through the integrated, detachable, retractable ear bud **100a**. In such embodiment physical accommodation is made within a retraction mechanism to absorb the in-line microphone **300** during retraction.

Fig. 4 shows yet another embodiment of a mobile phone with an integrated, detachable, retractable ear bud, with a separable replacement connector in a wired connection, in accordance with the principles of the present invention.

In particular, as shown in Fig. 4, a wireless phone **110a** including an integrated, detachable ear bud **100a** may have a replacement connection or extension jack **400** enabling the retraction cord **420a** to be separated such that the integrated, detachable ear bud **100a** may be replaced, upgraded, etc.

The present inventors have appreciated that hardwired, integrated, detachable ear buds provide a greater sound quality than a wireless headset (e.g., a BLUETOOTH(TM) ear bud and microphone.) However, if wireless audio is acceptable, Fig. 5 shows an embodiment of a wireless phone with an integrated, detachable, singular wireless ear bud, in accordance with the principles of another aspect of the invention.

In particular, the embodiment of Fig. 5 shows a wireless connection between an integrated, detachable ear bud **500a** and its associated wireless phone **510a**.

In disclosed embodiments the wireless integrated, detachable ear bud **500a** includes an internal rechargeable battery. The internal rechargeable battery may in certain low-cost applications instead by a non-rechargeable battery and occasionally replaced by the user.

The rechargeable battery of the wireless integrated, detachable ear bud **500a** preferably is recharged by power from the wireless phone **510a** when the integrated, detachable ear bud **500a** is plugged into its attached, home position on the wireless phone **510a**. To conserve battery power within the wireless phone **510a** it is preferred that the recharge circuit that recharges the integrated, detachable ear bud **500a** is activated to recharge the internal rechargeable battery of the integrated, detachable ear bud **500a** only when the wireless phone **510a** itself is being recharged or otherwise powered from an external power source external to the wireless phone **510a**.

Compatibility between the wireless phone **510a** and its associated integrated, detachable ear bud **500a** is assured because the integrated, detachable ear bud **500a** is integrated into, and detachably attached to, the wireless phone **510a** itself. Conventional 'pairing' may be avoided or simplified as pairing information may be presumed by the wireless phone **510a** when establishing its Bluetooth(TM) connection with the integrated, detachable ear bud **500a**. However, even if 'pairing' is nevertheless required before the integrated, detachable wireless ear bud **500a** may be fully activated, full conventional Bluetooth(TM) pairing may be accomplished to ensure that the integrated, detached ear bud **500a** is readily available.

Fig. 6 shows an embodiment of a mobile wireless phone **610a** including a pair of integrated, detachable wireless ear buds **600L**, **600R**, in accordance with the principles of the present invention.

Fig. 7 shows an embodiment of a wireless phone **610a** with a pair of integrated, detachable, wireless ear buds **700L**, **700R**, that are each mated with a respective matching battery recharge port **760L**, **760R**, when placed in their respective attached home positions integrated into the case of the wireless phone **610a**, to enable recharging of each integrated, detachable, wireless ear bud **700L**, **700R**, in accordance with the principles of the present invention.

As shown in Fig. 7, the integrated, detachable, wireless ear buds **700L**, **700R** has an electrical connector **750L**, **760R** to recharge their respective internal batteries when attached to the wireless phone **610a**, as the electrical connectors **750L**, **750R** electrically mate with respective recharge ports **760L**, **760R**.

Ideally the charge to the recharge ports **760L**, **760R** is activated when the wireless phone **610a** is itself connected to an external recharge power supply. However, the integrated, detachable, wireless ear buds **700L**, **700R** may be recharged by the internal main battery of the wireless phone **610a**. However, if such battery-to-battery recharge is activated, it is preferred that such battery-to-battery recharge be disabled when the remaining power in the main battery of the wireless phone **610a** drops below a given threshold, e.g., below 10%, at which time the recharge ports **760L**, **760R** connected to the electrical connectors **750L**, **750R** of the integrated, detachable, wireless ear buds **700L**, **700R** are preferably turned off to conserve battery power.

The recharge ports **760L**, **760R** (and matching electrical connectors **750L**, **750R**) may be of any suitable connector type, including, e.g., a straight power jack, a micro USB, etc.

Fig. 8 shows an exemplary embodiment of a wireless jawbone earpiece/microphone **800a**, in accordance with another aspect of the present invention.

In particular, as shown in Fig. 8, an integrated, detachable wireless "jawbone" ear bud **800a** includes an ear bud speaker **801a** with an attached microphone **802a**. The integrated, detachable wireless jawbone ear bud **800a** preferably includes an internal rechargeable battery, but can alternatively include a separate replaceable battery.

Fig. 9 shows an exemplary embodiment of a wireless jawbone earpiece/microphone **900a**, in accordance with still another aspect of the present invention.

In particular, as shown in Fig. 9, an integrated, detachable wireless "jawbone" ear bud **900a** includes an electrical connector that mates with a recharge port **960** on the wireless phone **510a** when the integrated, detachable wireless jawbone ear bud **900a** is in its attached, home position on the wireless phone **510a**.

The integrated, detachable wireless jawbone ear bud **900a** preferably includes an internal rechargeable battery that can be recharged through the recharge port **960** when in an attached, home position on the wireless phone **510a**. Alternatively, the integrated, detachable wireless jawbone ear bud **900a** may be recharged on a matching remote recharge port separate from the wireless phone **510a**. Alternatively, the integrated, detachable wireless jawbone ear bud includes a rechargeable battery that can be recharged when attached to an thus plugged into the wireless phone **510a** while the wireless phone **510a** too is recharging.

Unique left/right physical keying may be included between the integrated, detachable wireless ear buds **600L** & **600R**, or **700L** & **700R**, or integrated, detachable wireless jawbone earpiece/microphone to differentiate between a left-side and a right-side. Unique left/right physical keying would prevent a left-side ear bud from attaching to a designated right-side-associated portion of the wireless phone, and vice versa. In this way left-side audio may be consistently provided to what is expected to be a left ear of a user of the mobile phone, and vice versa for the right-side.

The present invention anticipates accommodation for advancement of audio devices by enabling replacement of the integrated, detachable ear buds (or wireless jawbone) for repair or upgrade. For instance, in one embodiment, an extendable/retractable cord of the integrated, detachable ear buds is removable by release of a set screw, or by release of a latch accessed through a small opening in the case of the wireless phone (e.g. using the end of a small paper clip.) Preferably, since integrated with a given model wireless phone, the integrated, detachable ear bud(s) are manufactured by an original equipment manufacturer (OEM) of the wireless phone itself.

The invention addresses a number of problems related to health, convenience, and performance of wireless accessories provided by the current marketplace. Any individual using a mobile phone with an integrated, detachable ear bud, whether for conversation or their listening pleasure, benefits.

A significant benefit from the use of an integrated, detachable ear bud system in accordance with the principles of the present invention is that it enables a wireless phone to provide a radiation-safe, secure, superior sound experience as the ear buds may be designed specifically to the needs of the attached wireless phone. Another benefit from the use of integrated, detachable ear buds is that it provides significant separation between an operating wireless phone and the head of a user, thereby keeping any possible harmful radio wave radiation even more safely away from the head of a user.

While the invention has been described with reference to the exemplary embodiments thereof, those skilled in the art will be able to make various modifications to the described embodiments of the invention without departing from the true spirit and scope of the invention.

CLAIMS

What is claimed is:

1. A wireless phone audio system, comprising:

an audio driver;

an internal speaker;

an integrated, detachable ear bud that physically attaches to a case of an associated wireless phone;

a proximity sensor to direct audio output from said audio driver to said integrated, detachable ear bud when said integrated, detachable ear bud is physically detached from said case of said associated wireless phone.

2. The wireless phone audio system according to claim 1, wherein:

said integrated, detachable ear bud remains electrically connected to said wireless phone both when said integrated, detachable ear bud is attached to and detached from said case of said associated wireless phone.

3. The wireless phone audio system according to claim 1, wherein:

said proximity sensor further directs audio output from said audio driver to said internal speaker when said integrated, detachable ear bud is attached to said case of said associated wireless phone.

4. The wireless phone audio system according to claim 1, wherein:

said integrated, detachable ear bud is attached to said case of said wireless phone with an earth magnet.

5. The wireless phone audio system according to claim 1, wherein:

said earth magnet is mounted within said case of said wireless phone.

6. The wireless phone audio system according to claim 1, wherein:

said integrated, detachable ear bud is attached to said case of said wireless phone with a physical latch.

7. The wireless phone audio system according to claim 6, wherein:

said physical latch is releasable by said wireless phone under software control.

8. The wireless phone audio system according to claim 1, wherein:

a speaker of said integrated, detachable ear bud inserts into a mating cavity in case of said associated wireless phone when said integrated, detachable ear bud is operably detached from said case of said wireless phone.

9. The wireless phone audio system according to claim 1, further comprising:

an internal microphone;

wherein said proximity sensor directs sound input to said internal microphone to an audio input of said wireless phone when said integrated, detachable ear bud is physically attached to said case of said associated wireless phone.

10. The wireless phone audio system according to claim 1, wherein said integrated, detachable ear bud further comprises:

an ear speaker; and

a microphone;

wherein said proximity sensor directs sound input to said microphone to an audio input of said wireless phone when said integrated, detachable ear bud is physically detached from said case of said associated wireless phone.

11. The wireless phone audio system according to claim 10, wherein:

said microphone is a jawbone microphone.

12. The wireless phone audio system according to claim 1, further comprising:

a retractable electrical cord between said internal, detachable ear bud and said wireless phone;

wherein said electrical cord retracts within said case of said wireless phone when said integrated, detachable ear bud is physically attached to said case of said wireless phone.

13. The wireless phone audio system according to claim 1, further comprising:

an additional integrated, detachable ear bud that physically attaches to a case of said associated wireless phone;

wherein said integrated, detachable ear bud and said additional integrated, detachable ear bud output stereo audio.

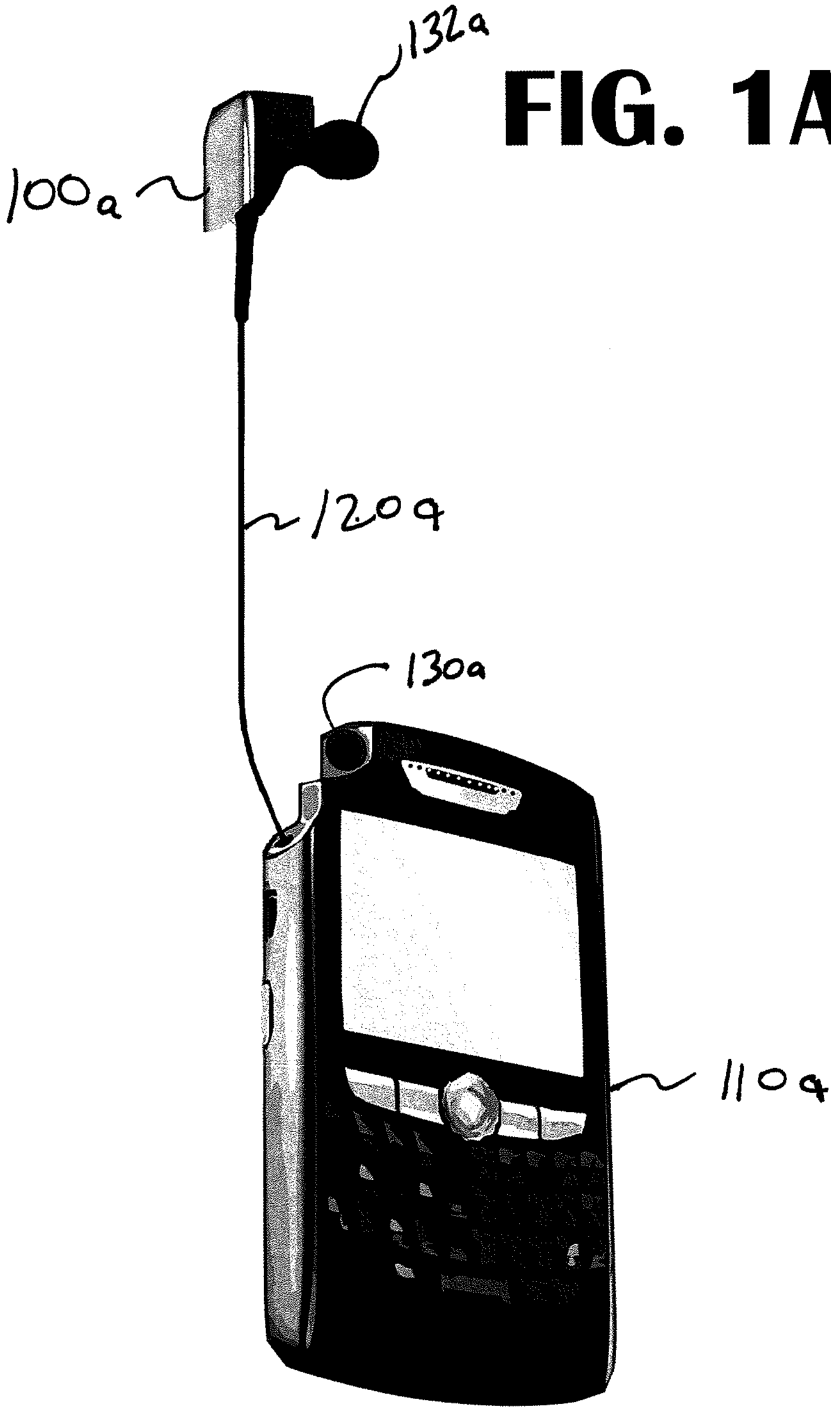
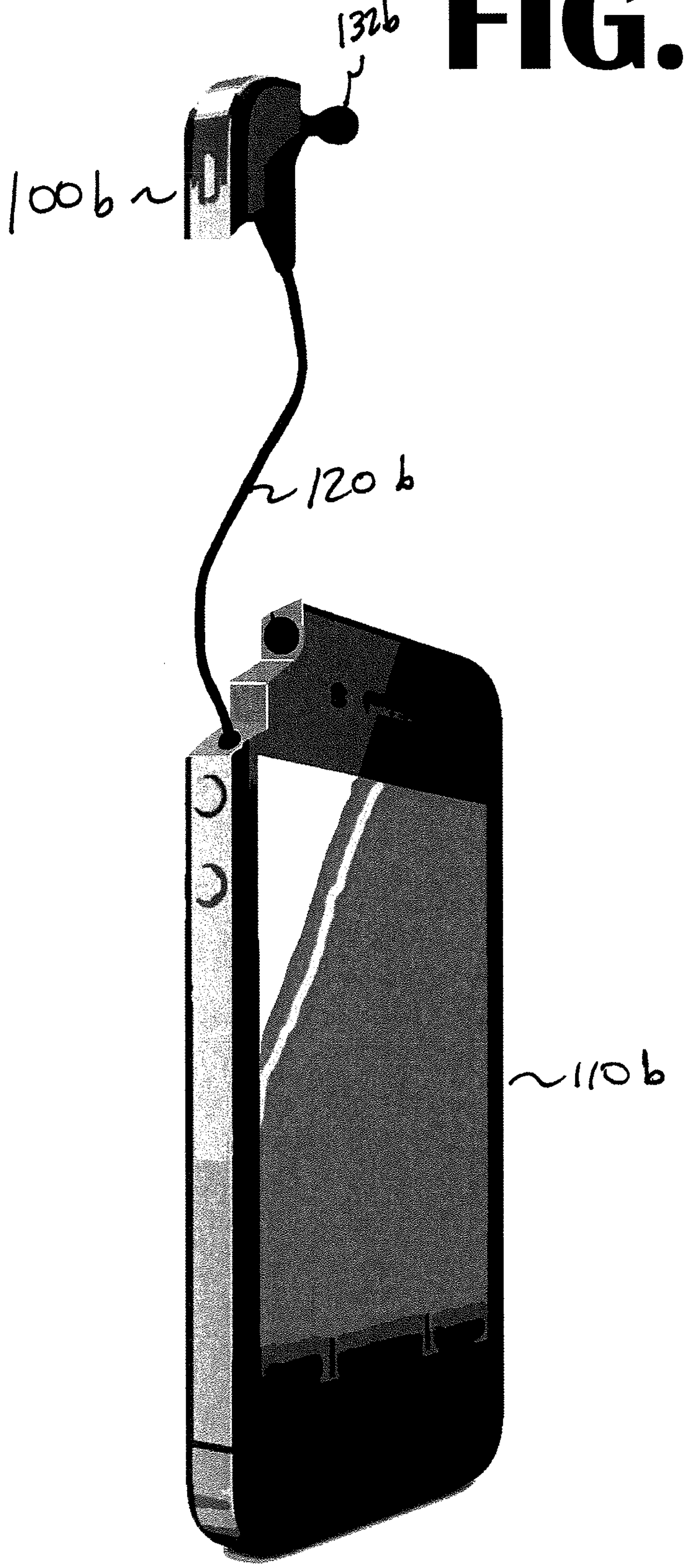


FIG. 1A

FIG. 1B



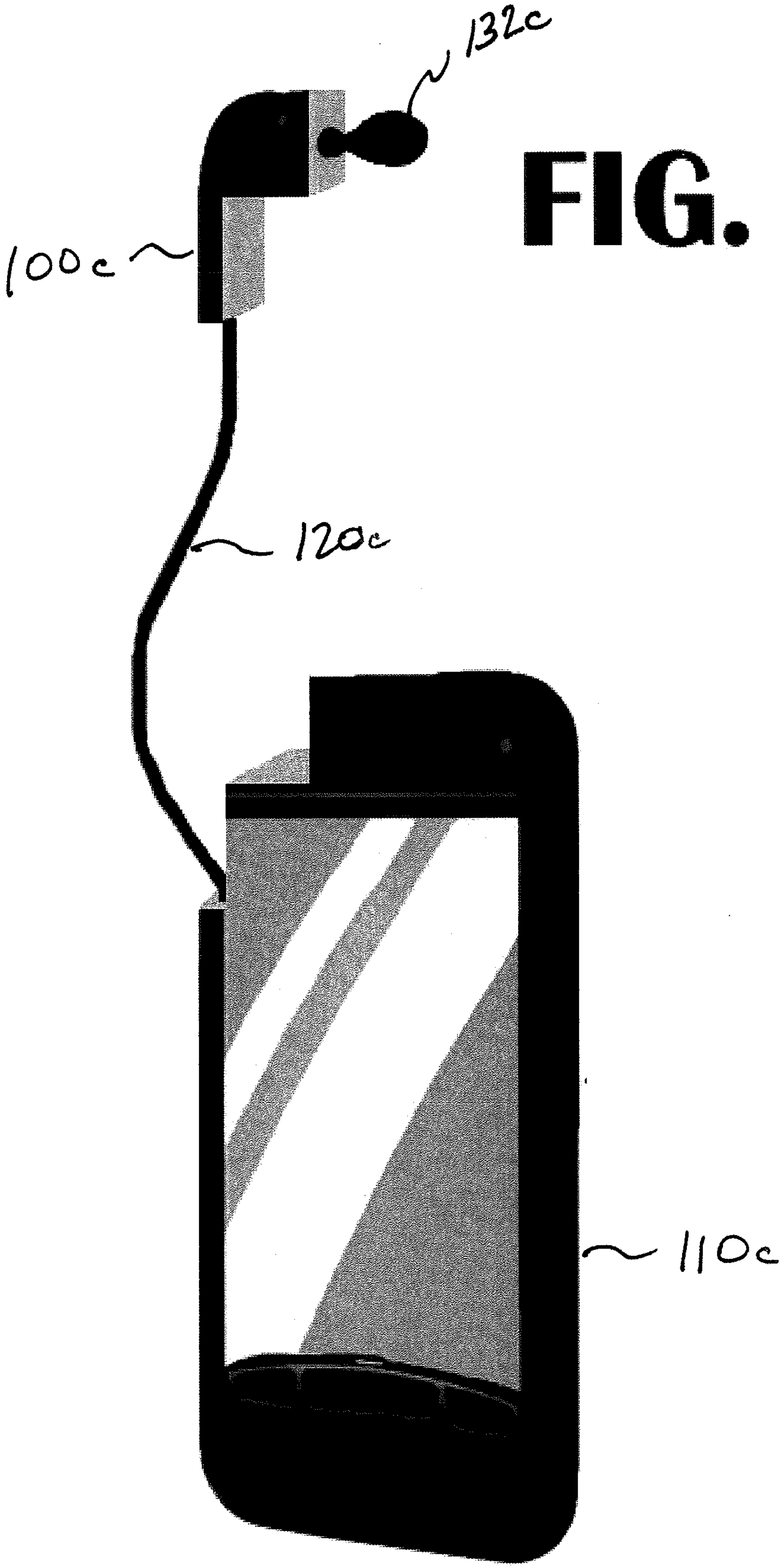


FIG. 1C

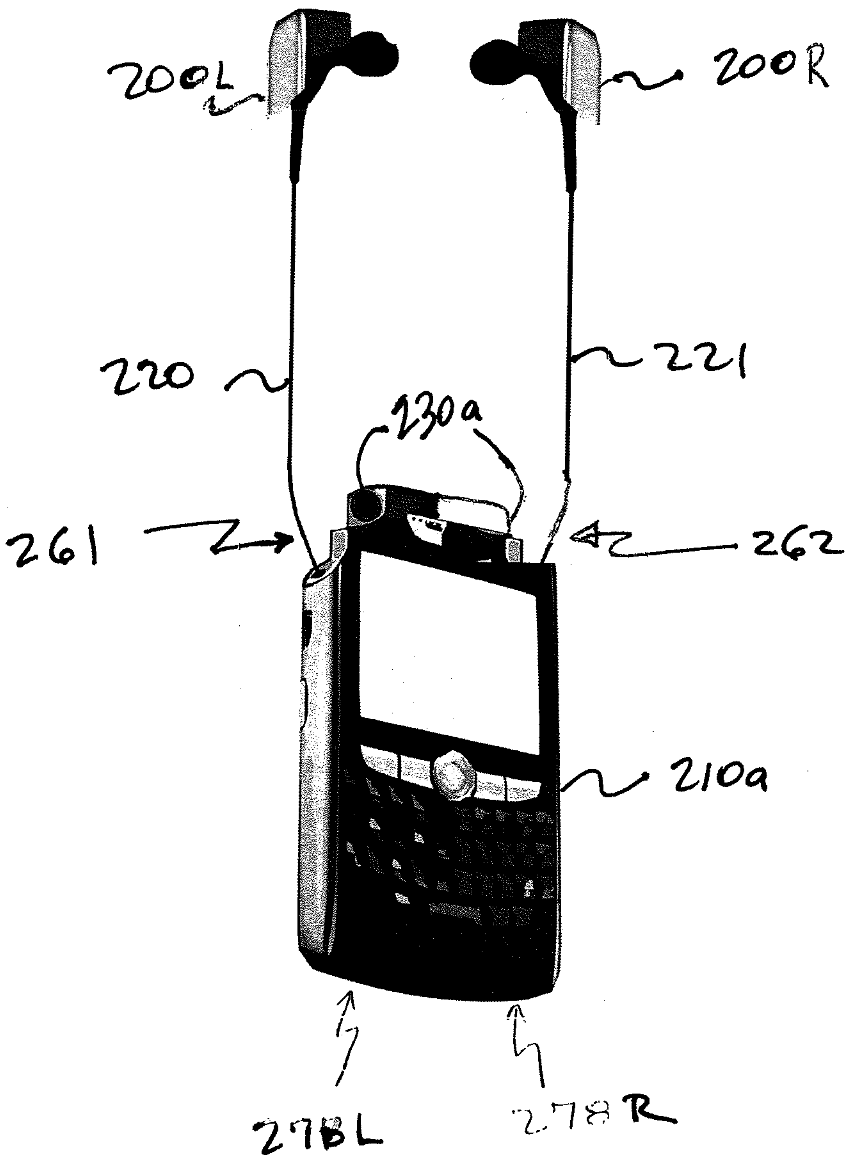


FIG. 2

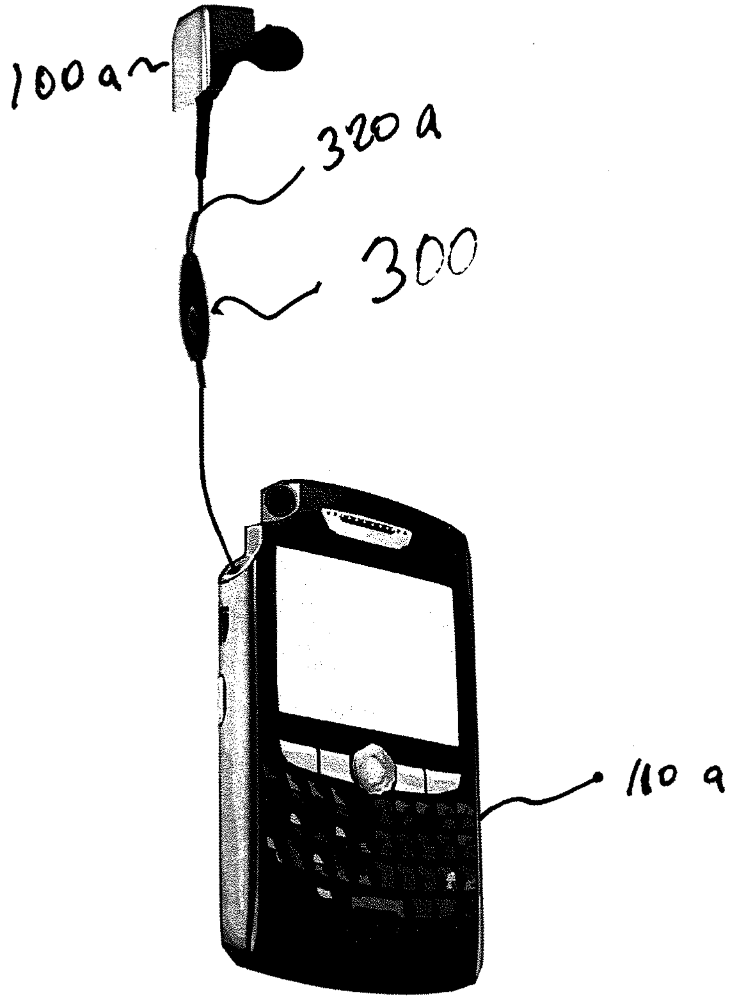


FIG. 3

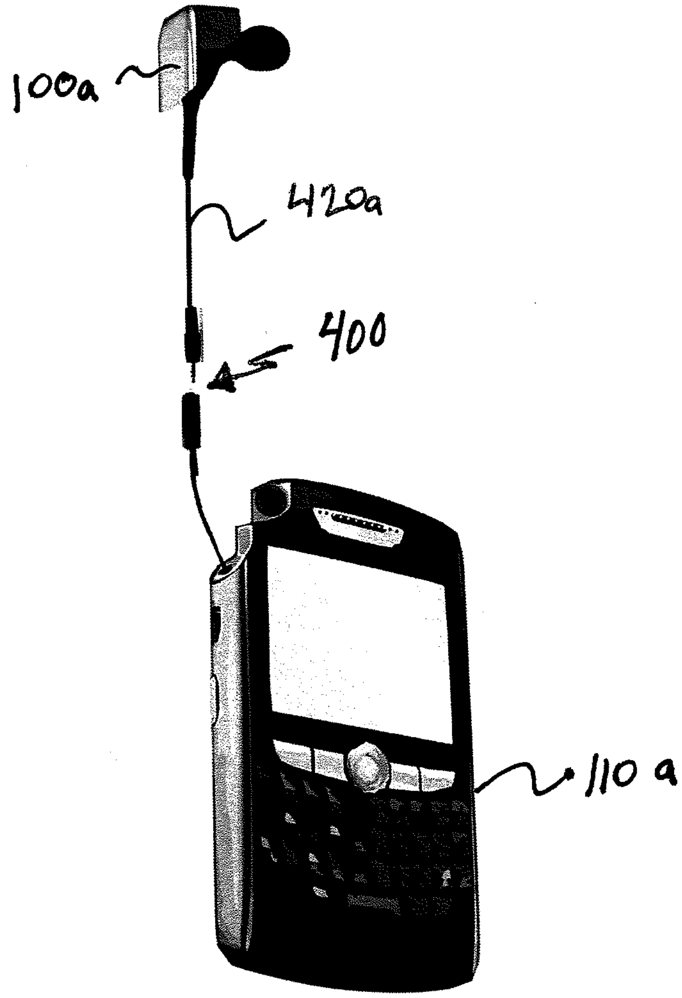


FIG. 4

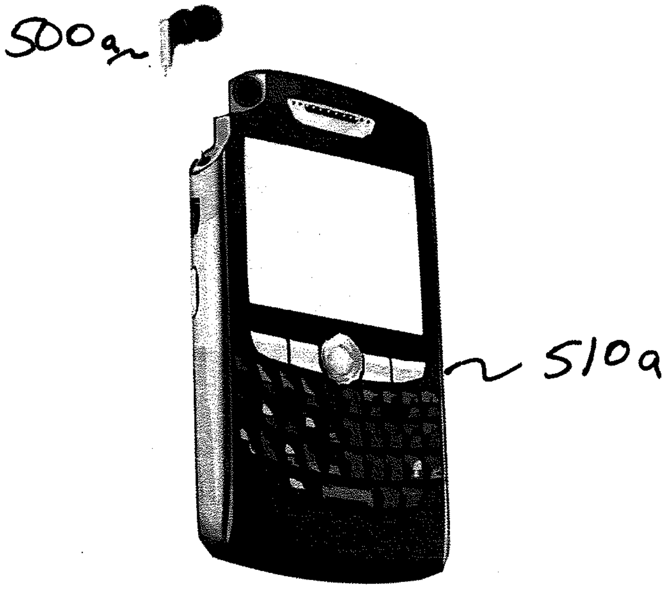


FIG. 5

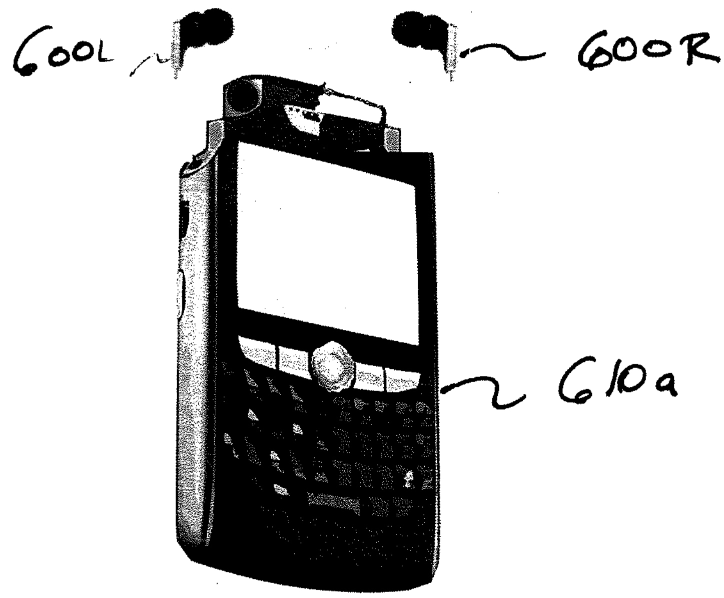


FIG. 6

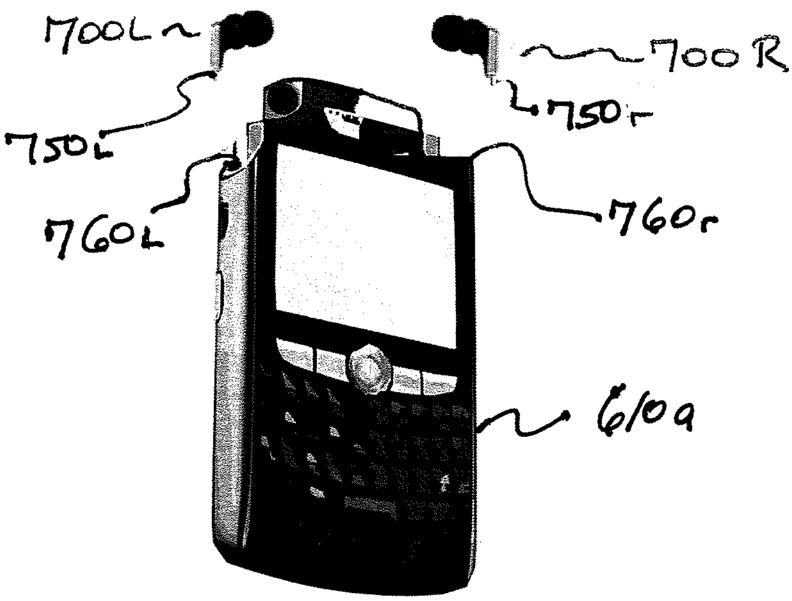


FIG. 7

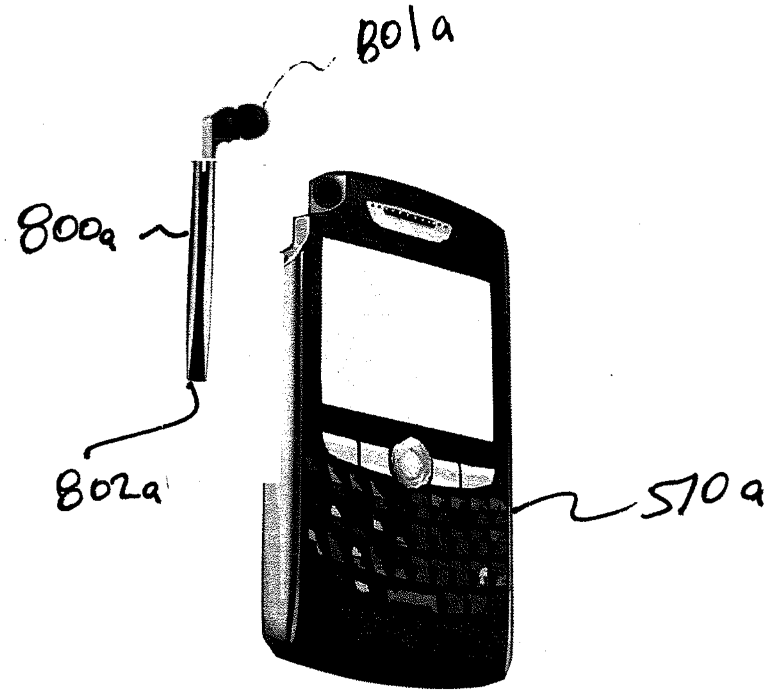


FIG. 8

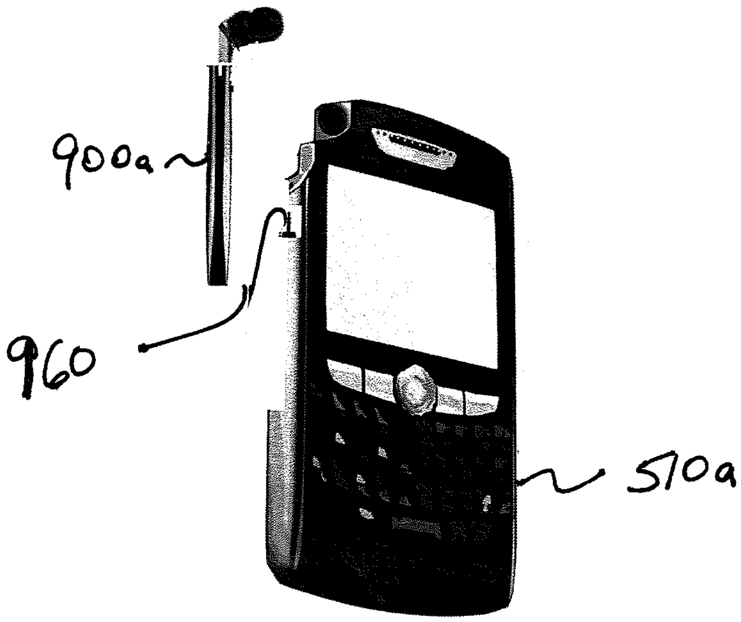


FIG. 9

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 13/29789

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - H04M 1/00 (2013.01)
USPC - 455/569.1
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC(8): H04M 1/00 (2013.01)
USPC: 455/569.1

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
IPC(8): H04M 1/00 (2013.01) (keyword limited - see terms below)
USPC: 455/569.1, 575.2 (keyword limited - see terms below)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PatBase, PubWEST(PGPB,USPT,USOC,EPAB,JPAB), Google Scholar
terms: earbud, earphone, earset, earpiece, retract, extendable, detach, releasable, integrated, seamless, stereo, stereophonic, channels, sensor, detect, removal, attach, indentation, recess, cavity, latch, lock, magnet, jawbone, wireless, cordless, cellular, cell phone

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 2003/0165237 A1 (Farr et al.) 04 September 2003 (04.09.2003), entire document, especially; para [0004], [0015], [0024]-[0026]. [0030], Fig. 1	1-3, 6, 8-12 --------------- 4, 5, 7, 13
Y	US 2006/0092773 A1 (Hsu et al.) 04 May 2006 (04.05.2006), entire document, especially; para [0015], [0026]-[0027]. Fig. 1, Claim 9	4, 5, 13
Y	US 2008/0156842 A1 (Panasik) 03 July 2008 (03.07.2008), entire document, especially; para [0021], [0039]-[0040], [0043], Fig. 1, 2	7
A	US 2007/0259701 A1 (Mirvis) 08 November 2007 (08.11.2007), entire document	1-13

☐ Further documents are listed in the continuation of Box C. ☐

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
07 April 2013 (07.04.2013)	07 MAY 2013

Name and mailing address of the ISA/US	Authorized officer:
Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774