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(54) **Method and system for controlling a maximum signal level output to headphones coupled to a wireless device**

Verfahren und System zur Steuerung eines maximalen Signalpegelausgangs zu an eine drahtlose Vorrichtung gekoppelte Kopfhörern

Procédé et système de contrôle d'une sortie de niveau du signal maximum dans des écouteurs couplés à un dispositif sans fil

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Description

FIELD OF THE APPLICATION

[0001] This application relates to the field of wireless devices, and more specifically, to a method and system for controlling a maximum signal level output to headphones coupled to a wireless device.

BACKGROUND

[0002] Current wireless mobile communication devices include microprocessors, memory, soundcards, speakers, headphones, and run one or more software applications in addition to providing for voice communications. Examples of software applications used in these wireless devices include micro-browsers, address books, email clients, instant messaging ("IM") clients, and wavetable instruments. Additionally, wireless devices have access to a plurality of services via the Internet. A wireless device may, for example, be used to browse web sites on the Internet, to transmit and receive graphics, and to execute streaming audio and/or video applications. Such wireless devices may operate on a cellular network, on a wireless local area network ("WLAN"), or on both of these types of networks.

[0003] One problem with current wireless devices pertains to the adjustment of maximum output sound pressure levels for headphones coupled to such devices. Headphones are typically used to listen to voice calls, radio programs, audio programs (e.g., music), etc., stored on or accessed by the wireless device. In particular, the maximum output sound pressure level for headphones for wireless devices and handheld products is legally constrained in several jurisdictions in order to protect users from hearing loss. For example, European Standard EN 50332-1:2000, dated March 2000 and entitled "Sound System Equipment: Headphones And Earphones Associated With Portable Audio Equipment - Maximum Sound Pressure Level Measurement Methodology And Limit Considerations - Part 1: General Method For 'One Package Equipment'", restricts maximum sound pressure level at the headphones (i.e., for headphones provided with the portable audio equipment and from the same manufacturer) to 100 dB. In addition, European Standard EN 50332-2:2003, dated October 2003 and entitled "Sound System Equipment: Headphones And Earphones Associated With Portable Audio Equipment - Maximum Sound Pressure Level Measurement Methodology And Limit Considerations - Part 2: Matching Of Sets With Headphones If Either Or Both Are Offered Separately", restricts maximum sound pressure level at the headphones (i.e., for headphones provided separately from the portable audio equipment by a different manufacturer) to 94 dB. Measurement of maximum sound pressure levels according to these standards is specified with respect to headphones having an impedance of 32 Ohms. One problem relating to such standards is that in

order to set the output signal level (e.g., in mV RMS) appropriately at the output jack of the wireless device in order to meet the maximum sound pressure level specified, the impedance of the headphones must be known.

This is especially problematic if the headphones are not provided by the manufacturer as a package with the wireless device.

[0004] A need therefore exists for an improved method and system for controlling a maximum signal level output to headphones coupled to a wireless device. Accordingly, a solution that addresses, at least in part, the above and other shortcomings is desired.

[0005] Published PCT Patent Application No. WO 2008/128563 discloses a hearing system which comprises a storage unit. The storage unit comprises location-related data relating to the hearing system's current location. The function of the hearing system changes in dependence of the location of the hearing system

[0006] European Patent Specification No. EP 1 720 375 relates to a system for enabling a hearing device wireless access to a communication network. The system comprises a first transceiver unit communicating according to a first communication protocol. The system further comprises a server device comprising an input/output unit, which is connected to the communication network and communicates according to a second communication protocol.

[0007] Published US Patent Application No. US 2006/182294 relates to a hearing aid which, with the aid of an integrated positioning unit or a positioning unit integrated in a mobile activation device automatically sets operating parameters of the hearing aid as a function of the location of the hearing aid or of the activation unit.

[0008] A need therefore exists for an improved method and system for controlling a maximum signal level output to headphones coupled to a wireless device. Accordingly, a solution that addresses, at least in part, the above and other shortcomings is desired.

GENERAL

[0009] The present teaching relates to a method as detailed in claim 1. The teaching also relates to a system as detailed in claim 13. Additionally, the teaching relates to a computer readable medium as detailed in claim 15. Advantageous features are provided in the dependent claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] Features and advantages of the embodiments of the present application will become apparent from the following detailed description, taken in combination with the appended drawings, in which:

[0011] FIG. 1 is a front view illustrating a wireless device coupled to headphones and adapted for implementing an embodiment of the application;

[0012] FIG. 2 is a block diagram illustrating the wireless

device of FIG. 1 and a wireless network adapted for implementing an embodiment of the application;

[0013] FIG. 3 is a block diagram illustrating a memory of the wireless device of FIGS. 1 and 2;

[0014] FIG. 4 is a block diagram illustrating a headphones subsystem;

[0015] FIG. 5 is a block diagram illustrating an alternate headphones subsystem; and,

[0016] FIG. 6 is a flow chart illustrating operations of modules within the memory of a wireless device for controlling maximum signal level output to headphones of the wireless device.

[0017] It will be noted that throughout the appended drawings, like features are identified by like reference numerals.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0018] In the following description, details are set forth to provide an understanding of the application. In some instances, certain software, circuits, structures and techniques have not been described or shown in detail in order not to obscure the application. Examples of the present application may be implemented in any computer programming language provided that the operating system of the wireless device or data processing system provides the facilities that may support the requirements of the application. Any limitations presented would be a result of a particular type of operating system or computer programming language and would not be a limitation of the present application. Examples of the preset application may also be implemented in hardware or in a combination of hardware and software.

[0019] According to the application, there is provided a method for controlling a maximum signal level output to headphones of a wireless device.

[0020] FIG. 1 is a front view illustrating a wireless device 100 coupled to headphones 105 (a.k.a., headphone set, headphone, headset, earphone, earphones, etc.) and adapted for implementing an example of the application. The wireless device 100 includes a casing 150, a display screen 122, a graphical user interface ("GUI") 180 displayed on the display screen 122, a keyboard (or keypad) 132, a trackball (or thumbwheel) 110, various select buttons 120, various inputs/outputs (e.g., power connector jack, data interface ports, etc.) 160, and a headphones jack 106. Internally, the wireless device 100 includes one or more circuit boards (not shown), a CPU 138, memory 124, 126, 200, a battery 156, an antenna (not shown), etc., which are operatively coupled to the various inputs/outputs 160, the keyboard 132, the display screen 122, the headphones jack 106, etc., as will be described below.

[0021] The headphones 105 are coupled to the wireless device 100 by a headphones cable or lead 107 which is inserted into the headphones jack 106. The headphones 105 include a speaker assembly which is inserted into or placed over a user's ear. The headphones 105

include two speaker assemblies, one for each of the user's ears. Each speaker assembly includes a speaker having an impedance (referred to as the impedance of the headphones in the following). The headphones 105, headphones jack 106, and headphones cable 107 may be configured for stereo and/or mono operation. When the headphones cable 107 is inserted into the headphones jack 106, audio output signals may be switched from the internal speaker 134 (see FIG. 2) to the headphones 105. Control of audio signal level (e.g., in mV RMS) output to the headphones 105 is performed by a headphones subsystem 400 as described below. According to one example of the application, the headphones jack 106 is a 3.5 mm headset jack adapted to support both a stereo headphones output and a mono microphone input.

[0022] FIG. 2 is a block diagram illustrating the wireless device 100 of FIG. 1 and a wireless network 220 adapted for implementing an embodiment of the application. The wireless network 220 may include antenna, base stations, access points, transceivers, supporting radio equipment, etc., as known to those of ordinary skill in the art, for supporting wireless communications between the wireless device 100 and other devices (not shown).

[0023] The wireless device 100 may be a two-way communication device having at least voice and advanced data communication capabilities, including the capability to communicate with other devices. Depending on the functionality provided by the device 100, it may be referred to as a data messaging device, a two-way pager, a cellular telephone with data messaging capabilities, a wireless Internet appliance, a data communication device (with or without telephony capabilities), a Wi-Fi device, a WLAN device, a dual-mode (i.e., Wi-Fi and cellular) device, or a portable audio device.

[0024] The wireless device 100 has a communication subsystem 111, which includes a RF receiver, a RF transmitter, and associated components. As will be apparent to those skilled in the field of communications, the particular design of the communication subsystem 111 depends on the communication network 220 in which the device 100 is intended to operate.

[0025] The device 100 may be capable of cellular network access and hence the device 100 may have a subscriber identity module (or "SIM" card) 162 for inserting into a SIM interface ("IF") 164 in order to operate on the cellular network (e.g., a global system for mobile communication ("GSM") network).

[0026] The device 100 may be a battery-powered device and so it may also include a battery IF 154 for receiving one or more rechargeable batteries 156. The battery (or batteries) 156 provides electrical power to most if not all electrical circuitry in the device 100, and the battery IF 154 provides for a mechanical and electrical connection for it.

[0027] The wireless device 100 includes a microprocessor 138, also called a processor, which controls overall operation of the device 100. The microprocessor 138 in-

teracts with device subsystems such as the display 122, a flash memory 124 or other persistent store, a random access memory ("RAM") 126, auxiliary input/output ("I/O") subsystems 128, a serial port (e.g., a universal serial bus ("USB") port) 131, the keyboard 132, the trackball or thumbwheel 110, the headphones 105, an internal speaker 134, a microphone 136, a short-range communications subsystem 141, and other device subsystems 142. The microprocessor 138, in addition to performing operating system functions, preferably enables execution of software applications on the device 100.

[0028] FIG. 3 is a block diagram illustrating a memory 200 of the wireless device 100 of FIGS. 1 and 2. The microprocessor 138 is coupled to the memory 200. The memory 200 has various hardware and software components for storing information (e.g., instructions, data, database tables, test parameters, etc.) for enabling operation of the device 100 and may include flash memory 124, RAM 126, ROM (not shown), disk drives (not shown), etc. In general, the memory 200 may include a variety of storage devices typically arranged in a hierarchy of storage as understood to those skilled in the art.

[0029] Operating system ("O/S") software modules 202 used by the microprocessor 138 may be stored in a persistent store such as the flash memory 124, which may alternatively be a read-only memory ("ROM") or similar storage element (not shown). Those skilled in the art will appreciate that the operating system, specific device applications, or parts thereof, may be temporarily loaded into a volatile store such as RAM 126.

[0030] To provide a user-friendly environment to control the operation of the device 100, operating system ("O/S") software modules 202 resident on the device 100 provide a basic set of operations for supporting various applications typically operable through the GUI 180 and supporting GUI software modules 204. For example, the O/S 202 provides basic input/output system features to obtain input from the auxiliary I/O 128, the keyboard 132, the trackball or thumbwheel 110, and the like, and for facilitating output to the user through the display 122, the speaker 134, the headphones 105, etc. According to one example of the application, the wireless device 100 is provided with hardware and/or software modules 206 for facilitating and implementing the method of the application as will be described below.

[0031] A user may interact with the wireless device 100 and its various software modules 202, 204, 206, using the GUI 180. GUIs are supported by common operating systems and provide a display format which enables a user to choose commands, execute application programs, manage computer files, and perform other functions by selecting pictorial representations known as icons, or items from a menu through use of an input or pointing device such as a trackball or thumbwheel 110 and keyboard 132. The GUI 180 may include a cursor 190, various selectable objects and icons 191, and various windows 192.

[0032] Thus, the wireless device 100 includes compu-

ter executable programmed instructions for directing the device 100 to implement examples of the present application. The programmed instructions may be embodied in one or more hardware or software modules 206 which may be resident in the memory 200 of the wireless device 100. Alternatively, the programmed instructions may be embodied on a computer readable medium (such as a CD disk or floppy disk) which may be used for transporting the programmed instructions to the memory of the wireless device 100. Alternatively, the programmed instructions may be embedded in a computer-readable signal or signal-bearing medium that may be uploaded to a network 220 by a vendor or supplier of the programmed instructions, and this signal or signal-bearing medium may be downloaded through an interface 111, 131, 141 to the wireless device 100 from the network 220 by end users or potential buyers.

[0033] FIG. 4 is a block diagram illustrating a headphones subsystem 400 in accordance with an example of the application. Components of the headphones subsystem 400 are generally contained in the wireless device 100 and are used to determine the impedance of the headphones 105 in order to adjust the maximum signal level (e.g., in mV RMS) output to the headphones 105 (and hence the maximum sound pressure level output by the headphones 105).

[0034] According to one example of the application, the headphones system 400 includes a signal generator 410, a digital to analog converter ("DAC") 440, and an audio amplifier 430 for generating an inaudible high frequency signal (e.g., 25 kHz). The signal generator 410, DAC 440, and audio amplifier 430 are controlled by the microprocessor 138. The audio amplifier 430 is coupled to the headphones 105 through a series resistor R. The series resistor R may have a low value (e.g., 5 Ohms). A voltage V produced across the resistor R when the high frequency signal is applied to the resistor R and headphones 105 is indicative of the impedance Z of the headphones 105. The signal may be applied to the resistor R and headphones 105 whenever the headphones 105 are connected to the headphones jack 106 via the headphones cable 107. The voltage V is amplified by a microphone pre-amplifier 450 which is coupled to an analog to digital converter ("ADC") 420. The ADC 420 monitors the voltage V and provides a digital signal indicative of the voltage V and hence the impedance Z of the headphones 105 to the microprocessor 138. The ADC 420 may also be used by the microphone 136 of the wireless device 100 in order to reduce component count. The microprocessor 138 receives the digital signal from the ADC 420 and determines the impedance Z of the headphones 105 from it (e.g., by voltage divider principles, etc.). The microprocessor 138 may do this by accessing a table that stores voltage values (or digital signal values) and corresponding headphones impedance values.

[0035] Having determined the impedance Z for the headphones 105, the microprocessor 138 controls the audio amplifier 430 to restrict the maximum signal level

(e.g., in mV RMS) output to the headphones **105**. In this way, the sound pressure level output by the headphones **105** may be restricted to a maximum sound pressure level for the determined impedance **Z**. The microprocessor **138** may do this by accessing a table (e.g., included in or associated with modules **206**) that stores headphones impedance values, corresponding maximum signal level values for the audio amplifier **430**, and/or corresponding maximum sound pressure values for the headphones **105**. For example, for a headphones impedance value of approximately 32 Ohms, the table **406** may indicate that the maximum sound pressure level for the headphones **105** is 100 dB.

[0036] According to one example of the application, if a headphone impedance value corresponding to the determined headphone impedance **Z** is not listed in the table **406**, no maximum signal level for the audio amplifier **430** and no maximum sound pressure level for the headphones **105** is prescribed and hence the maximum signal level of the audio amplifier **430** and the maximum sound pressure level for the headphones **105** are not restricted for that value of determined headphones impedance **Z**.

[0037] Now, the maximum signal level (e.g., in mV RMS) and/or the maximum sound pressure level (e.g., in dB) for a given headphones impedance may be set by government regulation which may change depending on the carrier or the location in which the wireless device **100** is operating or is sold. As is known to those skilled in the art, the wireless device **100** has means for determining its carrier and/or location and hence the government regulations that may apply to set maximum signal levels and/or maximum sound pressure levels. Thus, according to one example of the application, the microprocessor **138** receives a signal indicative of the carrier and/or location of the wireless device **100** and determines whether a maximum signal level value and/or a maximum sound pressure level value has been prescribed for the carrier and/or location and for the determined headphones impedance **Z**. The microprocessor **138** may do this by accessing a table **406** that stores wireless device location, corresponding headphones impedance values, corresponding carrier (or location) specific maximum signal level values (if any) for the audio amplifier **430**, and/or corresponding carrier (or location) specific maximum sound pressure level values (if any) for the headphones **105**. For example, the table may indicate that if the wireless device **100** is associated with a carrier based in Great Britain and if the headphones impedance is 32 Ohms (i.e., +/- 20%), then the maximum sound pressure level should be restricted to 100 dB (i.e., if the headphones **105** and wireless device **100** are sold as a package). As another example, the table **406** may indicate that if the wireless device **100** is associated with a carrier based in Great Britain and if the headphones impedance is 32 Ohms (i.e., +/- 20%), then the maximum sound pressure level should be restricted to 94 dB (i.e., if the headphones **105** and wireless device **100** are not sold as a package).

[0038] Similarly, the maximum signal level (e.g., in mV

RMS) and/or the maximum sound pressure level (e.g., in dB) may be set by government regulation which may change depending on the carrier or the location in which the wireless device **100** is operating or is sold (i.e., irrespective of the impedance of the headphones **105**). Again, as is known to those skilled in the art, the wireless device **100** has means for determining its carrier and/or location and hence the government regulations that may apply to set maximum signal levels and/or maximum sound pressure levels. Thus, according to one example of the application, the microprocessor **138** receives a signal indicative of the carrier and/or location of the wireless device **100** and determines whether a maximum signal level value and/or a maximum sound pressure level value has been prescribed for the carrier and/or location. The microprocessor **138** may do this by accessing a table **406** that stores wireless device carrier (or location), corresponding headphones impedance values, corresponding carrier specific maximum signal level values (if any) for the audio amplifier **430**, and/or corresponding carrier specific maximum sound pressure level values (if any) for the headphones **105**. For example, the table **406** may indicate that if the wireless device **100** is associated with a carrier based in Great Britain, then the maximum sound pressure level should be restricted to 100 dB (i.e., if the headphones **105** and wireless device **100** are sold as a package). As another example, the table **406** may indicate that if the wireless device **100** is associated with a carrier based in Great Britain, then the maximum sound pressure level should be restricted to 94 dB (i.e., if the headphones **105** and wireless device **100** are not sold as a package).

[0039] According to one example of the application, updates to the table **406** storing carrier (or wireless device location), corresponding headphones impedance values, corresponding carrier specific maximum signal level values (if any) for the audio amplifier **430**, and corresponding carrier specific maximum sound pressure level values (if any) for the headphones **105** may be periodically downloaded to the wireless device **100** (e.g., over the network **220**).

[0040] According to one example of the application, the carrier associated with the wireless device **100** may be determined from messages delivered to the wireless device **100** over the network **220**. According to another example of the application, the carrier may be determined from information stored in the wireless device's SIM card **162**.

[0041] According to one example of the application, the location of the wireless device **100** may be determined from messages delivered to the wireless device **100** over the network **220**. According to another example of the application, the location of the wireless device **100** may be determined by a global positioning system ("GPS") receiver (not shown) optionally provided for the device **100**. According to another embodiment, the location of the wireless device **100** may be determined from the location of antennae towers associated with the net-

work **220** on which the wireless device **100** operates.

[0042] FIG. 5 is a block diagram illustrating an alternate headphones subsystem **400** in accordance with an example of the application. In FIG. 5, a signal source **510** (e.g., microprocessor **138**) generates a signal (e.g., an audio signal, an inaudible audio signal, etc.) that is applied to a digital to analog converter ("DAC") **540**. The output of the DAC **540** is conditioned **530** (e.g., amplified **430**, etc.) to allow for impedance measurement **520** (e.g., via a resistor **R**, etc.) of the headphones **105** connected to the headphones jack **506**.

[0043] The application may provide several advantages. For example, the method of the present application allows wireless devices **100** to restrict maximum signal levels and maximum sound pressure levels to prescribed legal limits when necessary.

[0044] Aspects of the above described method may be illustrated with the aid of a flowchart. FIG. 6 is a flow chart illustrating operations **600** of modules **206** within the memory **200** of a wireless device **210** for controlling maximum signal level output to headphones **105** of the wireless device **100**, in accordance with an embodiment of the application.

[0045] At step **601**, the operations **600** start.

[0046] At step **602**, an impedance **Z** of the headphones **105** is determined.

[0047] At step **603**, a carrier specific maximum signal level for headphones having the impedance **Z** is determined.

[0048] At step **604**, an audio amplifier **430** of the wireless device **100** coupled to the headphones **105** is adjusted to restrict the maximum signal level output to the headphones **105** to the carrier specific maximum signal level.

[0049] At step **605**, the operations **600** end.

[0050] The above described method is generally performed by the wireless device **100**. However, according to one example of the application, the method can be performed by, or in combination with, a data processing system (not shown) such a personal computer ("PC") or server, a stereo system, a television system, etc.

[0051] While examples of this application are primarily discussed as a method, a person of ordinary skill in the art will understand that the apparatus discussed above with reference to a wireless device **100** and a data processing system, may be programmed to enable the practice of the method of these examples. Moreover, an article of manufacture for use with a wireless device **100** or data processing system, such as a pre-recorded storage device or other similar computer readable medium including program instructions recorded thereon, may direct the wireless device **100** or data processing system to facilitate the practice of the method of these embodiments. It is understood that such apparatus and articles of manufacture also come within the scope of the application.

[0052] The examples of the application described above are intended to be exemplary only. Those skilled

in this art will understand that various modifications of detail may be made to these examples.

5 Claims

1. A method for controlling a maximum signal level output to headphones (105) of a wireless device (100), comprising:

determining an impedance of the headphones (105), **characterised in that** the method further includes:

accessing from memory (200) in the wireless device (100) a carrier specific maximum signal level for headphones (105) having the impedance, wherein the carrier specific maximum signal level is a maximum signal level prescribed for a location of the wireless device (100) and for headphones (105) having the impedance; and, adjusting an audio amplifier (430) of the wireless device (100) coupled to the headphones (105) to restrict the maximum signal level output to the headphones (105) to the carrier specific maximum signal level;

wherein the memory (200) stores impedances, locations, and corresponding carrier specific maximum signal levels.

2. The method of claim 1 wherein the impedances, locations, and corresponding carrier specific maximum signal levels are stored in a searchable table in the memory (200).
3. The method of claim 1 or claim 2 wherein the determining of the impedance further comprises applying an audio signal to the headphones (105).
4. The method of claim 3 wherein the audio signal is an inaudible audio signal.
5. The method of any one of claims 1 to 4 and further comprising determining the location.
6. The method of claim 5 wherein the location is determined from one of:

a signal received from a network (220) in which the wireless device (100) is operating;
a global positioning system ("GPS") receiver of the wireless device (100); and,
a location of antennae towers associated with a network (220) in which the wireless device (100) operates.

7. The method of any one of claims 1 to 6 wherein the carrier specific maximum signal level is a maximum signal level prescribed for a cellular network carrier in which the wireless device (100) is operating, the location of the wireless device (100), and for the headphones (105) having the impedance. 5
8. The method of claim 7 wherein the memory (200) further stores cellular network carriers. 10
9. The method of claim 8 wherein the cellular network carriers are stored in the searchable table in the memory (200).
10. The method of claim 7 and further comprising determining the cellular network carrier. 15
11. The method of claim 10 wherein the cellular network carrier is determined from one of: 20
- a signal received from a network (220) in which the wireless device (100) is operating; and, information stored in a subscriber identity module ("SIM") (162) of the wireless device (100).
12. The method of any one of claims 1 to 11 wherein the adjusting of the audio amplifier (430) is performed if the carrier specific maximum signal level can be determined for the impedance. 25
13. A system for a wireless device (100) for controlling a maximum signal level output to headphones (105) coupled to the wireless device (100), comprising: 30
- a memory (200) storing program instructions; and
a processor (138) coupled to said memory (200) and configured to execute said program instructions to cause the system to implement the steps of the method of any one of claims 1 to 12. 35
14. A wireless device (100) having a system according to claim 13.
15. A computer readable medium containing program instructions executable by a processor of a wireless device (100) for causing said wireless device (100) to implement the steps of the method of any one of claims 1 to 12. 40
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Patentansprüche

1. Ein Verfahren zum Steuern eines maximalen Signalausgangspegels an Kopfhörer (105) einer drahtlosen Vorrichtung (100), umfassend: 55
- Bestimmen einer Impedanz der Kopfhörer

(105), charakterisiert dadurch, dass das Verfahren ferner aufweist:

Zugreifen von einem Speicher (200) in der drahtlosen Vorrichtung (100) auf einen trägerspezifischen maximalen Signalpegel für Kopfhörer (105) mit der Impedanz, wobei der trägerspezifische maximale Signalpegel ein maximaler Signalpegel ist, der für eine Position der drahtlosen Vorrichtung (100) und für Kopfhörer (105) mit der Impedanz vorgeschrieben ist; und, Einstellen eines Audioverstärkers (430) der drahtlosen Vorrichtung (100), der mit den Kopfhörern (105) verbunden ist, um den maximalen Signalausgangspegel an die Kopfhörer (105) auf den trägerspezifischen maximalen Signalpegel zu begrenzen;

wobei der Speicher (200) Impedanzen, Positionen und korrespondierende trägerspezifische maximale Signalpegel speichert.

2. Das Verfahren nach Anspruch 1, wobei die Impedanzen, Positionen und korrespondierenden maximalen Signalpegel in durchsuchbaren Tabellen in dem Speicher (200) gespeichert werden. 25
3. Das Verfahren nach Anspruch 1 oder 2, wobei das Bestimmen der Impedanz ferner ein Anlegen eines Audiosignals an die Kopfhörer (105) umfasst. 30
4. Das Verfahren nach Anspruch 3, wobei das Audiosignal ein unhörbares Audiosignal ist. 35
5. Das Verfahren nach einem der Ansprüche 1 bis 4, das ferner ein Bestimmen der Position umfasst.
6. Das Verfahren nach Anspruch 5, wobei die Position bestimmt wird aus einem aus: 40
- einem Signal, dass von einem Netzwerk (220) erhalten wird, in welchem die drahtlose Vorrichtung (100) arbeitet;
einem globalen-Navigationssystem-("GPS")-Empfänger der drahtlosen Vorrichtung (100); und,
einer Position von Antennentürmen, die mit einem Netzwerk (220) assoziiert sind, in welchem die Vorrichtung (100) arbeitet. 45
7. Das Verfahren nach einem der Ansprüche 1 bis 6, wobei der trägerspezifische maximale Signalpegel ein maximaler Signalpegel ist, der für einen Mobilfunknetzträger, in welchem die drahtlose Vorrichtung (100) arbeitet, der Position der drahtlosen Vorrichtung (100) und für die Kopfhörer (105) mit der 50

Impedanz vorgeschrieben ist.

8. Das Verfahren nach Anspruch 7, wobei der Speicher (200) ferner Mobilfunknetzträger speichert.

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9. Das Verfahren nach Anspruch 8, wobei die Mobilfunknetzträger in der durchsuchbaren Tabelle in dem Speicher (200) gespeichert werden.

10. Das Verfahren nach Anspruch 7 und ferner umfassend, ein Bestimmen des Mobilfunknetzträgers.

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11. Das Verfahren nach Anspruch 10, wobei der Mobilfunknetzträger bestimmt wird aus einem aus:

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einem Signal, dass von einem Netzwerk (220) erhalten wird, in welchem die drahtlose Vorrichtung (100) arbeitet; und, Information, die in einem Teilnehmeridentitätsmodul ("SIM") (162) der drahtlosen Vorrichtung (100) gespeichert wird.

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12. Das Verfahren nach einem der Ansprüche 1 bis 11, wobei das Einstellen des Audioverstärkers (430) durchgeführt wird, wenn der trägerspezifische maximale Signalpegel für die Impedanz bestimmt werden kann.

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13. Ein System für eine drahtlose Vorrichtung (100) zum Steuern eines maximalen Signalausgangspegels an Kopfhörer (105), die mit der drahtlosen Vorrichtung (100) gekoppelt sind, umfassend:

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einen Speicher (200), der Programminstruktionen speichert; und einen Prozessor (138), der mit dem Speicher (200) gekoppelt ist und konfiguriert ist die Programminstruktionen auszuführen, um das System zu veranlassen die Schritte des Verfahrens nach einem der Ansprüche 1 bis 12 zu implementieren.

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14. Eine drahtlose Vorrichtung (100) mit einem System nach Anspruch 13.

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15. Ein computerlesbares Medium, das Programminstruktionen aufweist, die durch einen Prozessor einer drahtlosen Vorrichtung (100) ausführbar sind, um die drahtlose Vorrichtung (100) zu veranlassen die Schritte des Verfahrens nach einem der Ansprüche 1 bis 12 zu implementieren.

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Revendications

1. Procédé destiné à commander un niveau de signal maximum délivré en sortie à des écouteurs (105) d'un dispositif sans fil (100), consistant à :

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déterminer une impédance des écouteurs (105), **caractérisé en ce que** le procédé consiste en outre à :

accéder depuis la mémoire (200) contenue dans le dispositif sans fil (100) à un niveau de signal maximum spécifique d'un opérateur pour des écouteurs (105) ayant ladite impédance, dans lequel le niveau de signal maximum spécifique d'un opérateur est un niveau de signal maximum prescrit pour une position du dispositif sans fil (100) et pour des écouteurs (105) ayant ladite impédance ; et ajuster un amplificateur audio (430) du dispositif sans fil (100) relié aux écouteurs (105) afin de limiter le niveau de signal maximum délivré en sortie aux écouteurs (105) au niveau de signal maximum spécifique d'un opérateur ; dans lequel la mémoire (200) stocke des impédances, des positions et des niveaux de signal maximum spécifiques d'opérateurs correspondants.

2. Procédé selon la revendication 1, dans lequel les impédances, les positions et les niveaux de signal maximum spécifiques d'opérateurs correspondants sont stockés dans une table dans laquelle une recherche peut être effectuée dans la mémoire (200).

3. Procédé selon la revendication 1 ou la revendication 2, dans lequel la détermination de l'impédance consiste en outre à appliquer un signal audio aux écouteurs (105).

4. Procédé selon la revendication 3, dans lequel le signal audio est un signal audio inaudible.

5. Procédé selon l'une quelconque des revendications 1 à 4 et consistant en outre à déterminer la position.

6. Procédé selon la revendication 5, dans lequel la position est déterminée à partir de l'un :

d'un signal reçu en provenance d'un réseau (220) dans lequel le dispositif sans fil (100) est en fonctionnement ; d'un récepteur de système global de localisation ("GPS") du dispositif sans fil (100) ; et d'une position de pylônes d'antennes associés à un réseau (220) dans lequel le dispositif sans fil (100) fonctionne.

7. Procédé selon l'une quelconque des revendications 1 à 6, dans lequel le niveau de signal maximum spécifique d'un opérateur est un niveau de signal maximum prescrit pour un opérateur de réseau cellulaire dans lequel le dispositif sans fil (100) est en fonc-

tionnement, pour la position du dispositif sans fil (100) et pour les écouteurs (105) ayant ladite impédance.

8. Procédé selon la revendication 7, dans lequel la mémoire (200) stocke en outre des opérateurs de réseaux cellulaires. 5
9. Procédé selon la revendication 8, dans lequel les opérateurs de réseaux cellulaires sont stockés dans la table dans laquelle une recherche peut être effectuée dans la mémoire (200). 10
10. Procédé selon la revendication 7 et consistant en outre à déterminer l'opérateur de réseau cellulaire. 15
11. Procédé selon la revendication 10, dans lequel l'opérateur de réseau cellulaire est déterminé à partir de l'un : 20
 - d'un signal reçu en provenance d'un réseau (220) dans lequel le dispositif sans fil (100) est en fonctionnement ; et
 - d'informations stockées dans un module d'identité d'abonné ("SIM") (162) du dispositif sans fil (100). 25
12. Procédé selon l'une quelconque des revendications 1 à 11, dans lequel l'ajustement de l'amplificateur audio (430) est effectué si le niveau de signal maximum spécifique d'un opérateur peut être déterminé pour l'impédance. 30
13. Système pour dispositif sans fil (100) destiné à commander un niveau de signal maximum délivré en sortie à des écouteurs (105) reliés au dispositif sans fil (100), comprenant : 35
 - une mémoire (200) stockant des instructions de programmes ; et 40
 - un processeur (138) relié à ladite mémoire (200) et configuré pour exécuter lesdites instructions de programmes afin d'amener le système à mettre en oeuvre les étapes du procédé selon l'une quelconque des revendications 1 à 12. 45
14. Dispositif sans fil (100) comportant un système selon la revendication 13.
15. Support lisible par ordinateur contenant des instructions de programmes exécutables par un processeur d'un dispositif sans fil (100) pour amener ledit dispositif sans fil (100) à mettre en oeuvre les étapes du procédé selon l'une quelconque des revendications 1 à 12. 50 55

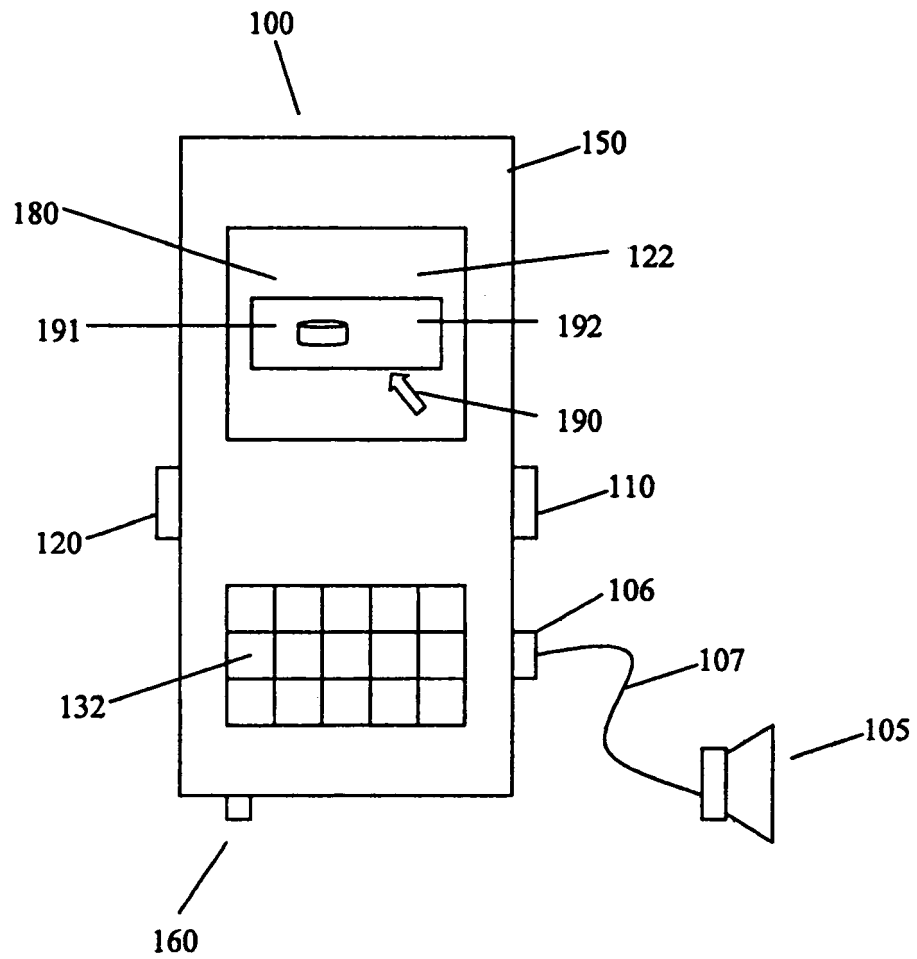


FIG. 1

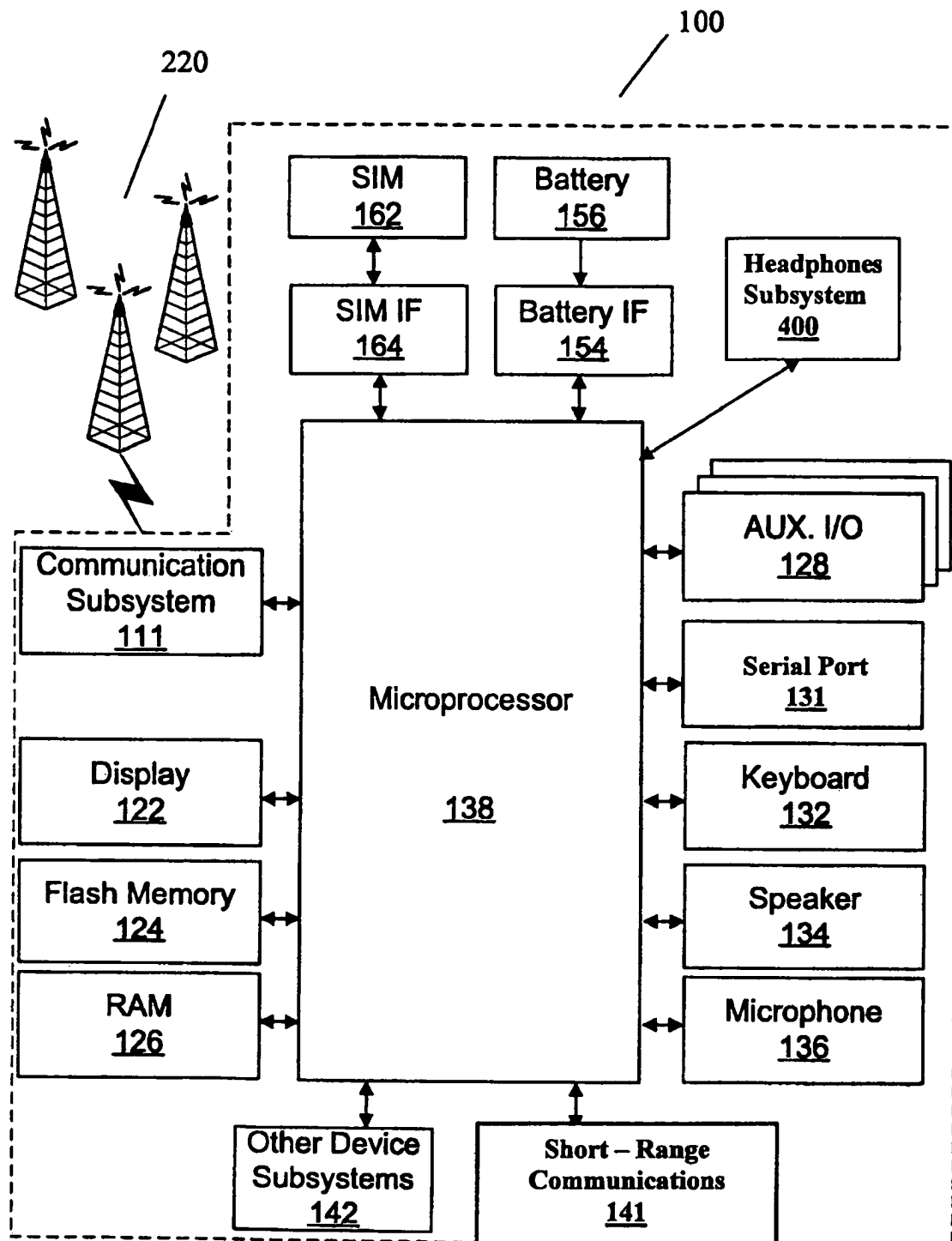


FIG. 2

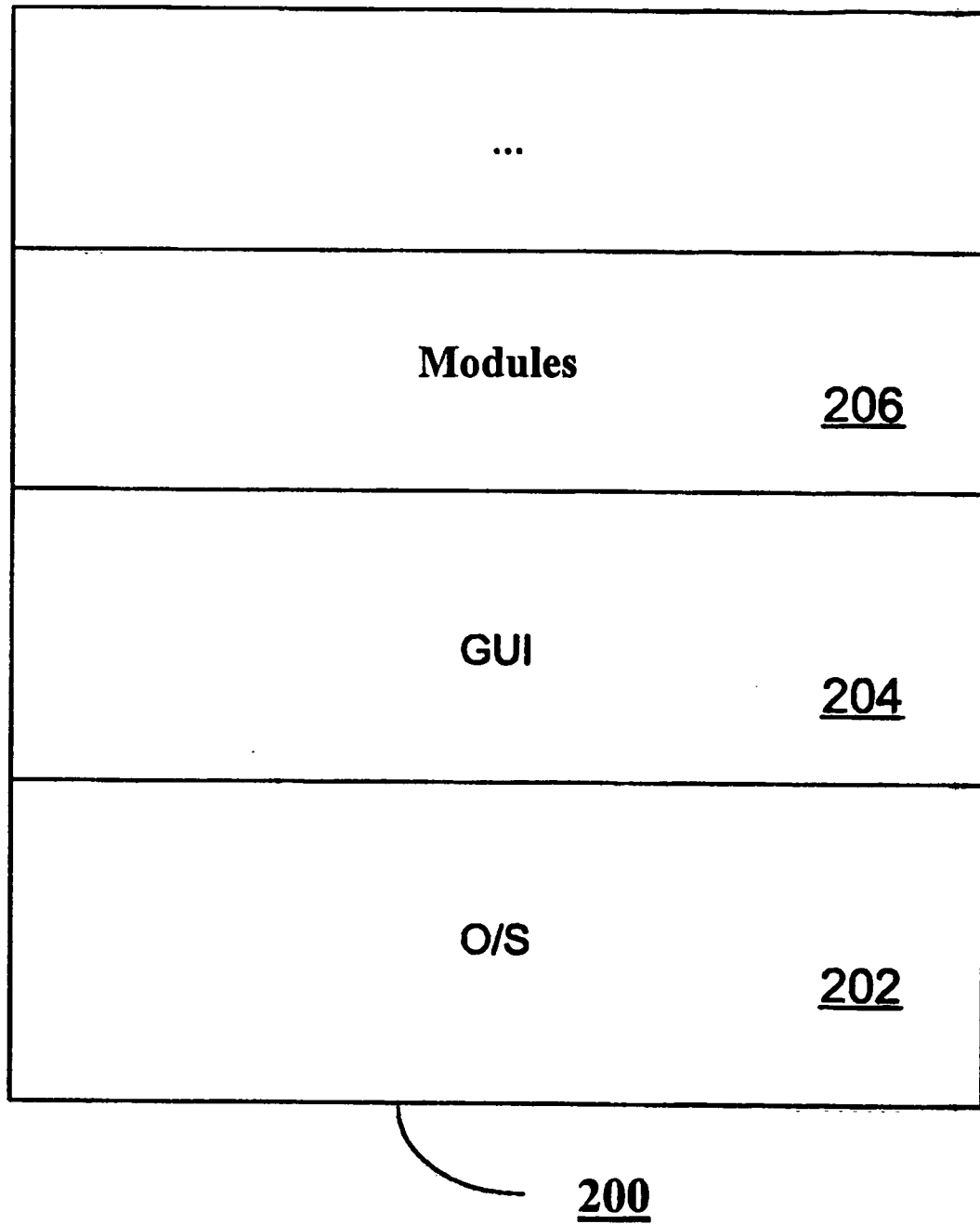


FIG. 3

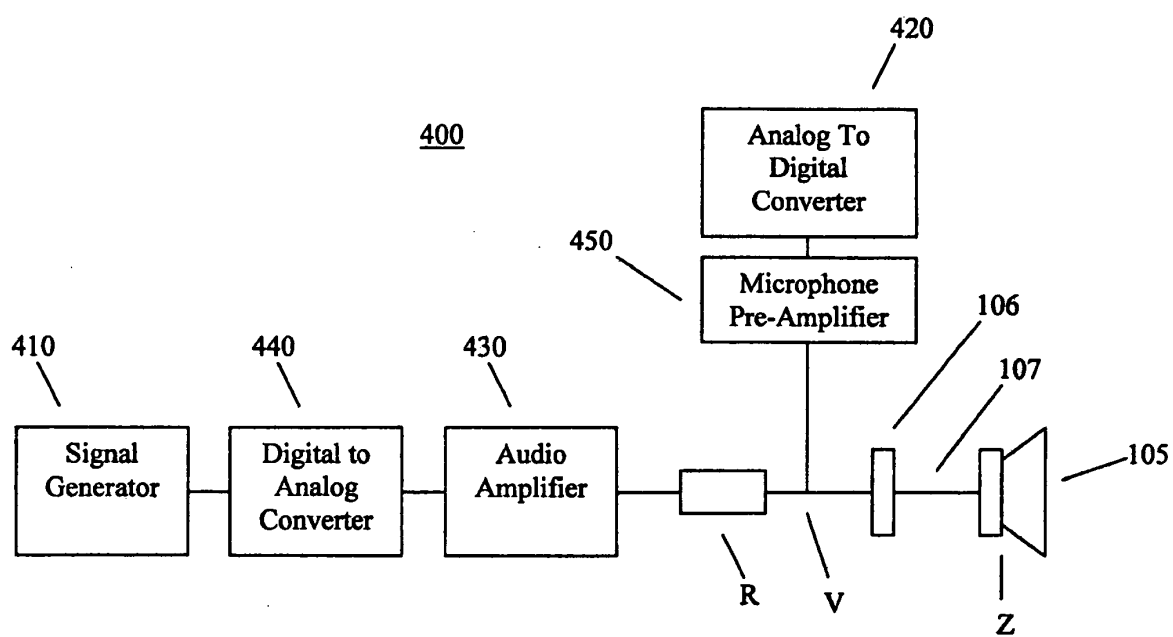


FIG. 4

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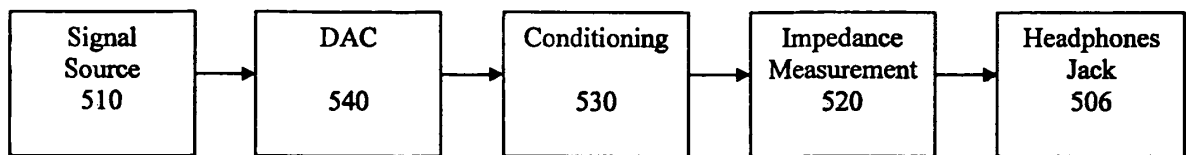
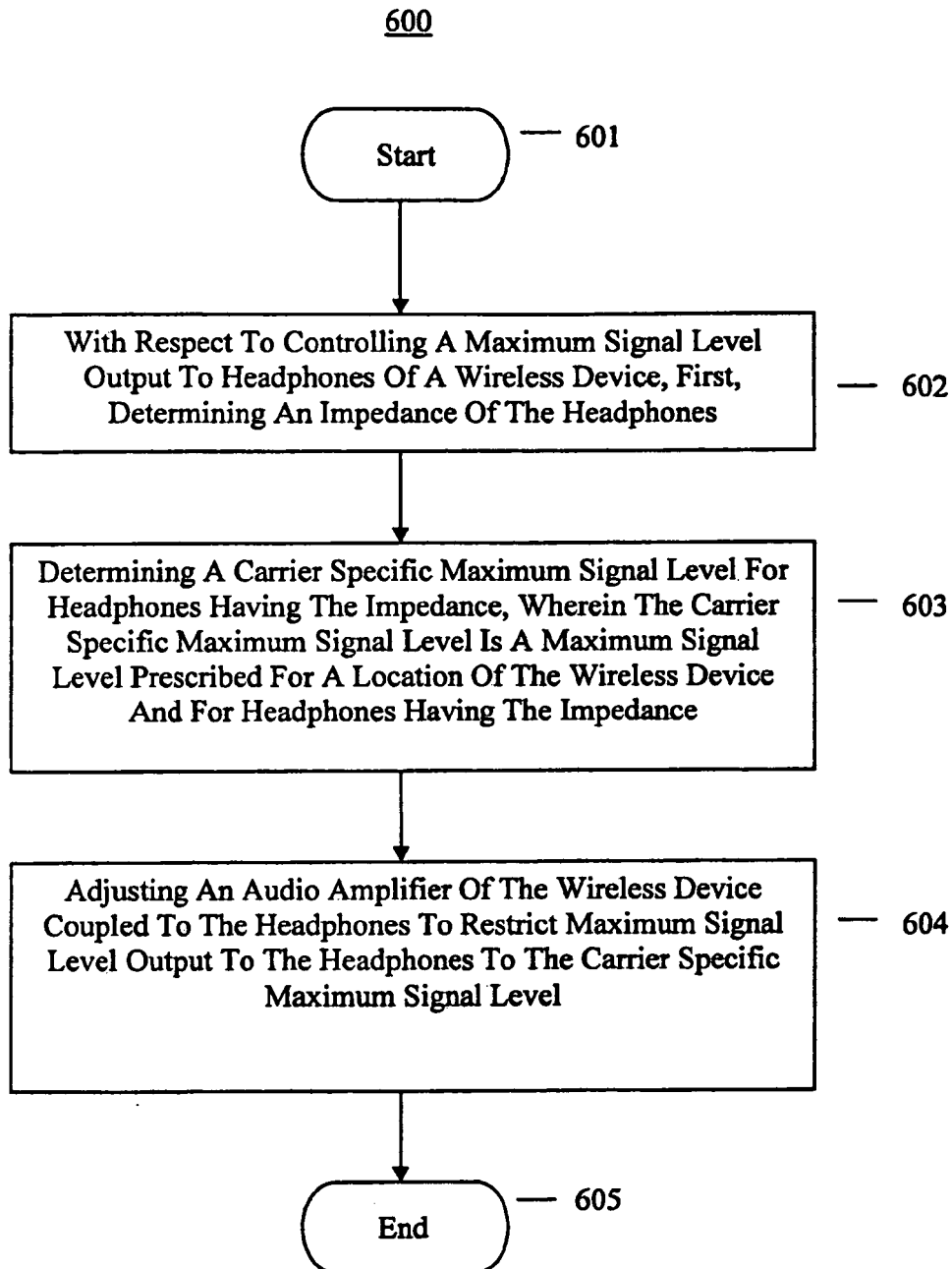


FIG. 5



REFERENCES CITED IN THE DESCRIPTION

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