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(54) **Wireless hearing system and method for monitoring the same**

Drahtloses Hörhilfesystem und Verfahren zu dessen Überwachung

Système de prothèse auditive sans fil et méthode de sa surveillance

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Description

[0001] The present invention relates to a hearing system comprising a hearing device to which an external audio signal is provided via a wireless, typically a radio frequency (RF) link. The invention also relates to a system for providing audio signals to a hearing device via a wireless link and to a method for monitoring a hearing system comprising a hearing device to which audio signals are provided via a wireless link.

[0002] It is well known to provide an external audio signal to a hearing aid via a radio frequency (RF) link, usually a frequency modulated (FM) link. The RF receiver can be integrated within the hearing aid or it can be an external component which is connected to the hearing aid via a suited and often standardized mechanical and electrical interface. A common application of such systems is the education of students in a classroom by a teacher. In this case the external audio signal is the teacher's voice which is picked-up by a microphone and is sent to the hearing aid of each student via the RF link. Another application of such a wireless system is the case in which parents want to communicate with their child wearing a hearing aid via a wireless microphone and a RF link to the hearing aid.

[0003] Conventionally, single channel FM receivers were used for establishing the RF link between the remote audio signal source and the hearing aid. Such systems are available with a "no FM" indicator LED indicating the absence of a carrier on the receiving channel. Such conventional devices are strictly unidirectional, with no signal being sent back from the RF receiver.

[0004] More recent devices are designed as multichannel receivers capable of changing between several audio signal transmission channels, i.e. frequency bands. With such devices, for example, each teacher may use his own transmission channel. Further, the students may be addressed individually via associated transmission channels. The selection of the receiving channel of the RF receiver may be controlled automatically, for example, by a wireless control panel installed at the wall of each classroom.

[0005] Further, it is known to use an RF link for remote programming of a hearing aid, respectively an FM receiver. An example of a multichannel RF system for a hearing aid is described in WO 02/23948 Al, wherein the RF receiver connected to the hearing aid also is adapted for remote programming via an FSK (frequency shift keying) modulation used for data transmission between the remote programming unit and the RF receiver. Such FSK link is bidirectional, wherein the RF receiver may transmit information regarding the version of the software installed in the hearing aid to the remote programming unit. It is also mentioned in WO 02/23948 A1 that the bidirectional link for remote programming also could be an inductive link rather than a RF link.

[0006] In products which are presently on the market the bidirectional remote programming wireless link may be used for reading identifying information such as serial number, school and student's name from the RF receiver.

[0007] An example for a wireless remote control for a hearing aid is given in EP 0681411 B1, wherein the hearing aid has a transmitter/receiver unit for establishing wireless communication with the transmitter/receiver unit of a remote control, wherein audiometric data, hearing parameters, algorithms, fuzzy input and configuration information can be transmitted from the hearing aid to the remote control.

[0008] US 5,721,783 describes a "distributed" hearing system, comprising an earpiece including a speaker and a microphone and a body-worn remote processor unit between which a bidirectional RF link is established for transmitting audio signals generated in the earpiece by the microphone to the remote processor unit for signal processing, with the processed audio signals being sent back from the remote processing unit to the earpiece for providing an acoustic signal via the speaker in the earpiece to the user. Thus, the RF link is used for bidirectional transmission of audio signals. In addition an auxiliary bit representative of the voltage level of the battery of the earpiece is transmitted. The remote processing unit may be operated in a search mode in which the remote processing unit displays information as to whether a link to an earpiece exists. A secondary wireless link may be provided to the remote processor unit for supplying external audio signals, such as from a telephone, to the speaker of the earpiece.

[0009] There are many applications of a hearing device provided with external audio signals via a wireless link in which it would be desirable to know whether the user of the hearing device properly receives the transmitted external audio signal. This applies particularly to the case in which the user of the hearing device is a child. The reason is that usually adults will easily remark and complain about non-working radio systems, while this cannot be expected in all cases from children, even more so in classroom applications.

[0010] Consequently it is an object of the invention to provide for a hearing system comprising a hearing device provided with an external audio signal via a wireless link, which allows a person, such as teachers or parents to monitor the reception of the external audio signal by the user of the hearing device. It is a further object of the invention to provide for a method for monitoring a hearing system comprising a hearing device provided with external audio signals via a wireless link.

[0011] These objects are achieved by a hearing system as defined in claim 1 and a method for monitoring a hearing system as defined in claim 28, respectively.

[0012] The invention is beneficial in that, by manually polling the audio signal receiver unit in order to transmit a status information signal containing data regarding the status of the wireless audio link and/or the audio signal receiver unit and by displaying such status information, the wireless audio signal link can be monitored in a very easy manner by persons other than the user of the hear-

ing device. This is particularly beneficial if the user of the hearing device is a child and the parents or a teacher of the child wishes to know whether at all and/or in which quality the external audio signal, for example, the parent's or teacher's voice, can be received by the child.

[0013] In general, the hearing device could be any type of wireless headset, such as a part of a tourist tour guide or museum guide system. However, preferably the hearing device is a hearing aid. Preferably, the status information signal in this case includes information regarding at least one of the following: integrity of the electrical connections between the audio signal receiver and the hearing aid, present frequency (channel) or frequency band of the wireless link carrying the audio signal, confirmation of remote control commands for setting the operation mode/operation parameters of the audio signal receiver unit, present operation mode of the audio signal receiver unit, present setting of operation parameters of the audio signal receiver unit, signal to noise ratio of the wireless link carrying the audio signal, battery status of the audio signal receiver unit or of the hearing aid, identification of the audio signal receiver unit among a plurality of audio signal receiver units, date of last servicing of the audio signal receiver unit, and user's name. The status information signal also may include information regarding the present operation mode of the hearing aid and/or present setting of operation parameters of the hearing aid, which information is provided via an interface from the hearing aid to the audio signal receiver unit.

[0014] Usually the wireless link carrying the audio signal will be a radio frequency link, preferably an FM (frequency modulation) link.

[0015] Preferably, the audio signal source is a remote microphone, which is used, for example, by a teacher in the classroom.

[0016] The status information signal may include data on whether the audio signal receiver unit is for a right ear or a left ear. In this case, the left ear / right ear differentiation of the status information may be done by time-delaying the response of the right and the left audio signal receiver unit.

[0017] According to a preferred embodiment, the audio signal source and/or the audio signal transmitter and/or the means for generating and transmitting the polling signal and/or the means for receiving the status information signal and displaying status information are integrated in a common device which is a portable, preferably handheld, device.

[0018] Preferably, the means for receiving the status information signal and displaying status information is adapted to display the status information graphically. The means for receiving the status information signal and displaying status information may be adapted to display the status information together with data identifying the audio signal receiver unit among a plurality of audio signal receiver units, whereby the displayed status information can be easily attributed to a certain person.

[0019] According to one embodiment, the means for generating and transmitting the polling signal may be adapted to establish a radio frequency link to the means for receiving the polling signal, wherein the radio frequency link carrying the polling signal preferably uses the same channel as the radio frequency link carrying the audio signal, with the polling signal being transmitted by the audio signal transmitter.

[0020] In an alternative embodiment, the means for generating and transmitting the polling signal may be adapted to establish an inductive link to the means for receiving the polling signal.

[0021] According to a further alternative embodiment, the means for receiving the polling signal and the means for generating and wirelessly transmitting the status information signal comprise a powerless electromagnetic signal response means adapted to be energized by energy included in the polling signal, with the status information signal being encoded in a modulation of the polling signal by the powerless electromagnetic signal response means. As a variant, the means for generating and wirelessly transmitting the status information signal may be a powerless electromagnetic signal response means adapted to be energized by energy included in an electromagnetic signal emitted by the means for receiving the status information signal, with the status information signal being encoded in a modulation of that electromagnetic signal by the powerless electromagnetic signal response means. Preferably, the powerless electromagnetic signal response means is an RFID (radio frequency identification) device.

[0022] The means for generating and transmitting the polling signal may comprise means for transmitting dedicated device addresses in order to specifically address the radio frequency receiver unit among a plurality of radio frequency receiver units.

[0023] Preferably, the means for generating and transmitting the polling signal comprise an FSK (frequency shift keying) modulator.

[0024] According to one embodiment, the means for generating and transmitting the status information signal and the means for receiving the status information signal and displaying status information are adapted to establish a radio frequency link carrying the status information signal, wherein the means for generating and transmitting the status information signal may comprise an FSK modulator. Preferably, the means for generating and transmitting the status information signal is adapted to use the same channel as radio frequency link carrying the audio signal, with the status information signal being transmitted via the antenna of the radio frequency receiver unit. The radio frequency transmitter and the radio frequency receiver unit in this case are preferably adapted to interrupt the radio frequency link carrying the audio signal while the status information signal is transmitted. This can be achieved by providing the radio frequency receiver unit with a RX/TX switch for the antenna.

[0025] Typically, the status information signal and/or the polling signal will be transmitted at a data rate of 100

bps to 2 kbps.

[0026] The means for generating and transmitting the polling signal and the means for receiving the polling signal at the audio signal receiver unit may be adapted to transmit remote control commands to the audio signal receiver unit, wherein the remote control commands may include commands for setting the frequency (channel) or frequency band of the wireless link carrying the audio signal and/or commands for setting the operation mode and operation parameters of the audio signal receiver unit, such as audio volume setting and gain setting.

[0027] In the following, preferred embodiments of the invention will be illustrated by reference to the attached drawings.

Fig. 1 shows a schematic block diagram of a wireless hearing system according to a first embodiment of the invention;

Fig. 2 shows a view like Fig. 1 of a second embodiment of the invention; and

Fig. 3 shows a view like Fig. 1 of a third embodiment of the invention.

[0028] The hearing system of Fig. 1 comprises a remote unit 10, an audio signal radio frequency receiver unit 12 and a hearing device 14. The hearing device 14 comprises an output transducer 16 for stimulation of a user's hearing, which typically will be an electro-acoustic transducer (speaker), with the hearing device 14 being designed such that the speaker 16 is located close to the outer and of the user's ear canal or within the ear canal when the hearing device 14 is worn by the user. Further, the hearing device 14 comprises an audio signal processing unit 18 for processing the input audio signals to the output transducer 16.

[0029] The hearing device 14 may be any type of headset or it may be a hearing aid / hearing instrument. In the latter case, the output transducer 16 could be a speaker, a cochlear implant (direct electrical stimulation of the inner ear) or an electro-mechanical transducer for direct mechanical stimulation of the middle ear or inner ear. The hearing aid may be arranged behind the ear, or partly or completely within the ear canal. In case that the hearing device 14 is not a hearing aid, it preferably may be a headset for a tourist tour guide or a museum guide system.

[0030] The radio frequency receiver unit 12 may provide the input audio signals to the hearing device 14 via a standardized interface 20. Alternatively, the radio frequency receiver unit 12 may be integrated within the hearing device 14. In any case, the radio frequency receiver unit 12 is adapted to establish a radio frequency link 22 for wireless transmission of audio signals from the remote unit 10. Usually, the radio frequency link 22 will be a frequency modulated (FM) link. To this end, the remote unit 10 comprises an RF transmitter/ receiver 24 and the RF receiver unit 12 comprises a receiver/transmitter 26. The receiver/transmitters 24, 26 each comprise an antenna 28 and a transceiver 30.

[0031] The remote unit 10 comprises an audio signal source 32 which is usually a microphone. The remote unit 10 preferably is a hand-held device, which picks up the voice of a person using the remote unit 10, such as a teacher in a classroom for persons with hearing loss or the guide of a tourist tour or a museum tour, via the microphone 32, with this audio signal being transmitted via the RF link 22 to the RF receiver unit 12 and from there to output transducer 16 in order to provide the user of the hearing device 14 with the voice of the person using the remote unit 10. In a conventional system, the communication between the remote unit 10 and the RF receiver unit 12 would be unidirectional, namely from the remote unit 10 to the RF receiver unit 12, so that in a conventional system in the remote unit 10 only a RF transmitter function and in the RF receiver unit 12 only a RF receiver function would be necessary.

[0032] According to the present invention, such conventional system is modified such that the person using the remote unit 10 can easily monitor the RF audio link 22 by causing the RF receiver unit 12 to send status information regarding the status of the RF audio link 22 and/or the RF receiver unit 12 to the remote unit 10. This is achieved by providing the remote unit 10 with means for transmitting a polling signal/command 34 to the RF receiver unit 12 which is provided with means for receiving such polling signals 34. in addition, the RF receiver unit 12 is provided with means for generating and wirelessly transmitting, when the polling signal 34 has been received, a status information signal 36 containing data regarding the status of the RF link 22 and/or the RF receiver unit 12 to the remote unit 10 which is provided with means for receiving the status information signal 36 and displaying, via a display 38, status information derived from the status information signal 36. The remote unit 10 comprises a control unit 42 which controls the receiver/transmitter 24 and receives the status information signal from the transmitter/receiver 24 and an activation element 40 for causing the control unit 42 and the receiver/transmitter 24 to generate and wirelessly transmit the polling signal 34. The activation element 40 is manually operable in order to generate and transmit the polling signal 34. The RF receiver unit 12 comprises a control unit 44 which controls the transmitter/receiver 26, a nonvolatile memory 46 and an analysis unit 48 for analyzing the audio signal received by the transmitter/receiver 26. Both the analysis unit 48 and the memory 46 communicate with the control unit 44. The memory 46 contains the program for operating the RF receiver unit 12 and data needed for operation of the RF receiver unit 12.

[0033] The remote unit 10 and the RF receiver unit 12 preferably are designed such that the audio signal from the remote unit 10 can be transmitted through a plurality of different frequency bands/channels. With such a system, for example, in each classroom a specific frequency

channel can be used in order to avoid reception of audio signals from an adjacent classroom. The selection of the respective frequency channel for each RF receiver unit 12 may be achieved, for example, by a synchronization unit mounted at the wall of each classroom. For such a multichannel system the status information signal 36 would include information regarding the channel on which the respective RF receiver unit 12 is set. Thereby the teacher immediately could recognize from the display 38 whether the respective pupil wearing the respective RF receiver unit 12, for example, is using a wrong frequency channel so that he could not receive the audio signal transmitted by the remote unit 10. In addition, the status information signal 36 may contain information regarding the signal to noise ratio of the RF audio link 22 as detected by the analysis unit 48. Further, the status information signal may include information regarding the integrity of the electrical connections between the RF receiver unit 12 and the hearing device 14 via the interface 20.

[0034] In the embodiment of Fig. 1 the RF link carrying the polling signal 34 uses the same channel as the RF audio link 22 and also the status information signal 36 uses the same channel as the RF audio link 22. Thereby the transmitter function of the transmitter/receiver 24 of the remote unit 10 may be used not only for the RF audio link 22 but also for the link for the polling signal 34. This applies analogously also to the receiver function of the receiver/transmitter 26 of the RF receiver unit 12. Transmission and reception of the status information signal 36 may occur via the antennas 28 of the remote unit 10 and the RF receiver unit 12, respectively, which are already used for the RF audio link 22. Such multiple use of the RF audio link channel can be achieved by interrupting the RF audio link 22 while the status information signal 22 or the polling signal 34 is transmitted.

[0035] The status information signal 36 and the polling signal 34 typically are transmitted at a low data rate of 100 bps to 2 kbps.

[0036] Fig. 2 shows an example of an alternative embodiment wherein the polling signal 34 and the status information signal 36 are not transmitted via the same channel as the RF audio signal but rather a separate wireless channel 50 is provided for transmission of the polling signal 34 and the status information signal 36. In the case of the embodiment shown in Fig. 2, this separate channel 50 is an inductive link comprising an inductive antenna 52 provided at the remote unit 10 and connected with the control unit 42 and an inductive antenna 54 provided at the RF receiver unit 12 and connected with the control unit 44. The antennas 52 and 54 are adapted both for transmitting and receiving, with the antenna 52 transmitting the polling signal 34 and receiving the status information signal 36 and with the antenna 54 transmitting the status information signal 36 and receiving the polling signal 34.

[0037] The inductive link 50 may be, for example, a 40 kHz FSK modulated inductive channel such as it is conventionally used for remote control purposes and programming of RF receiver units for hearing aids. Preferably, the inductive link 50, in addition to transmitting the polling signal 34 and the status information signal 36, may be used for transmitting remote control commands to the RF receiver unit 12, such as commands for setting the frequency or frequency band of the audio RF link 22 and/or commands for setting the operation mode and operation parameters of the RF receiver unit 12, such as audio volume setting and gain setting. In the embodiments of Figs. 2 and 3 the receiver/transmitter 24 of Fig. 1 is replaced by an audio signal transmitter 25 comprising an antenna 28 and a transmitter element 31 replacing the transceiver 30.

[0038] Fig. 3 shows an embodiment wherein the separate link 50 for the polling signal 34 and the status information signal 36 is realized as a powerless system by using a powerless electromagnetic signal response device 56 at the RF receiver unit 12, Such powerless response devices are known as radio frequency identification (RFID) systems and are commonly used, for example, in door access systems or theft surveillance systems. A description of RFID systems may be found, for example, in the "RFID-Handbook", 2nd edition, by Klaus Finkenzeller, Wiley and Sons Ltd., April 2003. In the embodiment of Fig. 3 the response device 56 is adapted to be energized by energy included in the polling signal 34,with the status information signal 36 being encoded in a modulation of the polling signal 34 caused by the response device 56. The range of RFID systems may be increased by powering the signal response device 56.

[0039] The response device 56 may include an antenna 58, an analogue circuit for receiving and transmitting RF signals, a digital circuit and a data memory wherein the status information basic to a status information signal 36 is stored by action of the control unit 44.

[0040] Generally, in all embodiments in which the remote unit 10 is used for providing audio signals to a plurality of RF receiver units 12 simultaneously, these RF receiver units 12 have to be addressed individually for gaining the desired status information signal 36 from a selected RF receiver unit 12. This can be achieved, for example, by transmitting dedicated device addresses from the remote unit 10 in order to specifically address a selected one of the RF receiver units 12. Such dedicated device addresses may be included in the polling signal 34. Such addresses may advantageously be programmable in both units 10 and 12. Another option is to achieve selection of the RF receiver unit 12 by controlling the range of the polling signal 34. This option is particularly appropriate if the polling signal 34 is transmitted via an inductive link, since the decay of inductive signals with the distance from the transmitter is extrernely steep. In this case, selection of the RF receiver unit 12 is practically achieved by approaching the selected RF receiver unit 12 with the remote unit 10 (for example, the teacher using a remote unit 10 approaches the pupil using the selected RF receiver unit 12).

[0041] In order to enable a distinction between the FM receiver unit 12 used for the right ear and that used for the left ear the status information signal 36 may include information on whether the RF receiver unit 12 is for a right ear or for a left ear. Such information can be provided, for example, by delaying the status information signal 36 depending on whether the RF receiver unit 12 is for a right ear or for a left ear.

Claims

1. Hearing system comprising a hearing device (14) having an output transducer (16) for stimulation of a user's hearing, an audio signal transmitter (24, 25), an audio signal source (32) for providing audio signals to the audio signal transmitter, an audio signal receiver unit (12) adapted to establish a wireless link (22) for transmission of the audio signals from the audio signal transmitter to the audio signal receiver unit which is connected to or integrated within the hearing device for providing the audio signals received from the audio signal transmitter as input to the hearing device, means (24, 28, 30, 40, 42, 52) for generating and wirelessly transmitting a polling signal (34) to the audio signal receiver unit, means (26, 28, 30, 44, 54, 56, 58) for receiving the polling signal at the audio signal receiver unit, means (26, 28, 30, 44, 48, 54, 56, 58) for generating and wirelessly transmitting, when the polling signal has been received, a status information signal (36) containing data regarding the status of the wireless audio signal link and/or the receiver unit, and means (24, 28, 30, 38, 42, 52) for receiving the status information signal and displaying status information derived from the status information signal to a person other than said user of the hearing device, wherein the means (24, 28, 30, 40, 42, 52) for generating and transmitting the polling signal (34) comprise an activation element (40) which is manually operable by said person other than said user.

2. The system of claim 1, wherein the audio signal source (32) and/or the transmitter (24, 25) and/or the means (24, 28, 30, 40, 42, 52) for generating and transmitting the polling signal (34) and/or the means (24, 28, 30, 38, 42, 52) for receiving the status information signal and displaying status information are integrated in a common device (10) to be used by said person other than said user.

3. The system of claim 2, wherein the common device (10) is a portable, preferably handheld, device.

4. The system of one of the preceding claims, wherein the means (24, 28, 30, 38, 42, 52) for receiving the status information signal (36) and displaying status information is adapted to display the status information graphically.

5. The system of one of the preceding claims, wherein the means (24, 28, 30, 38, 42, 52) for receiving the status information signal (36) and displaying status information is adapted to display the status information together with data identifying the audio signal receiver unit (12) among a plurality of audio signal receiver units.

6. The system of one of the preceding claims, wherein the means (24, 28, 30, 40, 42) for generating and transmitting the polling signal (34) is adapted to establish a radio frequency link to the means (26, 28, 30,44) for receiving the polling signal.

7. The system of one of the preceding claims, wherein the audio signal transmitter (24, 25) and the audio signal receiver unit (12) are adapted to establish a radio frequency link for the audio signal.

8. The system of claims 6 and 7, wherein the radio frequency link carrying the polling signal (34) uses the same channel as the radio frequency link (22) carrying the audio signal, with the polling signal being transmitted by the radio frequency transmitter (24).

9. The system of one of claims 1 to 5, wherein the means (42, 52) for generating and transmitting the polling signal (34) is adapted to establish an inductive link to the means (44, 54) for receiving the polling signal.

10. The system of one of the preceding claims, wherein the means (24, 28, 30, 40, 42, 52) for generating and transmitting the polling signal (34) comprises means for transmitting dedicated device addresses in order to specifically address the audio signal receiver unit (12) among a plurality of audio signal receiver units.

11. The system of one of the preceding claims, wherein the means (24, 28, 30, 40, 42, 52) for generating and transmitting the polling signal (34) comprises a frequency shift keying (FSK) modulator.

12. The system of one of the preceding claims, wherein the means (26, 28, 30, 44, 48) for generating and transmitting the status information signal (36) and the means (24, 28, 30, 38, 42) for receiving the status information signal and displaying status information are adapted to establish a radio frequency link carrying the status information signal.

13. The system of claim 12, wherein the means (26, 28, 30, 44, 48, 54, 56, 58) for generating and transmitting the status information signal (36) comprises a frequency shift keying (FSK) modulator.

14. The system of claim 8 and one of claims 12 and 13, wherein the means (26, 28, 30, 44, 48, 54, 56, 58) for generating and transmitting the status information signal (36) is adapted to use the same channel as the radio frequency link (22) carrying the audio signal, with the status information signal being transmitted via the antenna (28) of the audio signal receiver unit (12).

15. The system of claim 14, wherein the audio signal transmitter (24) and the audio signal receiver unit (12) are adapted to interrupt the radio frequency link (22) carrying the audio signal while the status information signal (36) is transmitted.

16. The system of one of claims 1 to 11, wherein the means (44, 48, 54, 56, 58) for generating and transmitting the status information signal (36) and the means (38, 42, 52) for receiving the status information signal and displaying status information are adapted to establish an inductive link carrying the status information signal.

17. The system of one of claims 1 to 11, wherein the means (56, 58) for receiving the polling signal (34) and the means (44, 48, 56, 58) for generating and wirelessly transmitting the status information signal (36) comprise a powerless electromagnetic signal response means (56, 58) adapted to be energized by energy included in the polling signal, with the status information signal being encoded in a modulation of the polling signal caused by the powerless electromagnetic signal response means.

18. The system of one of the preceding claims, wherein the status information signal (36) and/or the polling signal (34) is transmitted at a data rate of 100 bps to 2 kbps.

19. The system of one of the preceding claims, wherein the means (24, 28, 30, 40, 42, 52) for generating and transmitting the polling signal (34) and the means (26, 28, 30, 44, 54, 56, 58) for receiving the polling signal at the audio signal receiver unit (12) are adapted to transmit remote control commands to the audio signal receiver unit.

20. The system of claim 19, wherein the remote control commands include commands for setting the frequency or frequency band of the wireless link (22) carrying the audio signal and/or commands for setting the operation mode and operation parameters of the audio signal receiver unit (12), such as audio volume setting and gain setting.

21. The system of one of the preceding claims, wherein the hearing device (14) is a hearing aid.

22. The system of claim 21, wherein the status information signal (12) includes information regarding at least one of the following: the integrity of the electrical connections between the audio signal receiver unit (12) and the hearing aid (14), the present frequency or frequency band of the wireless link (22) carrying the audio signal, confirmation of remote control commands for setting the operation mode/operation parameters of the audio signal receiver unit, present operation mode of the audio signal receiver unit, present setting of operation parameters of the audio signal receiver unit, signal to noise ratio of the wireless link carrying the audio signal, battery status of the audio signal receiver unit or the hearing aid, identification of the audio signal receiver unit among a plurality of audio signal receiver units, date of last servicing of the audio signal receiver unit, and user's name.

23. The system of claim 21, wherein the status information signal (12) includes information regarding the present operation mode of the hearing aid (14) and/or present setting of operation parameters of the hearing aid.

24. The system of one of the preceding claims, wherein the status information signal (36) includes data on whether the audio signal receiver unit (12) is for a right ear or a left ear.

25. The system of claim 24, wherein transmission of the status information signal (36) is time-delayed depending on whether the audio signal receiver unit (12) is for a right ear or a left ear.

26. The system of one of the preceding claims, wherein the wireless link (22) carrying the audio signal is a frequency modulation (FM) link.

27. The system of one of the preceding claims, wherein the audio signal source is a remote microphone (32).

28. Method for monitoring a hearing system comprising a hearing device (14) having an output transducer (16) for stimulation of a user's hearing, an audio signal transmitter (24, 25), an audio signal source (32), and an audio signal receiver unit (12) connected to or integrated within the hearing device, comprising:

providing audio signals from the audio source to the audio signal transmitter;
establishing a wireless link (22) for transmission of the audio signals from the audio signal transmitter to the audio signal receiver unit;
providing the audio signals received by the audio signal receiver unit from the audio signal transmitter as input to the hearing device;
generating and wirelessly transmitting a polling

signal (34) to the audio signal receiver unit;
receiving the polling signal at the audio signal receiver unit;
generating and wirelessly transmitting, upon reception of the polling signal, a status information signal (36) containing data regarding the status of the wireless audio signal link and/or the audio signal receiver unit;
receiving the status information signal; and
displaying status information derived from the status information signal to a person other than said user of the hearing device,
wherein the polling signal is generated by using an activation element (40) which is manually operated by said person other than said user.

Patentansprüche

1. Hörsystem mit einer Hörvorrichtung (14) mit einem Ausgangswandler (16) zum Stimulieren des Gehörs eines Nutzers, einem Audiosignalsender (24, 25), einer Audiosignalquelle (32) zum Liefern von Audiosignalen an den Audiosignalsender, einer Audiosignalempfängereinheit (12) zum Aufbauen einer drahtlosen Verbindung (22) zum Senden der Audiosignale von dem Audiosignalsender zu der Audiosignalempfängereinheit, weiche mit der Hörvorrichtung verbunden oder in diese integriert ist, um die von dem Audiosignalsender empfangenen Audiosignale an die Hörvorrichtung als Eingabe zu liefern, Mitteln (24, 28, 30, 40, 42, 52) zum Erzeugen und drahtlosen Senden eines Abfragesignals (34) an die Audiosignalempfängereinheit, Mitteln (24, 28, 30, 40, 54, 56, 58) zum Empfangen des Abfragesignals an der Audiosignalempfängereinheit, Mitteln (26, 28, 30, 44, 48, 54, 56, 58) zum Erzeugen und drahtlosen Senden, wenn das Abfragesignal empfangen wurde, eines Statusinformationssignals (36), welches Daten bezüglich des Status der drahtlosen Audiosignalverbindung und/oder der Empfängereinheit enthält, und Mitteln (24, 28, 30, 38, 42, 52) zum Empfangen des Statusinformationssignals und zum Anzeigen von Statusinformation, welche von dem Statusinformationssignal abgeleitet wurde, an eine Person, bei welcher es sich nicht um den Nutzer der Hörvorrichtung handelt, wobei die Mittel (24, 28, 30, 40, 42, 52) zum Erzeugen und Senden des Abfragesignals (34) ein Aktivierungselement (40) aufweisen, welches von der Person, bei welcher es sich nicht um den Nutzer handelt, manuell betätigbar ist.

2. System gernäl3 Anspruch 1, wobei die Audiosignalquelle (32) und/oder der Sender (24, 25) und/oder die Mittel (24, 28, 30, 40, 42, 52) zum Erzeugen und Senden des Abfragesignals und/oder die Mittel (24, 28, 30, 38, 42, 52) zum Empfangen des Statusinformationssignals und zum Anzeigen von Statusinformation in ein gemeinsames Gerät (10) integriert sind, welches von der Person zu benutzen ist, bei welcher es sich nicht um den Nutzer handelt.

3. System gemäß Anspruch 2, wobei es sich bei dem gemeinsamen Gerät (10) um ein tragbares, vorzugsweise handgehaltenes, Gerät handelt.

4. System gemäß einem der vorhergehenden Ansprüche, wobei die Mittel (24, 28, 30, 38, 42, 52) zum Empfangen des Statusinformaüonssignals (36) und zum Anzeigen von Statusinforrnation zum grafischen Anzeigen der Statusinformation ausgebildet sind.

5. System gemäß einem der vorhergehenden Ansprüche, wobei die Mittel (24, 28, 30, 38, 42, 52) zum Empfangen des Statusinformationssignals (36) und zum Anzeigen von Statusinforrnation ausgebildet sind, um die Statusinformation zusammen mit Daten anzuzeigen, welche die Audiosignalempfängereinheit (12) unter einer Mehrzahl von Audiosignalempfängereinheiten identifizieren.

6. System gemäß einem der vorhergehenden Ansprüche, wobei die Mittel (24, 28, 30, 40, 42) zum Erzeugen und Senden des Abfragesignals ausgebildet sind, um eine Radiofrequenzverbindung mit den Mitteln (26, 28, 30, 44) zum Empfangen des Abfragesignals aufzubauen.

7. System gemäß einem der vorhergehenden Ansprüche, wobei der Audiosignalsender (24, 25) und die Audiosignalempfängereinheit (12) ausgebildet sind, um eine Radiofrequenzverbindung für das Audiosignal aufzubauen.

8. System gemäß den Ansprüchen 6 und 7, wobei die Radiofrequenzverbindung, welche das Abfragesignal (34) trägt, den gleichen Kanal verwendet wie die Radiofrequenzverbindung (22), welche das Audiosignal trägt, wobei das Abfragesignal von dem Radiofrequenzsender (24) gesendet wird.

9. System gemäß einem der Ansprüche 1 bis 5, wobei die Mittel (42, 52) zum Erzeugen und Senden des Abfragesignals (34) ausgebildet sind, um eine induktive Verbindung mit den Mitteln (44, 54) zum Empfangen des Abfragesignals aufzubauen.

10. System gemäß einem der vorhergehenden Ansprüche, wobei die Mittel (24, 28, 30, 40, 42, 52) zum Erzeugen und Senden des Abfragesignals (34) Mittel zum Senden von zugeordneten Geräteadressen aufweisen, um die Audiosignalempfängereinheit (12) unter einer Mehrzahl von Audiosignalempfängereinheiten spezifisch zu adressieren.

11. System gemäß einem der vorhergehenden Ansprüche, wobei die Mittel (24, 28, 30, 40, 42, 52) zum Erzeugen und Senden des Abfragesignals (34) einen FSK-Modulator aufweisen.

12. System gemäß einem vorhergehenden Ansprüche, wobei die Mittel (26, 28, 30, 44, 48) zum Erzeugen und Senden des Statusinformationssignals (36) und die Mittel (24, 28, 30, 38, 42) zum Empfangen des Statusinformationssignals und zum Anzeigen von Statusinformation ausgebildet sind, um eine Radiofrequenzverbindung aufzubauen, welche das Statusinformationssignal trägt.

13. System gemäß Anspruch 12, wobei die Mittel (26, 28, 30, 44, 48, 54, 56, 58) zum Erzeugen und Senden des Statusinformationssignals (36) einen FSK-Modulator aufweisen.

14. System gemäß Anspruch 8 und einem der Ansprüche 12 und 13, wobei die Mittel (26, 28, 30, 44, 48, 54, 56, 58) zum Erzeugen und Senden des Statusinformationssignals (36) ausgebildet sind, um denselben Kanal wie die Radiofrequenzverbindung (22), welche das Audiosignal trägt, zu versenden, wobei das Statusinformationssignal über die Antenne (28) der Audiosignatempfängereinheit (12) gesendet wird.

15. System gemäß Anspruch 14, wobei der Audiosignalsender (24) und die Audiosignalempfängereinheit ausgebildet sind, um die Radiofrequenzverbindung (22), welche das Audiosignal trägt, zu unterbrechen, während das Statusinformationssigna! (36) gesendet wird.

16. System gemäß einem der Ansprüche 1 bis 11, wobei die Mittel (44, 48, 54, 56, 58) zum Erzeugen und Senden des Statusinformationssignais (36) und die Mittel (38, 42, 52) zum Empfangen des Statusinformationssignals und zum Anzeigen von Statusinformation ausgebildet sind, um eine induktive Verbindung aufzubauen, welche das Statisinformationssignal trägt.

17. System gemäß einem der Ansprüche 1 bis 11, wobei die Mittel (56, 58) zum Empfangen des Abfragesignals (34) und die Mittel (44, 48, 56, 58) zum Empfangen und drahtlosen Senden des Statusinformationssignals (36) Mittel zur leistungslosen elektromagnetischen Signalantwort (56, 58) aufweisen, die ausgebildet sind, um von in dem Abfragesignal enthaltener Energie energetisiert zu werden, wobei das Statusinformationssignal in einer Modulation des Abfragesignals codiert ist, die von den Mitteln zur leistungslosen elektromagnetischen Signalantwort verursacht wird.

18. System gemäß einem der vorhergehenden Ansprüche, wobei das Statusinformationssignal (36) und/oder das Abfragesignal (34) bei einer Datenrate von 100 bps bis 2 kbps gesendet wird.

19. System gemäß einem der vorhergehenden Ansprüche, wobei die Mittel (24, 28, 30, 40, 42, 52) zum Erzeugen und Senden des Abfragesignals (34) und die Mittel (24, 28, 30, 44, 54, 56, 58) zum Empfangen des Abfragesignals an der Audiosignalempfängereinheit (12) ausgebildet sind, um Fernbedienungsbefehle zu der Audiosignalempfängereinheit zu senden.

20. System gemäß Anspruch 19, wobei die Fernbedienungsbefehle Befehle zum Setzen der Frequenz oder des Frequenzbands der drahtlosen Verbindung (22), welche die Audiosignale trägt, und/oder Befehle zum Setzen des Betriebsmodus und von Betriebsparametern der Audiosignalempfängereinheit (12), wie beispielsweise die Audiolautstärkeeinstellung und Verstärkungseinstellung, aufweist.

21. System gemäß einem der vorhergehenden Ansprüche, wobei die Hörvorrichtung (14) ein Hörgerät ist.

22. System gemäß Anspruch 21, wobei das Statusinformationssignal (12) Information bezüglich mindestens eines der folgenden Punkte aufweist: die Integrität der elektrischen Verbindungen zwischen der Audiosignalempfängereinheit (12) und dem Hörgerät (14), die gegenwärtige Frequenz oder das gegenwärtige Frequenzband der drahtlosen Verbindung (22), welche das Audiosignal trägt, Bestätigung von Fernbedienungsbefehlen zum Setzen des Betriebsmodus / der Betriebsparameter der Audiosignalempfängereinheit, gegenwärtiger Betriebsmodus der Audiosignalempfängereinheit, gegenwärtige Einstellung von Betriebsparametern der Audiosignalempfängereinheit, Signal-Rausch-Verhältnis der drahtlosen Verbindung, welche das Audiosignal trägt, Batteriestatus der Audiosignalempfängereinheit oder des Hörgeräts, Identifikation der Audiosignalempfängereinheit unter einer Mehrzahl von Audiosignalempfängereinheiten, Datum des letzten Services der Audiosignalempfängereinheit, und Nutzername.

23. System gemäß Anspruch 21, wobei das Statusinformationssignal (12) Information bezüglich des gegenwärtigen Betriebsmodus des Hörgeräts (14) und/oder der gegenwärtigen Einstellung von Betriebsparametern des Hörgeräts aufweist.

24. System gemäß einem der vorhergehenden Ansprüche, wobei das Statusinformationssignal (36) Daten bezüglich der Frage, ob die Audiosignalempfängereinheit (12) für ein rechtes Ohr oder ein linkes Ohr

ist, aufweist.

25. System gemäß Anspruch 24, wobei das Senden des Statusinformationssignals (36) zeitverzögert wird in Abhängigkeit davon, ob die Audiosignalempfängereinheit (12) für ein rechtes Ohr oder für ein linkes Ohr ist.

26. System gemäß einem der vorhergehenden Ansprüche, wobei es sich bei der drahtlosen Verbindung (22), welche das Audiosignal trägt, um eine Frequenzmodulationsverbindung (FM) handelt.

27. System gemäß einem der vorhergehenden Ansprüche, wobei es sich bei der Audiosignalquelle um ein Fernmikrofon (32) handelt.

28. Verfahren zum Überwachen eines Hörsystems mit einer Hörvorrichtung (14) mit einem Ausgangswandler (16) zum Stimulieren des Gehörs eines Nutzers, eines Audiosignalsenders (24, 25), einer Audiosignalquelle (32) und einer Audiosignalempfängereinheit (12), welche mit der Hörvorrichtung verbunden oder in diese integriert ist, wobei:

Audiosignale von der Audioquelle an den Audiosignalsender geliefert werden;
eine drahtlose Verbindung (22) zum Senden von Audiosignalen von dem Audiosignalsender an die Audiosignalernpfängereinheit aufgebaut wird,
die von der Audiosignalempfängereinheit von dem Audiosignalsender empfangenen Audiosignale als Eingabe an die Hörvorrichtung geliefert werden;
ein Abfragesignal (34) erzeugt und drahtlos an die Audiosignalempfängereinheit gesendet wird;
das Abfragesignal an der Audiosignalempfängereinheit empfangen wird;
ein Statusinformationssignal (36), welches Daten bezüglich des Status der drahtlosen Audiosignalverbindung und/oder der Audiosignalempfängereinheit enthält, nach dem Empfangen des Abfragesignals erzeugt und drahtlos gesendet wird;
das Statusinformationssigna! empfangen wird; und
Statusinformation, die von dem Statusinformationssignal abgeleitet wird, einer Person, bei welcher es sich nicht um den Nutzer der Hörvorrichtung handelt, angezeigt wird,
wobei das Abfragesignal unter Verwendung eines Aktivierungselements (40) erzeugt wird, welches von der Person, bei welcher es sich nicht um den Nutzer handelt, manuell betätigt wird.

Revendications

1. Système auditif comprenant un dispositif auditif (14) comportant un transducteur de sortie (16) destiné à stimuler l'audition d'un utilisateur, un émetteur de signal audio (24, 25), une source de signal audio (32) destinée à fournir des signaux audio, une unité de réception de signaux audio (12) apte à établir une liaison sans fil (22) destinée à la transmission de signaux audio à l'unité de réception de signaux audio qui est connectée ou intégrée au dispositif auditif pour fournir en entrée les signaux audio reçus de l'émettetzr de signaux audio au dispositif auditif, un moyen (24, 28, 30, 40, 42, 52) destiné à générer et à émettre sans fil un signal d'interrogation (34) vers l'unité de réception de signaux audio, un moyen (26, 28, 30, 44, 54, 56, 58) destiné à recevoir le signal d'interrogation sur l'unité de réception de signaux audio, un moyen (26, 28, 30, 44, 48, 54, 56, 58) destiné à générer et à émettre sans fil, lorsque le signal d'interrogation a été reçu, un signal d'informations d'état (36) contenant des données concernant l'état de la liaison de signaux audio sans fil et/ou de l'unité de réception, et un moyen (24, 28, 30, 38, 42, 52) destiné à recevoir le signal d'informations d'état et à présenter des informations d'état dérivées du signal d'informations d'état à une personne autre que ledit utilisateur dudit dispositif auditif, dans lequel le moyen (24, 28, 30, 40, 42, 52) destiné à générer et à émettre le signal d'interrogation (34) comprend un élément d'activation (40) qui peut être actionné manuellement par ladite personne autre que ledit utilisateur.

2. Système selon la revendication 1, dans lequel la source de signaux audio (32) et/ou l'émetteur (24, 25) et/ou le moyen (24, 28, 30, 40, 42, 52) destiné à générer et à émettre le signal d'interrogation (34) et/ou le moyen (24, 28, 30, 38, 42, 52) destiné à recevoir le signal d'informations d'état et à présenter les informations d'état sont intégrés dans un dispositif commun (10) devant être utilisé par ladite personne autre que ledit utilisateur.

3. Système selon la revendication 2, dans lequel le dispositif commun (10) est un dispositif portable de préférence tenu à la main.

4. Système selon l'une des revendications précédentes, dans lequel le moyen (24, 28, 30, 38, 42, 52) destiné à recevoir le signal d'informations d'état (36) et à présenter des informations d'état est apte à afficher graphiquement les informations d'état.

5. Système selon l'une des revendications précédentes, dans lequel le moyen (24, 28, 30, 38, 42, 52) destiné à recevoir le signal d'informations d'état (36) et à présenter des informations d'état est apte à pré-

senter les informations d'état en association avec des données identifiant l'unité de réception de signaux audio (12) parmi une pluralité d'unités de réception de signaux audio.

6. Système selon l'une des revendications précédentes, dans lequel le moyen (24, 28, 30, 40, 42, 52) destiné à générer et à émettre le signal d'interrogation (34) est apte à établir une liaison radiofréquence avec le moyen (26, 28, 30, 44) destiné à recevoir le signal d'interrogation.

7. Système selon l'une des revendications précédentes, dans lequel l'émetteur de signaux audio (24, 25) et l'unité de réception de signaux audio (12) sont aptes à établir une liaison radiofréquence pour le signal audio.

8. Système selon les revendications 6 et 7, dans lequel la liaison radiofréquence acheminant le signal d'interrogation (34) utilise le même canal que la liaison radiofréquence (22) acheminant le signal audio, le signal d'interrogation étant émis par l'émetteur radiofréquence (24).

9. Système selon l'une des revendications 1 à 5, dans lequel le moyen (42, 52) destiné à générer et émettre le signal d'interrogation (34) est apte à établir une liaison par induction avec le moyen (44, 54) destiné à recevoir le signal d'interrogation.

10. Système selon l'une des revendications précédentes, dans lequel le moyen (24, 28, 30, 40, 42, 52) destiné à générer et émettre le signal d'interrogation (34) comprend un moyen destiné à émettre des adresses de dispositifs spécialisés afin d'adresser spécifiquement l'unité de réception de signaux audio (12) parmi une pluralité d'unités de réception de signaux audio.

11. Système selon l'une des revendications précédentes, dans lequel le moyen (24, 28, 30, 40, 42, 52) destiné à générer et émettre le signal d'interrogation (34) comprend un modulateur à modulation par déplacement de fréquence (FSK, Frequency Shift Keying).

12. Système selon l'une des revendications précédentes, dans lequel le moyen (26, 28, 30, 44, 48) destiné à générer et émettre le signal d'information d'état (36) et le moyen (24, 28, 30, 38, 42) destiné à recevoir le signal d'informations d'état et à présenter des informations d'état sont aptes à établir une liaison radiofréquence acheminant le signal d'informations d'état.

13. Système selon la revendication 12, dans lequel le moyen (26, 28, 30, 44, 48, 54, 56, 58) destiné à générer et émettre le signal d'informations d'état (36) comprend un modulateur à modulation par déplacement de fréquence. (FSK).

14. Système selon la revendication 8 et l'une des revendications 12 et 13, dans lequel le moyen (26, 28, 30, 44, 48, 54, 56, 58) destiné à générer et émettre le signal d'informations d'état (36) est apte à utiliser le même canal que la liaison radiofréquence (22) acheminant le signal audio, le signal d'informations d'état étant émis par l'intermédiaire de l'antenne (28) de l'unité de réception de signaux audio (12).

15. Système selon la revendication 14, dans lequel l'émetteur de signaux audio (24) et l'unité de réception de signaux audio (12) sont aptes à interrompre la liaison radiofréquence (22) acheminant le signal audio pendant que le signal d'informations d'état (36) est émis.

16. Système selon l'une des revendications 1 à 11, dans lequel le moyen (44, 48, 54, 56, 58) destiné à générer et émettre le signal d'information d'état (36) et le moyen (38, 42, 52) destiné à recevoir le signal d'informations d'état et à afficher des informations d'état sont aptes à établir une liaison par induction acheminant le signal d'informations d'état.

17. Système selon l'une des revendications 1 à 11, dans lequel le moyen (56, 58) destiné à recevoir le signal d'interrogation (34) et le moyen (44, 48, 56, 58) destiné à générer et émettre le signal d'informations d'état (36) comprennent un moyen de réponse par signal électromagnétique sans alimentation (56, 58) apte à être alimenté en énergie contenue dans le signal d'interrogation, le signal d'informations d'état étant codé dans une modulation du signal d'interrogation provoqué par le moyen de réponse par signal électromagnétique sans alimentation.

18. Système selon l'une des revendications précédentes, dans lequel le signal d'informations d'état (36) et/ou le signal d'interrogation (34) est/sont émis à un débit de données de 100 bps à 2 kbps.

19. Système selon l'une des revendications précédentes, dans lequel le moyen (24, 28, 30, 40, 42, 52) destiné à générer et émettre le signal d'interrogation (34) et le moyen (26, 28, 30, 44, 54, 56, 58) destiné à recevoir le signal d'interrogation sur l'unité de réception de signaux audio (12) sont aptes à émettre des ordres de commande à distance vers l'unité de réception de signaux audio.

20. Système selon la revendication 19, dans lequel les ordres de commande à distance comprennent des ordres destinés à régler la fréquence ou la bande de fréquences de la liaison sans fil (22) acheminant le

signal audio et/ou des ordres destinés à régler le mode de fonctionnement et des paramètres de fonctionnement de l'unité de réception de signaux audio (12), tels que le réglage du volume et le réglage du gain.

21. Système selon l'une des revendications précédentes, dans lequel le dispositif auditif (14) est une prothèse auditive.

22. Système selon la revendication 21, dans lequel le signal d'informations d'état (12) comprend des informations concernant au moins l'un des éléments suivants : l'intégrité des connexions électriques entre l'unité de réception de signaux audio (12) et la prothèse auditive (14), la fréquence ou la bande de fréquences présente de la liaison sans fil (22) acheminant le signal audio, une confirmation d'ordres de commande à distance destinés à régler le mode de fonctionnement/des paramètres de fonctionnement de l'unité de réception de signaux audio, le mode de fonctionnement présent de l'unité de réception de signaux audio, le réglage présent de paramètres de fonctionnement de l'unité de réception de signaux audio, le rapport signal à bruit de la liaison sans fil acheminant le signal audio, un état de batterie de l'unité de réception de signaux audio ou de la prothèse auditive, une identification de l'unité de réception de signaux audio parmi une pluralité d'unités de réception de signaux audio, la date du dernier entretien de l'unité de réception de signaux audio et le nom de l'utilisateur.

23. Système selon la revendication 21, dans lequel le signal d'informations d'état (12) comprend des informations concernant le mode de fonctionnement présent de la prothèse auditive (14) et/ou un réglage présent de paramètres de fonctionnement de la prothèse auditive.

24. Système selon l'une des revendication précédentes, dans lequel le signal d'informations d'état (36) comprend des données indiquant si l'unité de réception de signaux audio (12) est destinée à une oreille droite ou à une oreille gauche.

25. Système selon la revendication 24, dans lequel la transmission du signal d'informations d'état (36) est retardée dans le temps selon que l'unité de réception de signaux audio (12) est destinée à une oreille droite ou à une oreille gauche.

26. Système selon l'une des revendications précédentes, dans lequel la liaison sans fil (22) acheminant le signal audio est une liaison à modulation de fréquence (FM).

27. Système selon l'une des revendications précédentes, dans lequel la source de signaux audio est un microphone distant (32).

28. Procédé de surveillance d'un système auditif comprenant un dispositif auditif (14) comportant un transducteur de sortie (16) destiné à stimuler l'audition d'un utilisateur, un émetteur de signaux audio (24, 25), une source de signaux audio (32) et une unité de réception de signaux audio (12) connectée ou intégrée au dispositif auditif, consistant à :

fournir des signaux audio de la source audio à l'émetteur de signaux audio ;
établir une liaison sans fil (22) destinée à la transmission des signaux audio de l'émetteur de signaux audio à l'unité de réception de signaux audio ;
fournir en entrée les signaux audio reçus par l'unité de réception de signaux audio de l'émetteur de signaux audio au dispositif auditif ;
générer et émettre sans fil un signal d'interrogation (34) vers l'unité de réception de signaux audio ;
recevoir le signal d'interrogation sur l'unité de réception de signaux audic ;
générer et émettre sans fil, lors de la réception du signal d'interrogation, un signal d'informations d'état (36) contenant des données concernant l'état de la liaison de signaux audio sans fil et/ou de l'unité de réception de signaux audio ;
recevoir le signal d'informations d'état ; et
présenter des informations d'état dérivées du signal d'information d'état à une personne autre que ledit utilisateur du dispositif auditif,
dans lequel le signal d'interrogation est généré en utilisant un élément d'activation (40) qui peut être actionné manuellement par ladite personne autre que ledit utilisateur.

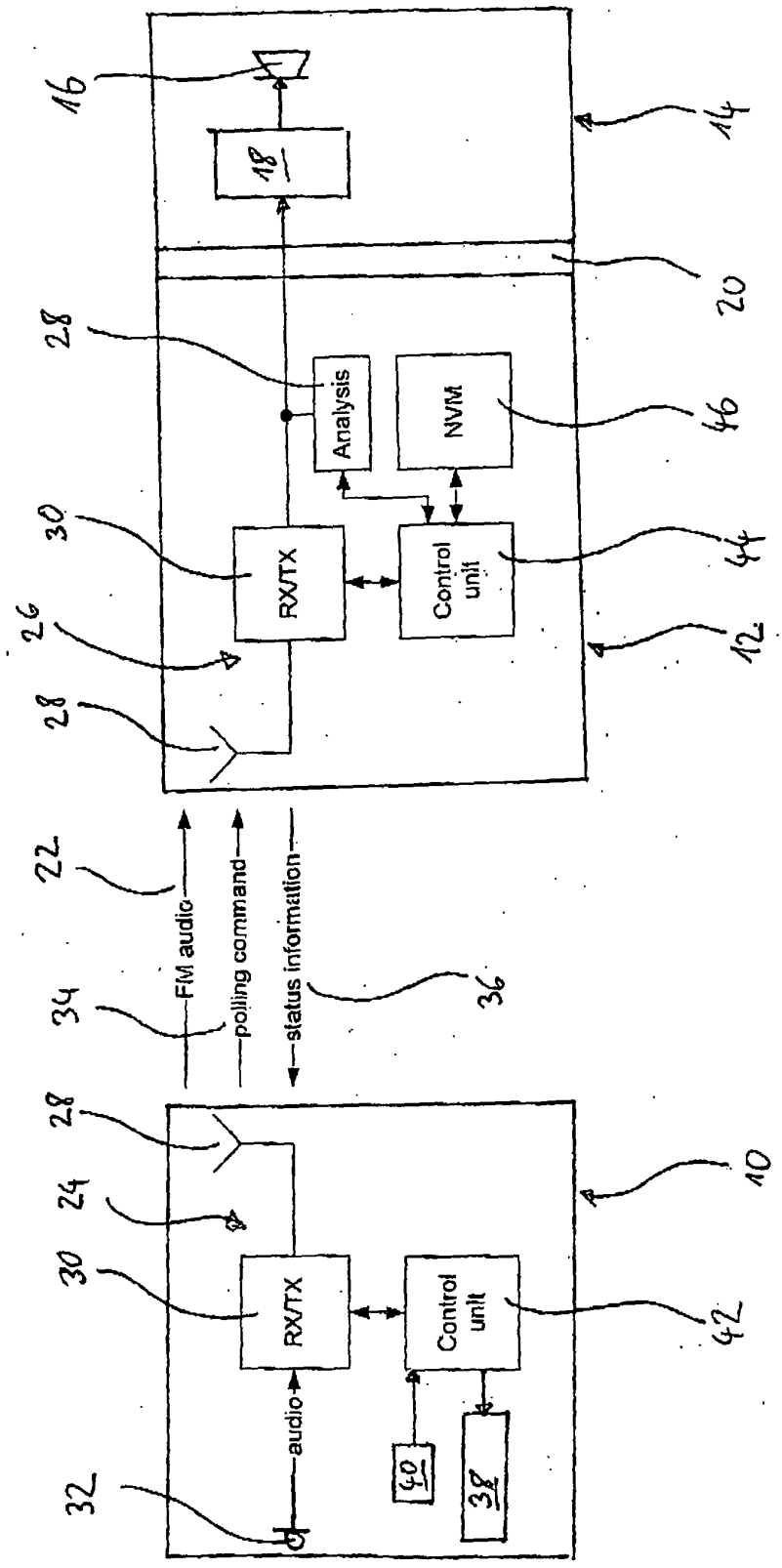
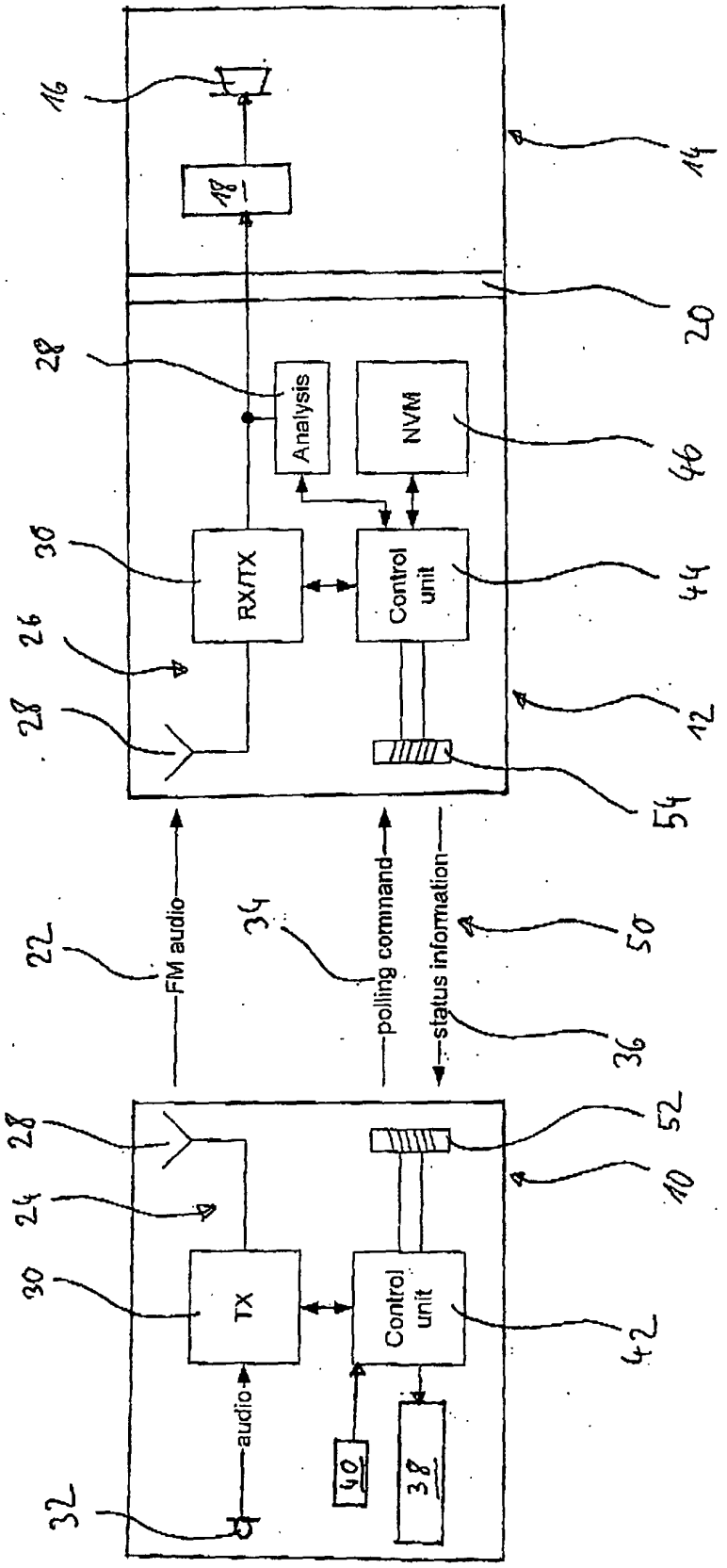

16
18
14
20
28
Analysis
NVM
46
30
RX/TX
Control unit
44
26
12
28
22
FM audio
polling command
status information
36
34
28
10
24
30
RX/TX
Control unit
42
audio
40
38
32

Fig. 1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RX/TX
Control unit
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54
22
FM audio
34
polling command
status information
50
36
28
52
24
10
30
TX
Control unit
42
audio
32
40
38

Fig. 2

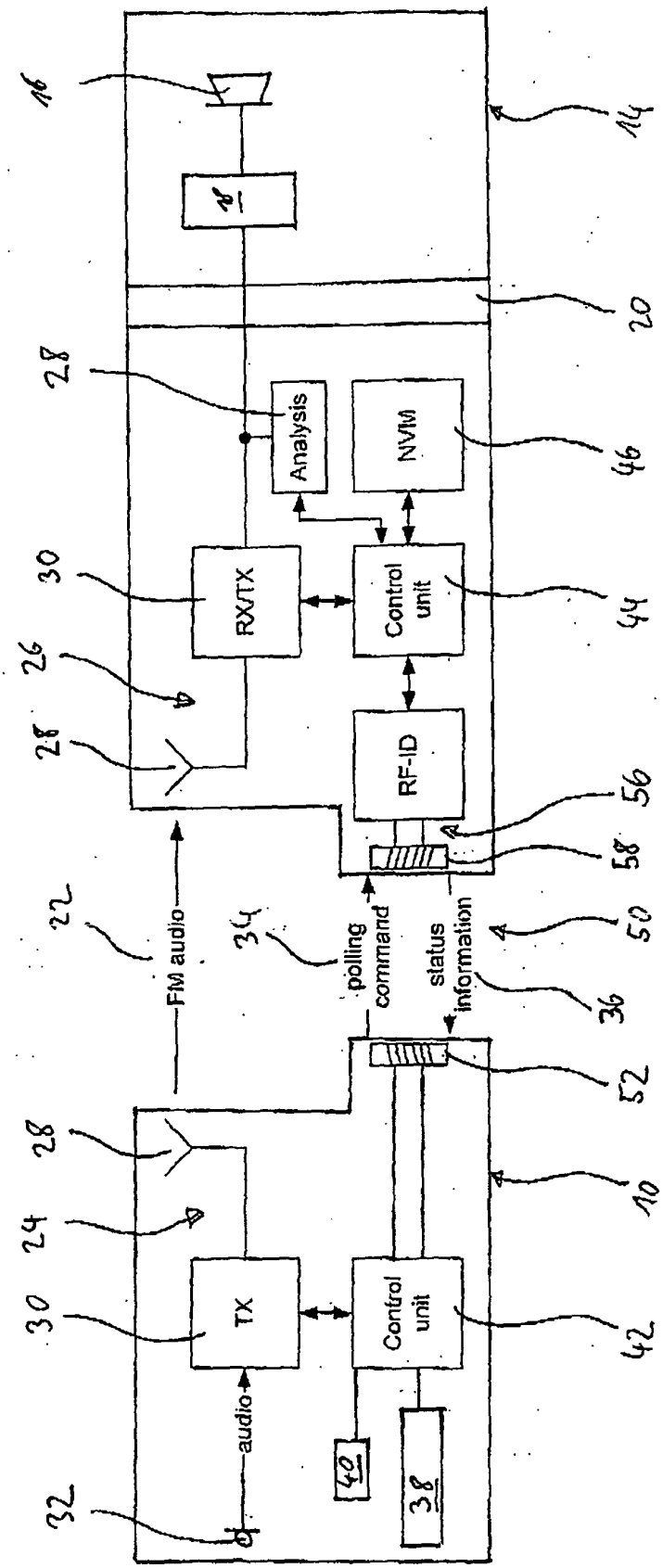
16
14
18
20
28
Analysis
NVM
46
30
RX/TX
Control unit
44
26
28
RF-ID
56
58
22
FM audio
34
polling command
status information
50
36
52
28
10
24
30
TX
Control unit
42
audio
40
38
32

Fig. 3

REFERENCES CITED IN THE DESCRIPTION

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