

(19)



[logo:] European Patent Office



(11)

EP 1 727 395 B1

(12)

EUROPEAN PATENT APPLICATION

(45) Publication date and disclosure of reference to granting of patent:

08/20/2008 Patent Bulletin 2008/34

(51) Int Cl.:

H04R 25/00^(2006.01)

(21) Application number: **06002561.6**

(22) Filing date: **02/08/2006**

(54) **Verfahren und Vorrichtung zum induktiven Laden von Hörgeräten**

Method and apparatus for charging hearing aids inductively

Procédé et dispositif pour le chargement de prothèses auditives de manière inductive

(84) Designated contracting states:

**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI
SK TR**

(30) Priority: **05/25/2005 DE 102005024227**

(43) Publication date of application: **11/29/2006**

Patent Bulletin 2006/48

(73) Proprietor: **Audia Akustik GmbH 99610 Sömmerda
(DE)**

(72) Inventor(s):

- **Steinbrecher, Helmut
99625 Köllda (DE)**

- **Kupper, Lutz
99636 Ostramondra (DE)**
- **Panitzsch, Frank
99625 Burgwenden (DE)**

(74) Counsel: **Liedtke, Klaus
Liedtke & Partner
Patent Attorneys
Elisabethstrasse 10
99096 Erfurt (DE)**

(56) Citations:

**EP-A- 0 909 113
DE-U1- 29 718 104
US-B1- 6 291 968**

**EP-A2- 0 984 541
US-A- 4 379 988**

Note: Within nine months of the publication of the notification of the grant of the European patent in the European Patent Bulletin, anyone may file an opposition to this patent with the European Patent Office pursuant to the Implementing Regulations. The opposition is not deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

EP 1 727 395 B1

HIMPP 1006

Description

[0001] The invention relates to a procedure and a device for the contactless loading of an accumulator battery in a hearing aid which, during the charge process, is located in a charging shell.

[0002] An arrangement is known from DE 197 45 101 A1 in which the battery in a hearing aid is charged with a hearing aid charging circuit, which is inductively connected to a power supply arranged there when the hearing aid is inserted into a charging container. For this purpose, a primary coil is arranged in the charging container, and a secondary coil is arranged in the hearing aid. The state of charge of the accumulator battery is determined in the hearing aid by a voltmeter whose output signal is fed to the secondary coil via a modulator. A demodulator picks up the inductively transmitted signal at the primary coil, demodulates it, and then feeds it to the charging controller, which adjusts the flow of energy to the primary coil according to the state of charge determined.

[0003] The disadvantage here is that the user does not receive any information about the state of charge. Another problem is the limited service life of the batteries, which only support a number of charging and discharging cycles depending on a type. In the interests of high availability and reliability of the hearing aid, information about the remaining life expectancy of the battery is desirable.

[0004] The invention addresses the problem of specifying a procedure and a device for contactless loading of batteries in hearing aids, wherein the user receives information about the state of charge.

[0005] The problem is solved according to the invention by a procedure according to claim 1 and a device according to claim 11.

[0006] Advantageous configurations of the invention are the subject-matter of the dependent claims.

[0007] In the procedure according to the invention for contactless loading of a accumulator battery in a hearing device, the hearing device is located in a charging shell during the charge process. The charging shell comprises a first circuit arrangement, which is used in order to transmit energy and receive and process signals. For this purpose, it contains at least one energy transmission device and one signal processing device.

[0008] A second circuit arrangement is located in the hearing aid and is connected to the first one in a contactless manner. This second circuit arrangement serves to receive energy, rectify it, and process signals. For this purpose, it contains at least one energy receiving device and a rectifier. In addition, a charge controller is arranged in the second circuit arrangement, which monitors the state of charge of the battery and starts the charge process when it falls below a setpoint value. In addition, the number of charging cycles already completed is monitored, and this number or the number of remaining charging cycles and the current state of charge are processed in a suitable form as signals and transmitted from a modulator output via a suitable signal path to a demodulator input of the signal processing device, so that this information can be made available for the user at the charging shell.

[0009] The energy transmission preferably takes place inductively from a primary coil arranged in the first circuit arrangement to a secondary coil arranged in the second circuit arrangement, because this procedure is best suited for contactless energy transmission.

[0010] The pre-processed signals are preferably modulated onto a carrier signal in order to achieve the most suitable signal properties for the respective type of transmission.

[0011] For this purpose, in particular, the secondary coil can be used as a transmitter and the primary coil can be used as a receiver, which eliminates the use of additional components and thus reduces costs and installation space. For this purpose, the secondary coil is connected to the modulator output and the

primary coil is connected to the demodulator input.

[0012] In an alternative embodiment, the light intensity of a light source arranged in the second circuit arrangement, in particular a light-emitting diode, which emits light in the visible or invisible spectral range, is modulated with the pre-processed signals. An optical receive element, e.g. a phototransistor, serves as the receiver in the first circuit arrangement. This embodiment eliminates the adjustment problems associated with the coupling and decoupling of the signals into and out of the energy transmission path.

[0013] In a further embodiment, the pre-processed signals are used in order to drive an RF transmitter, e.g. a Bluetooth transmitter, and a corresponding RF receiver is connected to the first circuit arrangement. Here, too, there is no need to couple the signals in and out of the energy transmission path. Bluetooth components can also be used inexpensively due to their widespread use.

[0014] The signals demodulated in the first circuit arrangement are preferably fed to an output device arranged there in order to inform the user about the state of charge and the remaining life expectancy of the battery.

[0015] In particular, the output device can be an LED, an LED matrix, or another optical display, because this form of output is particularly eye-catching.

[0016] Alternatively or additionally, the output can also take place acoustically, whereby a higher degree of attention can be achieved on the part of the user, in particular when the remaining life expectancy of the battery is indicated.

[0017] Advantageously, the second circuit arrangement can also add information about a necessary service interval to the pre-processed signals in order to inform the user about the output.

[0018] In a preferred embodiment, the hearing aid's electronics are switched off using the charge controller, in particular during the charge process and as soon as the hearing aid is located in the charging shell. This ensures that energy is not consumed unnecessarily and feedback whistling does not occur.

[0019] A microswitch is preferably arranged in the hearing aid, which then controls an Ftou of the charge controller when the hearing aid is placed in a storage case. In this case, the charge controller separates the hearing aid's electronics from the battery, so that no current is consumed and no feedback whistling occurs.

[0020] In a particularly preferred embodiment, the microswitch is designed as a reed contact, which is actuated by a permanent magnet arranged in the storage case.

[0021] In a further embodiment, light-emitting diodes are integrated into the hearing aid in order to display the state of charge or the charge process, making it easier for the user to associate the display with the respective hearing aid.

[0022] In the following, exemplary embodiments of the invention are explained in further detail by means of the drawings.

[0023] The following are shown:

Fig. 1 a perspective view of a charging shell;

Fig. 2 the circuit arrangement;

Fig. 3 a schematic diagram of an arrangement with optical signal transmission;

and

Fig. 4 a schematic diagram of an arrangement with electromagnetic signal transmission.

[0024] The charging shell 1 shown in Fig. 1 has a housing

bottom part 1.1 and a lid 1.2. In the housing bottom part 1.1, an intermediate floor 1.3, preferably made of a plastic that can be drawn, is inserted, in which two receiving recesses 1.4 for one hearing aid H each are incorporated. The charging shell 1 can be closed with the lid 1.2. The receiving recesses 1.4 are dimensioned in such a way that they can accommodate both a behind-the-ear device and an in-the-ear device and hold them in a defined position. Below the intermediate floor 1.3, there is a first circuit arrangement 2, which can be connected by the mains plug 3 to the electrical network. Alternatively, the mains connection could also be made with a plug-in power supply. An output device 7 is used in order to display the state of charge or information about the remaining life expectancy of a battery A in a hearing aid H that may have been inserted.

[0025] The function of the second circuit arrangement 4 arranged in the hearing aid H with the charge controller C is explained in Fig. 2. The hearing aid H is supplied with energy via the energy receiving device in the form of the secondary coil S and rectified with the rectifier G. The hearing aid H also contains hearing aid's electronics E, the battery A, the secondary coil S, and the charge controller C. After the hearing aid H has been inserted into the charging shell, the charge controller C is activated. Activation is indicated with the aid of light-emitting diodes L1, L2. The charge controller C has a control output with which the charge process can be started and ended. For this purpose, the current state of charge of the battery A is detected by the charge controller C, and the amount of charge required to complete the charging is determined and fed into the battery A. The charge process is indicated by the charging LED L1. After the charge process is complete and the battery A has reached its full charge, the charging LED L1 goes out and the indicator LED L2 starts to light up. The lighting of the indicator LED L2 indicates to the user that the full charge has been reached. For as long as the hearing aid H remains in the charging shell 1, the state of charge of the battery A is constantly monitored and, if necessary, maintained at the nominal value of the charge level by a trickle charge. The current state of charge can be displayed optically with the aid of additional light-emitting diodes. The charge controller C has a modulator output CM, which is connected to the secondary coil in order to feed it modulated signals in order to transmit the state of charge and the number of charging cycles completed to the charging shell 1. When placed in a storage case, the microswitch configured as a reed contact is actuated by means of a built-in permanent magnet, which controls an input of the charging controller, whereupon the latter disconnects the electrical connection between the battery and the hearing aid's electronics.

[0026] In the arrangement shown in Fig. 3, the charge controller C is arranged in the hearing aid H, which monitors the state of charge of the battery A (not shown here), and transmits signals from its modulator output to the light source L3 in the form of an LED, so that signals with visible or invisible light are emitted, which characterize the status of the battery A. The modulation of the emitted signals, which describes the status of the battery A, can take place by varying the light intensity or the frequency of the emitted light. In addition to information about the state of charge of the battery A, information about the number of charging cycles that have been carried out and/or that are still possible and about the required service intervals is also transmitted. An optical receive element 5 is located in the charging shell 1 in the vicinity of the hearing aid receptacle, which receives the light signals emitted by the light source L3 and feeds them to a demodulator input of a signal processing device 6. The signal processing device 6 controls an optical output device 7, which then transmits the respective information to the user. In the case shown, the output device consists of a row of display elements 7.1 and an individual display 7.2. The row of display elements 7.1 can advantageously be designed in the form of a row of LEDs or

LCDs that light up in a specific color as a chaser light or similar arrangement during the charge process. When the charge process is complete, the chaser light goes out and the individual display 7.2 lights up. In this case, for example, the information that the battery is fully charged can be indicated by a green signal and the information that the battery has fallen below a minimum state of charge can be indicated by a red signal.

The display can also take place with a light-emitting diode matrix or a similar arrangement, with which a variety of display options can be realized.

[0027] Fig. 4 shows an embodiment in which the signals are not transmitted from the hearing aid H to the charging shell 1 by optical means, but rather by electromagnetic waves, for example by means of Bluetooth transmission. For this purpose, a miniaturized RF transmitter 8 is arranged on the hearing aid, whose transmission signals are modulated by the charge controller C. To receive the signals, the charging shell 1 is equipped with an RF receiver 9, which receives the electromagnetic signals and transmits them to the signal processing device 6. The display takes place in the manner as described in Fig. 3.

LIST OF REFERENCE NUMERALS

[0028]

1	Charging shell
1.1	Housing bottom part
1.2	Lid
1.3	Intermediate floor
1.4	Receiving recesses
2	First circuit arrangement
3	Mains plug
4	Second circuit arrangement
5	Optical receive element
6	Signal processing device
7	Output device
7.1	Row of display elements
7.2	Individual display element
8	RF transmitter
9	RF receiver
A	Battery
C	Charge controller
CM	Modulator output
E	Hearing aid's electronics
G	Rectifier
H	Hearing aid
L	Light-emitting diodes
L1	Charging LED
L2	indicator LED
L3	Light source
M	Microswitch
S	Secondary coil

Patentansprüche

- Verfahren zum kontaktlosen Laden eines Akkumulators (A) in einem Hörgerät (H), welches sich während des Ladevorgangs in einer Ladeschale (1) befindet, die eine erste Schaltungsanordnung (2) umfasst, welche kontaktlos mit einer im Hörgerät (H) befindlichen, zweiten Schaltungsanordnung (4) gekoppelt ist, die zumindest der Aufnahme von Energie, deren Gleichrichtung und dem Aufbereiten und Senden von Signalen dient, wobei die erste Schaltungsanordnung (2) der zweiten Schaltungsanordnung (4) kontaktlos Energie zuführt und diese dort gleichgerichtet wird, **dadurch gekennzeichnet, dass** von einem in der zweiten Schaltungsanordnung (4) angeordneten Ladecontroller

- (C) zumindest der Ladezustand des Akkumulators (A), die Anzahl der von diesem durchlaufenen oder noch verbleibenden Ladezyklen und der Ladestrom überwacht werden, der Ladevorgang bei Unterschreiten eines Sollwertes des Ladezustandes gestartet wird und zumindest der Ladezustand des Akkumulators (A) und die Anzahl der von diesem durchlaufenen oder noch verbleibenden Ladezyklen in der zweiten Schaltungsanordnung (4) als Signale aufbereitet an die erste Schaltungsanordnung (2) versendet werden.
2. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** vom Ladecontroller (C) der Ladestrom überwacht wird.
 3. Verfahren nach einem der Ansprüche 1 oder 2, **dadurch gekennzeichnet, dass** die Energie induktiv von einer in der ersten Schaltungsanordnung (2) angeordneten Primärspule auf eine in der zweiten Schaltungsanordnung (4) angeordnete Sekundärspule (S) übertragen wird.
 4. Verfahren nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die aufbereiteten Signale einem Trägersignal aufmoduliert werden.
 5. Verfahren nach einem der Ansprüche 3 oder 4, **dadurch gekennzeichnet, dass** die aufbereiteten Signale in Form eines modulierten Trägersignals induktiv von der Sekundärspule (S) an die Primärspule gesendet werden.
 6. Verfahren nach einem der Ansprüche 1 bis 3, **dadurch gekennzeichnet, dass** mit den aufbereiteten Signalen die Lichtintensität einer in der zweiten Schaltungsanordnung (4) angeordneten Lichtquelle (L3) moduliert wird, die Licht im sichtbaren oder unsichtbaren Spektralbereich emittiert, welches von einem in der ersten Schaltungsanordnung (2) angeordneten optischen Empfangselement (5) empfangen wird.
 7. Verfahren nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die in der ersten Schaltungsanordnung (2) demodulierten Signale zumindest teilweise einer dort angeordneten Ausgabevorrichtung (7) zugeführt werden.
 8. Verfahren nach Anspruch 7, **dadurch gekennzeichnet, dass** die Ausgabe der Signale optisch erfolgt.
 9. Verfahren nach einem der Ansprüche 7 oder 8, **dadurch gekennzeichnet, dass** die Ausgabe der Signale akustisch erfolgt.
 10. Verfahren nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** den aufbereiteten Signalen in der zweiten Schaltungsanordnung (4) Informationen über ein Serviceintervall des Hörgerätes (H) zugeführt werden.
 11. Verfahren nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die zweite Schaltungsanordnung (4) die Hörgeräteelektronik (E) abschalten kann.
 12. Vorrichtung zum kontaktlosen Laden eines Akkumulators (A) in einem Hörgerät (H), das zum Laden in einer Ladeschale (1) aufnehmbar ist, die eine erste Schaltungsanordnung (2) umfasst, die mindestens eine Energieübertragungsvorrichtung und eine

Signalverarbeitungsvorrichtung (6) beinhaltet und kontaktlos mit einer im Hörgerät (H) befindlichen, zweiten Schaltungsanordnung (4) gekoppelt ist, die zumindest eine Energieempfangsvorrichtung und einen Gleichrichter umfasst, **dadurch gekennzeichnet, dass** in der zweiten Schaltungsanordnung (4) ein Ladecontroller (C) angeordnet ist, der zumindest den Ladezustand des Akkumulators (A) und die Anzahl der von diesem durchlaufenen Ladezyklen überwacht, den Ladevorgang bei Unterschreiten eines Sollwertes des Ladezustandes startet und an einem Modulatorausgang zumindest den Ladezustand des Akkumulators (A) und die Anzahl der von diesem durchlaufenen oder noch verbleibenden Ladezyklen als Signale in modulierter Form über einen Signalübertragungsweg kontaktlos zu einem Demodulatoreingang der Signalverarbeitungsvorrichtung (6) überträgt.

13. Vorrichtung nach Anspruch 12, **dadurch gekennzeichnet, dass** die Energieübertragungsvorrichtung als Primärspule und die Energieempfangsvorrichtung als Sekundärspule (S) ausgebildet ist.
14. Vorrichtung nach einem der Ansprüche 12 oder 13, **dadurch gekennzeichnet, dass** der Modulatorausgang mit der Sekundärspule (S) und der Demodulatoreingang mit der Primärspule gekoppelt ist.
15. Vorrichtung nach einem der Ansprüche 12 oder 13, **dadurch gekennzeichnet, dass** die zweite Schaltungsanordnung (4) eine mit ihrem Modulatorausgang gekoppelte Lichtquelle (L3), insbesondere eine Leuchtdiode enthält, die Licht im sichtbaren oder unsichtbaren Spektralbereich emittiert und dass die erste Schaltungsanordnung (2) ein mit ihrem Demodulatoreingang gekoppeltes optisches Empfangselement (5) enthält.
16. Vorrichtung nach einem der Ansprüche 12 oder 13, **dadurch gekennzeichnet, dass** der Modulatorausgang mit einem HF-Sender (8) und der Demodulatoreingang mit einem HF-Empfänger (9) gekoppelt ist.
17. Vorrichtung nach einem der Ansprüche 12 bis 16, **dadurch gekennzeichnet, dass** die - erste Schaltungsanordnung (2) eine optische oder akustische Ausgabevorrichtung (7) enthält.
18. Vorrichtung nach einem der Ansprüche 12 bis 17, **dadurch gekennzeichnet, dass** der Ladecontroller (C) einen Steuerausgang besitzt, mit dem die Hörgeräteelektronik (E) abschaltbar ist.
19. Vorrichtung nach einem der Ansprüche 12 bis 18, **dadurch gekennzeichnet, dass** im Hörgerät (H) mindestens ein Mikroschalter (M) angeordnet ist, der einen Eingang des Ladecontrollers ansteuert.
20. Vorrichtung nach Anspruch 19, **dadurch gekennzeichnet, dass** der Mikroschalter (M) in Form von Reedkontakten realisiert ist.
21. Vorrichtung nach einem der Ansprüche 12 bis 20, **dadurch gekennzeichnet, dass** in oder am Hörgerät (H) vom Ladecontroller (C) angesteuerte Leuchtdioden (L) zur Anzeige des Ladezustandes und/oder des Ladevorganges angeordnet sind.

Claims

1. Procedure for the contactless loading of an accumulator battery (A) in a hearing aid (H) which, during the charge process, is located in a charging shell (1) which comprises a first circuit arrangement (2) coupled without contacts to a second circuit arrangement (4) located in the hearing aid (H) and used at least for receiving energy, its rectification and for the preprocessing and transmitting of signals, while the first circuit arrangement (2) feeds energy without contact to the second circuit arrangement (4) and this energy is rectified there, **characterized in that**, by a charge controller (C) located in the second circuit arrangement (4), at least the charge status of the accumulator battery (A), the number of charging cycles completed or still to be completed by the accumulator battery and the charging current is monitored, the charge process is started when the charge status falls below a setpoint value, and at least the charge status of the accumulator battery (A) and the number of accumulator battery charging cycles completed or still to be completed in the second circuit arrangement (4) is pre-processed as signals and transmitted to the first circuit arrangement (2).
2. Procedure as claimed in claim 1, **characterized in that** the charge controller (C) monitors the charging current.
3. Procedure as claimed in any claim 1 or 2, **characterized in that** energy is transmitted inductively from a primary coil located in the first circuit arrangement (2) to a secondary coil (S) located in the second circuit arrangement (4).
4. Procedure as claimed in any preceding claim **characterized in that** the pre-processed signals are modulated onto a carrier signal.
5. Procedure as claimed in any claim 3 or 4, **characterized in that** the pre-processed signals are transmitted in the form of a modulated carrier signal inductively from the secondary coil (S) to the primary coil.
6. Procedure as claimed in any claim 1 through 3 **characterized in that** the pre-processed signals are used to modulate the light intensity of a light source (L3) which is located in the second circuit arrangement (4), and which emits light in the visible or invisible spectral range that is received by an optical receive element (5) which is located in the first circuit arrangement (2).
7. Procedure as claimed in any preceding claim, **characterized in that** the signals demodulated in the first circuit arrangement (2) are fed at least in part to an output device (7) located there.
8. Procedure as claimed in claim 7, **characterized in that** the output of the signals is done optically.
9. Procedure as claimed in any claim 7 or 8, **characterized in that** the output of the signals is done acoustically.
10. Procedure as claimed in any preceding claim, **characterized in that** information on a service interval of the hearing aid (H) is fed to the pre-processed signals in the second circuit arrangement (4).
11. Procedure as claimed in any preceding claim,
12. Device for the contactless loading of an accumulator battery (A) in a hearing aid (H) accommodatable for charging in a charging shell (1) which comprises a first circuit arrangement (2) that contains at least one energy transmission device and one signal processing device (6) and is coupled without contacts to a second circuit arrangement (4) located in the hearing aid (H) and comprising at least one energy receiving device and one rectifier, **characterized in that** a charge controller (C) is located in the second circuit arrangement (4) and monitors at least the charge status of the accumulator battery (A) and the number of charging cycles completed by the accumulator battery, starts the charge process when the charge status falls below a setpoint value, and transmits at least the charge status of the accumulator battery (A) and the number of accumulator battery charging cycles completed and still to be completed as signals in a modulated form at a modulator output via a signal transmission path without contact to a demodulator input of the signal processing device (6).
13. Device as claimed in claim 12, **characterized in that** the energy transmission device is designed as a primary coil and the energy receiving device is designed as a secondary coil (S).
14. Device as claimed in any claim 12 or 13, **characterized in that** the modulator output is coupled to the secondary coil (S) and the demodulator input is coupled to the primary coil.
15. Device as claimed in any claim 12 or 13, **characterized in that** the second circuit arrangement (4) contains a light source (L3), especially a light emitting diode, which is coupled to its modulator output, and which emits light in the visible or invisible spectral range, and **in that** the first circuit arrangement (2) contains an optical receive element (5) coupled to its demodulator input.
16. Device as claimed in any claim 12 or 13, **characterized in that** the modulator output is coupled to an RF transmitter (8) and the demodulator input is coupled to an RF receiver (9).
17. Device as claimed in any claim 12 through 16, **characterized in that** the first circuit arrangement (2) contains an optical or acoustical output device (7).
18. Device as claimed in any claim 12 through 17, **characterized in that** the charge controller (C) has a control output by which the hearing aid's electronics (E) is disconnectible.
19. Device as claimed in any claim 12 through 18, **characterized in that** at least one microswitch (M), which controls an input of the charge controller, is located in the hearing aid (H).
20. Device as claimed in claim 19, **characterized in that** the microswitch (M) is implemented in the form of reed contacts.
21. Device as claimed in any claim 12 through 20, **characterized in that** light-emitting diodes (L) controlled by the charge controller (C) for indicating the charge

status and/or the charge process are located in or at the hearing aid (H).

Revendications

1. Procédé pour la charge sans contact d'un accumulateur (A) dans un appareil auditif (H), disposé dans une coque de chargement (1) pendant le processus de charge, laquelle comprend un premier montage de circuit (2) couplé sans contact à un deuxième montage de circuit (4) qui est disposé dans un appareil auditif (H) et sert au moins à la réception de courant, au redressement de celui-ci et à la préparation et à l'émission de signaux, le premier montage de circuit (2) délivrant sans contact du courant au deuxième montage de circuit (4) qui redresse celui-ci, **caractérisé en ce qu'**au moins l'état de charge de l'accumulateur (A), le nombre de cycles de charge exécutés ou restant à exécuter par celui-ci et le courant de charge sont surveillés par un contrôleur de charge (C) disposé dans le deuxième montage de circuit (4), que le processus de charge est démarré en cas de sous-dépassement d'une valeur de consigne de l'état de charge, et qu'au moins l'état de charge de l'accumulateur (A) et le nombre de cycles de charge exécutés ou restant à exécuter par celui-ci dans le deuxième montage de circuit (4) sont adressés comme signaux préparés au premier montage de circuit (2).
2. Procédé selon la revendication 1, **caractérisé en ce que** le courant de charge est surveillé par le contrôleur de charge (C).
3. Procédé selon l'une des revendications 1 ou 2, **caractérisé en ce que** le courant est transmis inductivement d'un enroulement primaire disposé dans le premier montage de circuit (2) à un enroulement secondaire (S) disposé dans le deuxième montage de circuit (4).
4. Procédé selon l'une des revendications précédentes, **caractérisé en ce que** les signaux préparés sont modulés en un signal porteur.
5. Procédé selon l'une des revendications 3 ou 4, **caractérisé en ce que** les signaux préparés sous la forme d'un signal porteur sont inductivement adressés de l'enroulement secondaire (S) à l'enroulement primaire.
6. Procédé selon l'une des revendications 1 à 3, **caractérisé en ce que** l'intensité lumineuse d'une source lumineuse (L3) disposée dans le deuxième montage de circuit (4) est modulée par les signaux préparés, que la lumière est émise dans la plage spectrale visible ou invisible reçue par un élément récepteur optique (5) disposé dans le premier montage de circuit (2).
7. Procédé selon l'une des revendications précédentes, **caractérisé en ce que** les signaux démodulés dans le premier montage de circuit (2) sont délivrés au moins en partie à un dispositif de sortie (7) qui y est disposé.
8. Procédé selon la revendication 7, **caractérisé en ce que** la sortie des signaux est réalisée optiquement.
9. Procédé selon l'une des revendications 7 ou 8, **caractérisé en ce que** la sortie des signaux est réalisée acoustiquement.

10. Procédé selon l'une des revendications précédentes, **caractérisé en ce que** des informations sur un intervalle de service de l'appareil auditif (H) sont délivrées aux signaux préparés dans le deuxième montage de circuit (4).

- 5 11. Procédé selon l'une des revendications précédentes, **caractérisé en ce que** le deuxième montage de circuit (4) peut désactiver l'électronique (E) de l'appareil auditif.
- 10 12. Dispositif pour la charge sans contact d'un accumulateur (A) dans un appareil auditif (H) pouvant être logé dans une coque de chargement (1) pour la charge, laquelle comprend un premier montage de circuit (2) qui comporte au moins un dispositif de transmission de courant et un dispositif de traitement de signal (6) et est couplé sans contact à un deuxième montage de circuit (4) qui est disposé dans un appareil auditif (H) et qui comprend au moins un dispositif de réception de courant et un redresseur, **caractérisé en ce qu'**un contrôleur de charge (C) est disposé dans le deuxième montage de circuit (4), lequel surveille au moins l'état de charge de l'accumulateur (A) et le nombre de cycles de charge exécutés par celui-ci, démarre le processus de charge en cas de sous-dépassement d'une valeur de consigne de l'état de charge et transmet à une sortie de modulateur au moins l'état de charge de l'accumulateur (A) et le nombre de cycles de charge exécutés ou restant à exécuter par celui-ci en tant que signaux sous forme modulée via un trajet de transmission de signaux sans contact vers une entrée de démodulateur du dispositif de traitement de signal (6).
- 15 13. Dispositif selon la revendication 12, **caractérisé en ce que** le dispositif de transmission de courant est prévu comme enroulement primaire et le dispositif de réception de courant comme enroulement secondaire (S).
- 20 14. Dispositif selon l'une des revendications 12 ou 13, **caractérisé en ce que** la sortie de modulateur est couplée à l'enroulement secondaire (S) et l'entrée de démodulateur à l'enroulement primaire.
- 25 15. Dispositif selon l'une des revendications 12 ou 13, **caractérisé en ce que** le deuxième montage de circuit (4) comporte une source lumineuse (L3), en particulier une diode électroluminescente, couplée à sa sortie de modulateur, laquelle émet de la lumière dans la plage spectrale visible ou invisible, et **en ce que** le premier montage de circuit (2) comprend un élément récepteur optique (5) couplé à son entrée de démodulateur.
- 30 16. Dispositif selon l'une des revendications 12 ou 13, **caractérisé en ce que** la sortie de modulateur est couplée à un émetteur HF (8) et l'entrée de démodulateur à un récepteur HF (9).
- 35 17. Dispositif selon l'une des revendications 12 à 16, **caractérisé en ce que** le premier montage de circuit (2) comprend un dispositif de sortie (7) optique ou acoustique.
- 40 18. Dispositif selon l'une des revendications 12 à 17, **caractérisé en ce que** le contrôleur de charge (C) est pourvu d'une sortie de commande, par laquelle l'électronique (E) de l'appareil auditif (E) peut être désactivée.
- 45 19. Dispositif selon l'une des revendications 12 à 18, **caractérisé en ce qu'**au moins un microrupteur (M) est
- 50
- 55

disposé dans l'appareil auditif (H), lequel commande une entrée du contrôleur de charge.

- 20.** Dispositif selon la revendication 19, **caractérisé en ce que** le microrupteur (M) est réalisé sous la forme de contacts Reed.

5

- 21.** Dispositif selon l'une des revendications 12 à 20, **caractérisé en ce que** des diodes électroluminescentes (L) excitées par le contrôleur de charge (C) sont disposées dans ou sur l'appareil auditif (H) pour l'indication de l'état de charge et/ou du processus de charge.

10

15

20

25

30

35

40

45

50

55

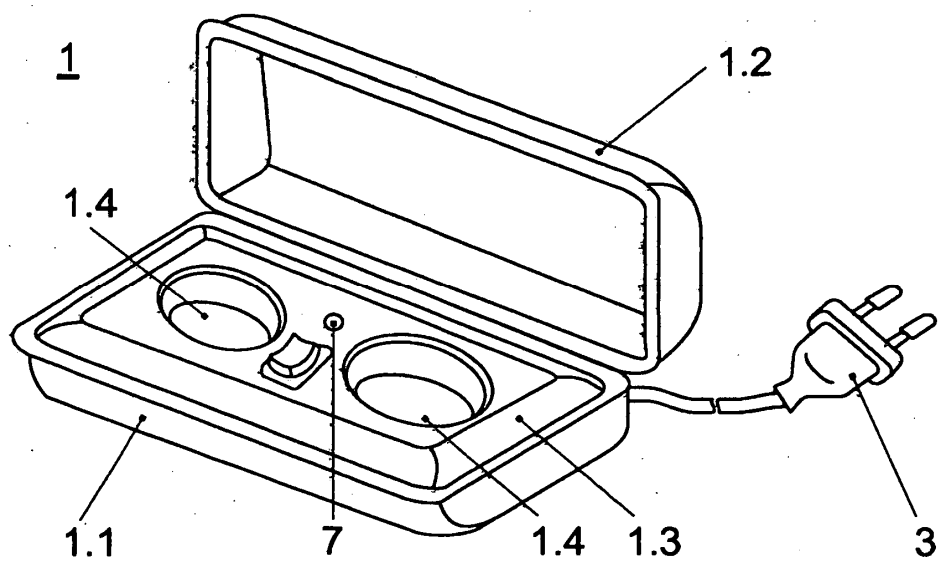


Fig. 1

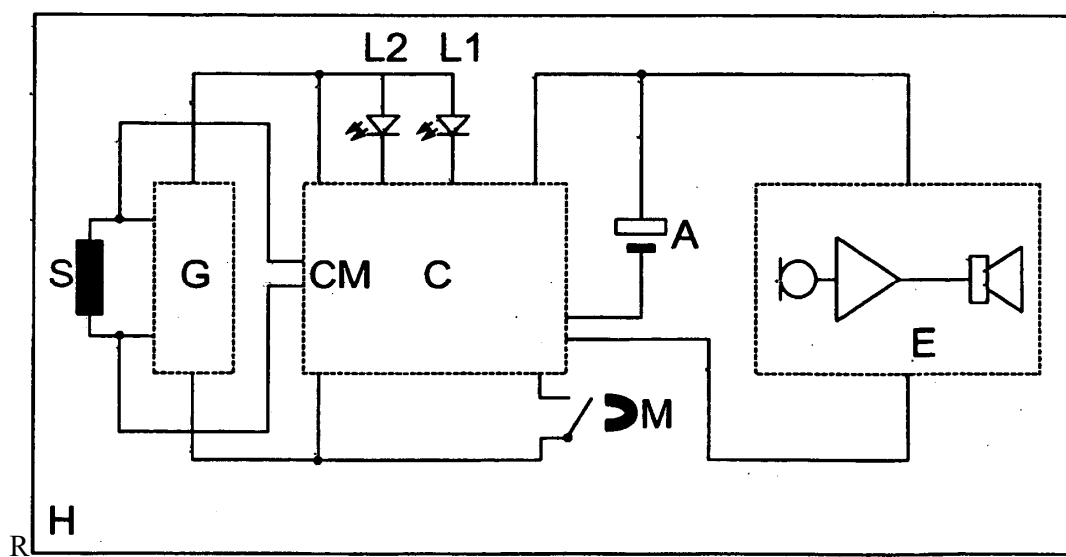
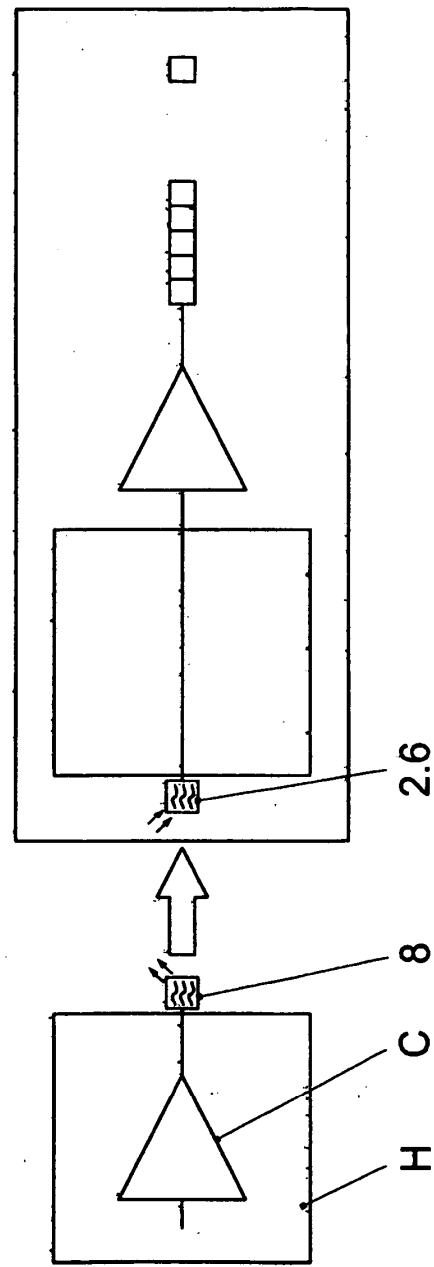
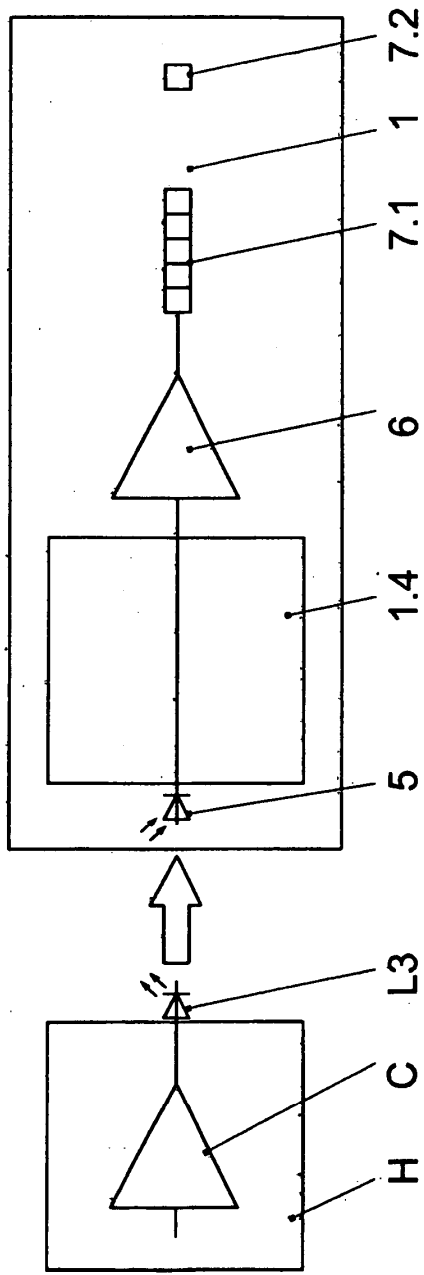


Fig. 2



DOCUMENTS CITED IN THE DESCRIPTION

This list of the documents cited by the applicant was included here solely for the better information of the reader and is not a component of the European patent document. It has been compiled with the greatest of care; however, the EPO assumes no liability for any errors or omissions.

Patent documents cited in the description

- DE 19745101 A1 [0002]