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(54) **Audio device and plug assembly**

(57) A first aspect of the invention is related to an audio device comprising a main unit and a wired remote control. The main unit has an interface for connecting the remote control and for exchanging audio signals and command data signals between the main unit and the remote control unit. The interface comprises a data jack to transmit and/or receive command data signals, and an audio signal jack to transmit audio signals from the main unit to the remote control.

The data jack and the audio signal jack are sepa-

ratedly arranged on the main unit. This specific configuration allows a large variety of possible set-ups with a minimum expense of different jacks.

A second aspect of the present invention is related to a plug assembly for a wired remote control unit for controlling an audio device. The plug assembly comprises a double rod plug having an audio rod and a data rod integrated in a single isolating housing. The plug assembly can most advantageously be used in connection with an audio device according to the first aspect of the invention.

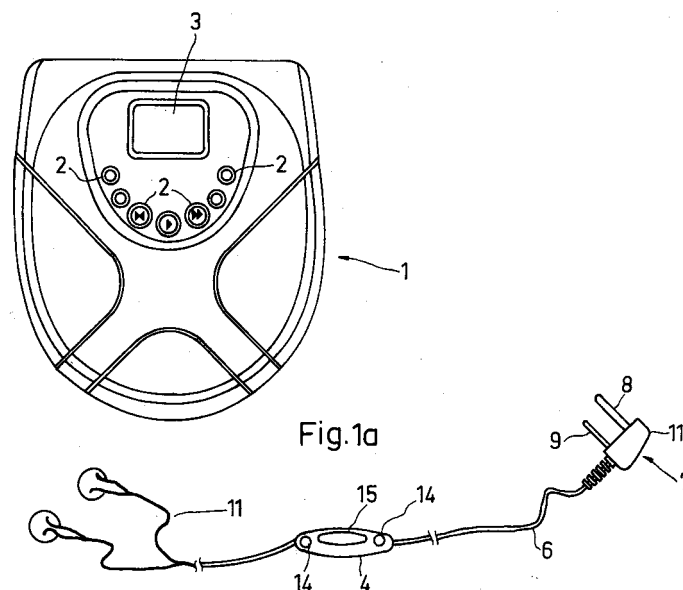


Fig.1a

Description

[0001] The present invention is related to an audio device comprising a main unit and a wired remote control. The invention is also related to a plug assembly to be used in connection with the audio device.

[0002] GB-A 2 335 805 discloses a reproducing apparatus and a data communication system in particular for portable audio devices. The known audio device is equipped with a jack, which can selectively accommodate several types of plugs for communicating signals to different data communication standards. The jack provided is capable of addressing a number of data communication standards without occupying additional connector space on the equipment, as well as a reproducing apparatus.

[0003] Starting from here it is desirable to have an audio device being operable by a wired remote control, wherein the number of jacks is further reduced without compromising the flexibility of using the device.

[0004] According to a first aspect of the invention, therefore, an audio device is suggested comprising a main unit and a wired remote control. The main unit has an interface for connecting the remote control and for exchanging audio signals and command data signals between the main unit and the remote control unit. The interface comprises a data jack to transmit and/or receive command data signals, and an audio signal jack to transmit audio signals from the main unit to the remote control.

[0005] The data jack and the audio signal jack are separately arranged on the main unit. This specific configuration allows a large variety of possible set-ups with a minimum expense of different jacks.

[0006] In one embodiment of the inventive audio device the audio jack is a combined optical and electrical jack.

[0007] In a particularly advantageous embodiment of the invention the audio jack is a combined optical and electrical 4-pole jack allowing to connect selectively an electrical 4-pole plug, an electrical 3-pole plug and an optical plug.

[0008] In another embodiment of the invention the audio jack and the data jack have different diameters to increase the safety in operation against wrong insertion of plugs.

[0009] A second aspect of the present invention is related to a plug assembly for a wired remote control unit for controlling an audio device. The plug assembly comprises a double rod plug having an audio rod and a data rod integrated in a single isolating housing. The plug assembly can most advantageously be used in connection with an audio device according to the first aspect of the invention.

[0010] In this case it is particularly useful if the audio rod and the data rod have different diameters. This arrangement presents an effective protection against the inadvertent insertion of the plug rods into the wrong jack.

[0011] This protective feature is further supported if the rod having the larger diameter is longer than the rod having the smaller diameter. Then the user can even more easily realize his attempt to connect the plug in the wrong orientation.

[0012] The present invention can be understood more easily by reading the following description in connection with the attached drawing.

[0013] In the drawing an exemplifying embodiment of the present invention is shown. It shows:

- | | |
|--------------|---|
| Fig. 1a | a top view of a portable CD player together with a wired remote control and headphones, |
| Fig. 1b | a side view of the player of Fig. 1a, |
| Fig. 2a | the mechanical arrangement of jacks and a twin-rod plug, |
| Fig. 2b | the contact configuration on the twin-rod plug |
| Fig. 2c | the contact configuration of the audio jack and different types of allowable rods, |
| Fig. 3 | a schematic block diagram of the main unit and the remote control unit, and |
| Fig. 4a...4c | several set-up configurations of the audio device |

[0014] Fig. 1a displays a top view of a combined CD/MP3 player comprising two units. The main unit is referenced as a whole with reference number 1. On the topside of the player a group of operating elements 2 are arranged, realized in the present embodiment as push buttons. The operating elements 2 for the volume control are arranged on a side of the housing of the player (Fig. 1b). The operating elements 2 enable a user of the device to enter commands like "play", "forward", "reverse" and others. The actual operating status of the player 1 is indicated on a display 3, which is realized as an LCD display.

[0015] In general, such a portable device is carried in a pocket or on a belt of the clothing when the user listens to the music via headphones. Under these circumstances it is rather inconvenient to operate the device 1 by means of the operating elements 2 because when the player is e.g. carried in a pocket the user cannot see the elements 2 nor the operational status indicated on display 3, like the song number.

[0016] In order to enhance the operational comfort for the user the player is controllable by a remote control 4 forming the second unit of the player. The remote control 4 is connectable to the main unit 1 by a cable 6 terminating in a 2-rod plug 7. The plug 7 has an audio rod 8 and a data rod 9, which are integrated in a single isolating housing 10. The audio rod 8 has a larger diameter than the data rod 9 and is also longer. An audio jack 12 and a data jack 13 are provided on one side of the housing of the player 1 (Fig. 1b). The audio jack and the data jack 13 are arranged mechanically and electrically to ac-

commodate the audio rod 8 and the data jack 9, respectively, for establishing a mechanical and electrical connection between the remote control 4 and the main unit 1.

[0017] The remote control 4 itself is provided with a headphone jack not shown in Fig. 1a. Thereby, a pair of headphones 11 for sound reproduction is connectable to the remote control 4, i.e. the sound signal generated by the main unit 1 is passed through the remote control 4.

[0018] The remote control unit 4 is provided with operating elements 14 and a display 15 enabling the user to control the connected audio device. The remote control 4 is fixed to the clothing by a clip in the same way as a pen. It is therefore easily detachable of and attachable to the clothing. Hence, each time the user intends to monitor or control the audio device he can take the remote control unit into his hands effecting a good visibility of the display 15 and accessibility of the control elements 14.

[0019] Fig. 2a exhibits the audio jack 12, the data jack 13 and the rod plug 7 in more detail. The different diameters and lengths of the rods 8 and 9 are clearly visible. Advantageously this arrangement prevents the inadvertent insertion of the rods 8 and 9 into the wrong jacks 12 and 13.

[0020] In Fig. 2b the electrical configuration of the rods 8 and 9 are shown. The audio rod 8 is a 4-pole rod having four contact regions. Contact regions 16 and 17 are associated with the left and right channel of a stereo audio signal, respectively. Contact regions 18 and 19 are associated with the ground for analog signals and the ground for digital signals, respectively.

[0021] The data rod 9 is a 3-pole rod having three contact regions. Contact region 21 is reserved for receiving start-up signals, contact region 22 is attributed to digital display and command data, and contact region 23 is attributed to the supply voltage for the remote control.

[0022] In Fig. 2c the arrangement of the electrical contacts of the audio jack 12 are shown. Inside the jack there are contact springs 26 establishing electrical contact to the contact regions of an inserted rod. Each of the springs 26 forms a contact pad 16'...19', respectively. The contact pads 16'...19' are arranged to make electrical contact to the correspondingly referenced contact regions 16...19 of the audio rod 8. It is noted that the audio jack 12 allows to accommodate not only the audio rod 8 of plug 7 but also other single rod plugs, which are shown on the right side of Fig. 2c.

[0023] The plugs shown in Fig. 2c can alternatively be inserted into the audio jack 12. It is from top to bottom the audio rod 8 of the remote control plug 7, a 3-pole plug 27 of a line output or headphone plug, and finally an optical plug 28 for transmitting optical audio data. It is an advantage of the present invention that the audio jack 8, which is necessary to connect the remote control can also be used for other purposes, in particular to connect head phones directly to the main unit 1. Hence, the

present invention allows to safe one or two additional jacks on the main unit.

[0024] Fig. 3 schematically shows a block diagram of the main unit and the remote control unit with regard to the command and display data exchange. On the left hand side of the dashed line 31 a block diagram of the main unit is shown whereas on the right hand side of the line 31 a block diagram of the remote control unit 4 is shown. The remote control unit is provided with a μP 32 to communicate with a main μP 33 in the main unit and to drive the LCD display 15, which indicates all functions and activities going on in the main unit. For inputting a command the user activates one of the switches 34 forming a "key ladder" representing a potential divider. When one of the keys is pressed the respective voltage level is provided to the main μP 33, which converts the voltage into a corresponding digital value by means of an internal A/D converter. The digital represents a command word for the operation of the main unit 1. The main unit further comprises a DC-DC converter 36 as a voltage regulator and a power ON/OFF device.

[0025] When the "Play" key is pressed the output of the remote control is short to ground, the DC-DC converter 36 starts to operate and a supply voltage V_{cc} is generated. As long as the V_{cc} voltage is available the main μP 33 operates. It keeps the DC-DC converter 36 in ON mode as long as the output voltage of the remote control unit 4 remains in a predetermined "Play" key range. If this is not the case the main μP 33 turns the DC-DC converter 36 OFF.

[0026] Obviously, the variety of possible connections creates a high flexibility for the set up of the inventive audio device. The various set-up possibilities are visualized in Fig. 4.

[0027] Fig. 4 displays possible set-up configurations in a schematic way, wherein dashed lines indicate alternative connections. In Fig. 4a the remote control 4 is connected to the main unit. To the remote control again a headphone plug 41 or alternatively a line output plug 42 are connectable. The line output plug is apt for supplying the audio signal to loudspeakers 43 or an audio amplifier not shown in Fig. 3.

[0028] Fig. 4b shows basically the same configuration as Fig. 4a without the interposition of the remote control 4. The headphone plug 41 and the line output plug 42, respectively, are rather inserted directly into the audio jack 12 of the main unit.

[0029] Finally, Fig. 4c exemplifies a configuration, in which an optical plug 44 is connected to the audio jack 12. A cable associated with the optical plug 44 in general is used to transmit digital optical audio data between two audio devices. It is important to note that the numerous configurations require only the audio jack 12 and the data jack 13 at the main unit.

Claims

1. Audio device comprising a main unit (1) and a wired remote control unit (4), the main unit (1) having an interface for connecting the remote control unit (4) exchanging audio signals and command data signals between the main unit and the remote control,
characterized in that
the interface comprises a data jack (13) to transmit and/or receive command data signals, and an audio signal jack (12) to transmit audio signals from the main unit to the remote control, and **in that** the data jack and the audio signal jack are separate.
2. Audio device according to claim 1, **characterized in that** the audio jack (12) is a combined optical and electrical jack.
3. Audio device according to claim 2, **characterized in that** the audio jack (12) is a combined optical and electrical 4-pole jack allowing to connect selectively an electrical 4-pole plug (8), an electrical 3-pole plug (27) and an optical plug (28).
4. Audio device according to claim 1, **characterized in that** the audio jack (12) and the data (13) jack have different diameters.
5. Plug assembly for a wired remote control unit for controlling an audio device,
characterized in that
the plug assembly (7) comprises a double rod plug having an audio rod (8) and a data rod (9) integrated in a single isolating housing (10).
6. Plug assembly according to claim 4, **characterized in that** the audio rod (8) and the data rod (9) have different diameters.
7. Plug assembly according to claim 5, **characterized in that**
the rod having the larger diameter is longer than the rod having the smaller diameter.

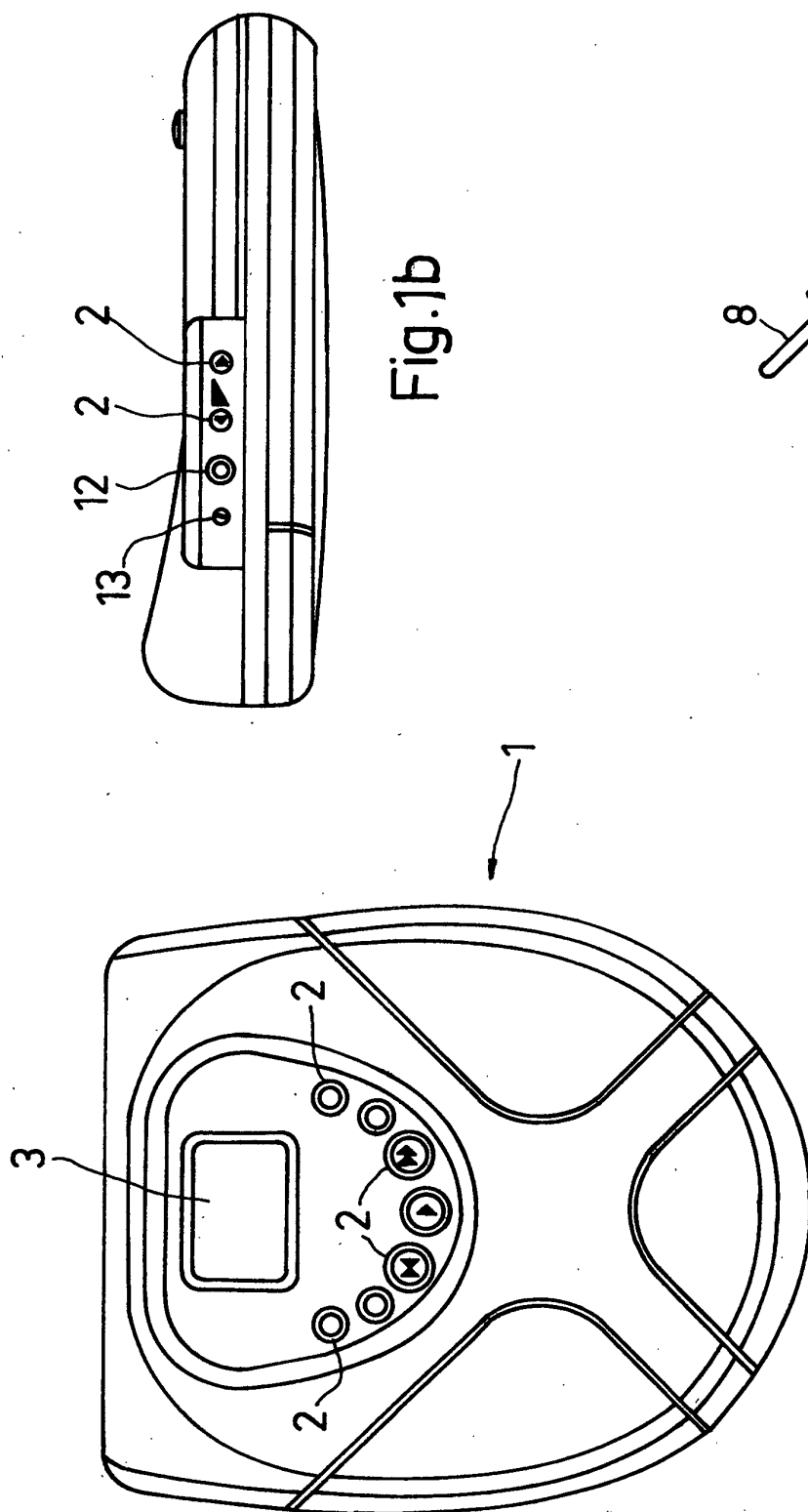


Fig.1b

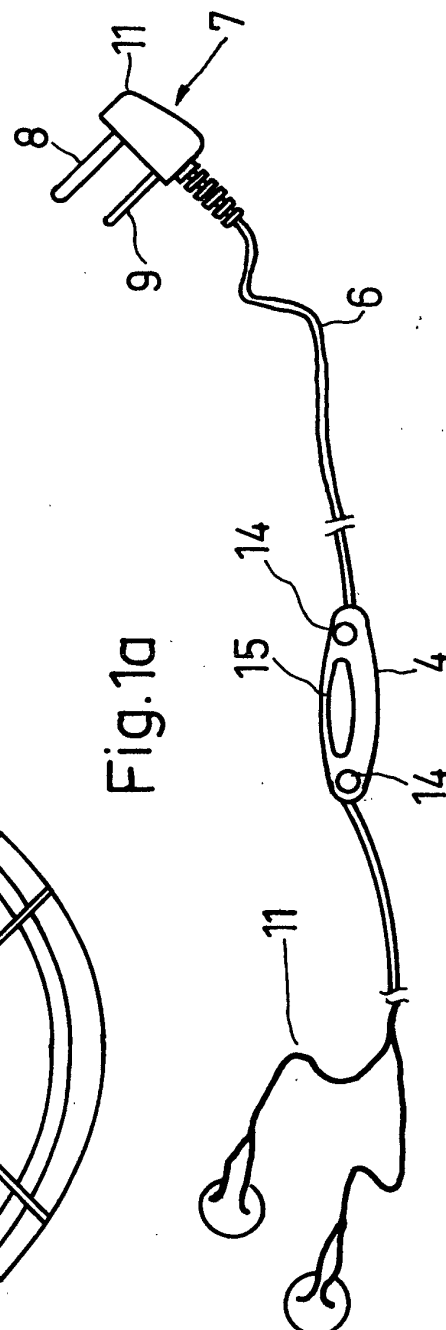


Fig.1a

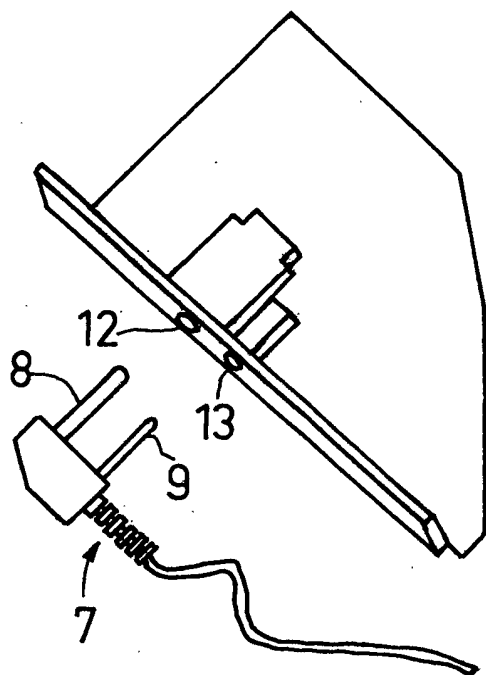


Fig. 2a

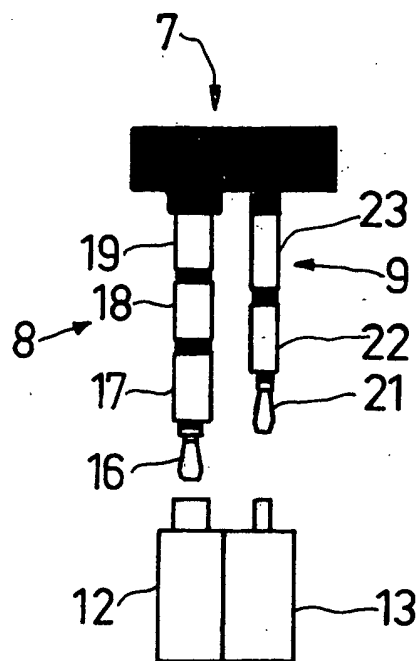


Fig. 2b

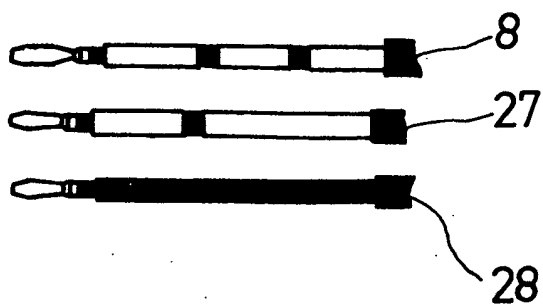
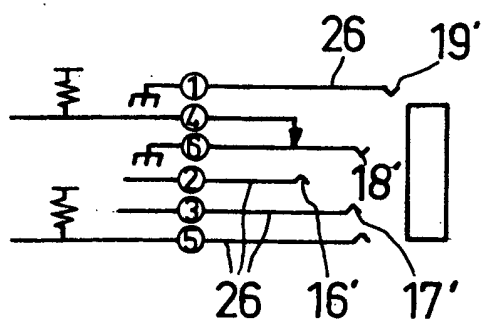


Fig. 2c

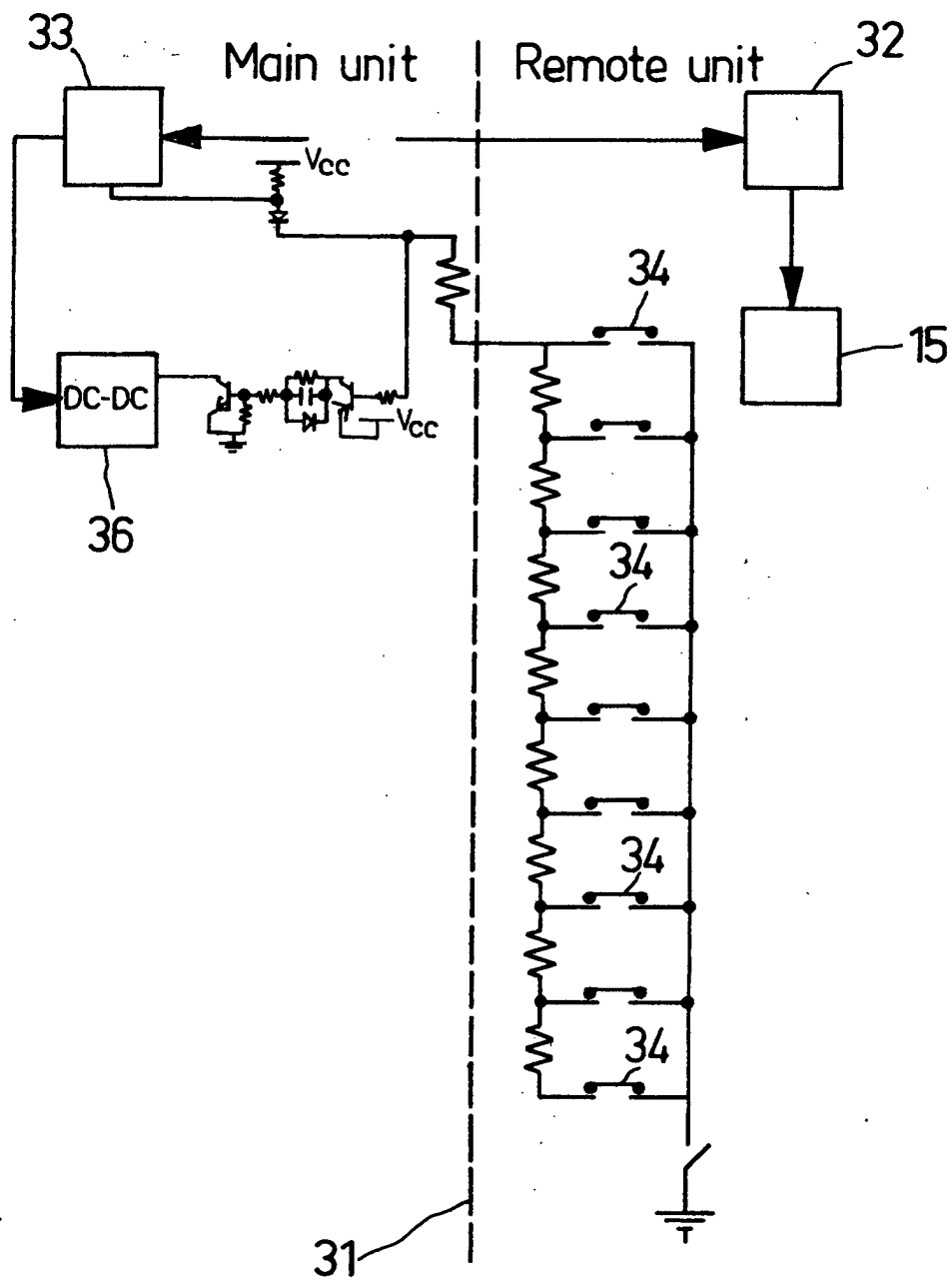


Fig.3

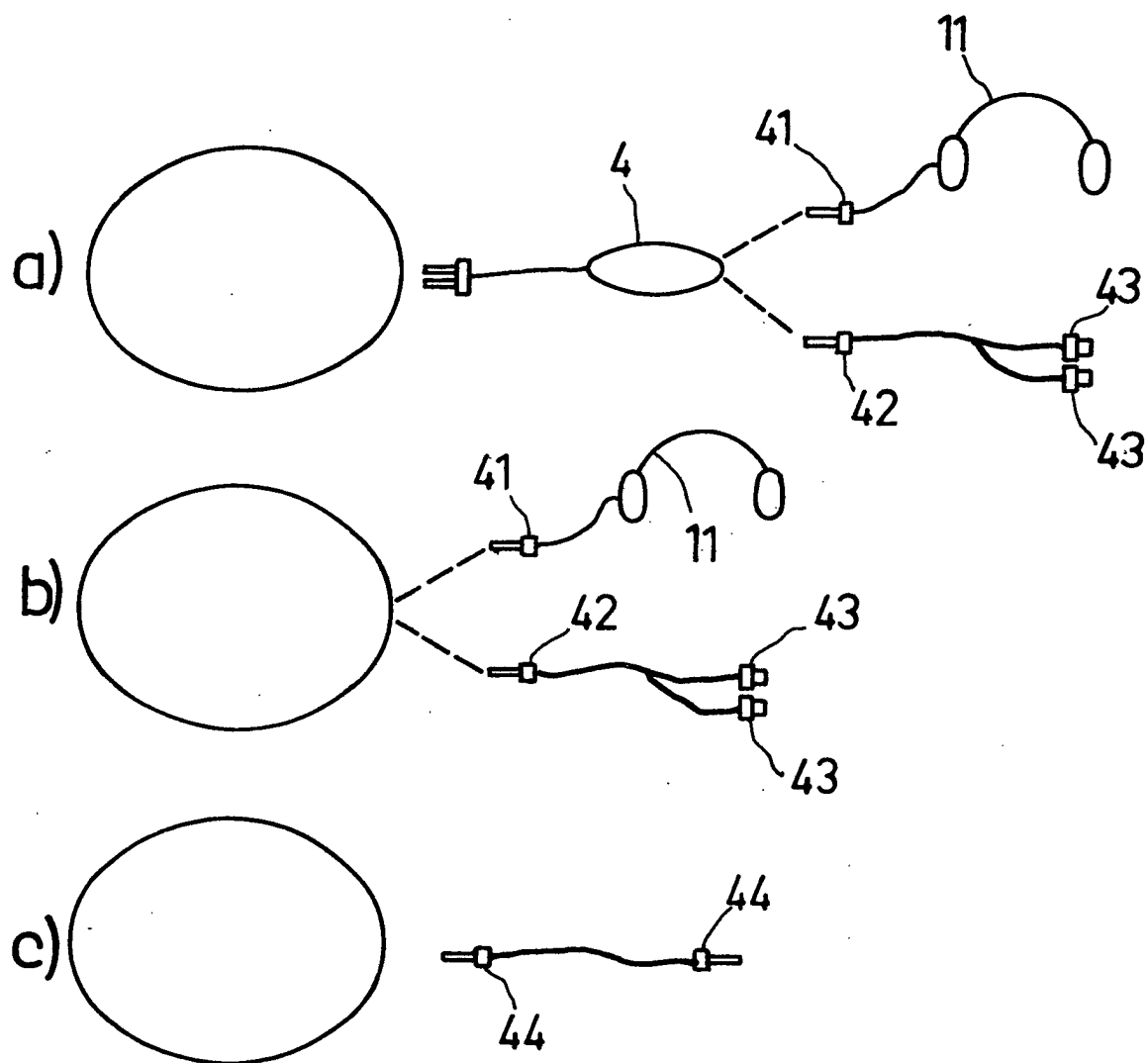


Fig. 4



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 02 00 8792

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
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The present search report has been drawn up for all claims			
Place of search BERLIN		Date of completion of the search 7 August 2002	Examiner Stirn, J-P
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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