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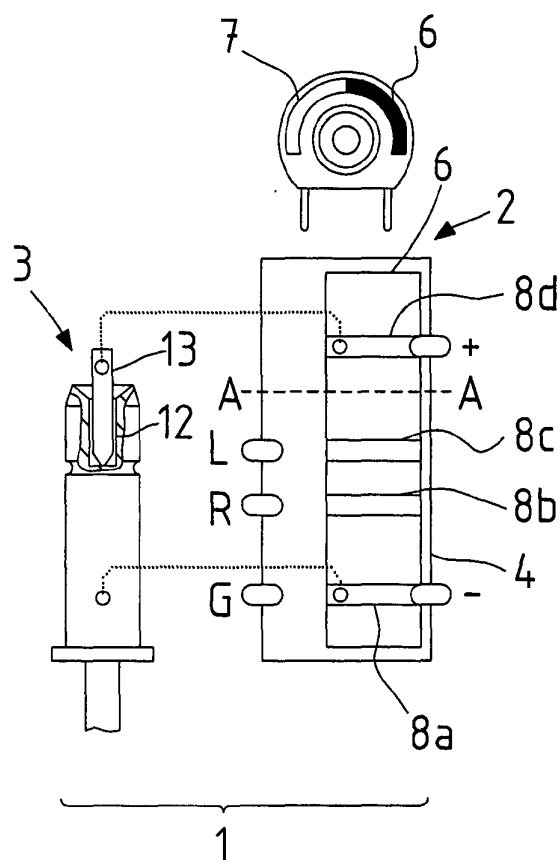
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(54) **Connector assembly**

(57) A connector assembly comprises an audio plug and a power plug, respectively, and a jack. The jack is provided with a first and a second set of contacts. The first set of contacts is arranged to mate with the power plug. The second set of contacts is arranged to mate with the audio plug to connect sound reproducing means. The sound reproducing means is appropriate for reproducing stereo acoustic signals. The power plug is appropriate to connect the jack with a voltage supply. The jack is provided with a control means wherein the control means is effective to enable the first set of contacts and to disable the second set of contacts when the power plug is inserted into the jack. The control means is also effective to disable the first set of contacts and to enable the second set of contacts when the audio plug is inserted into the jack.



**Fig.1a**

## Description

**[0001]** The present invention is related to a connector assembly comprising an audio plug and a power plug, respectively, and a jack. The jack is provided with a first and a second set of contacts. The first set of contacts is arranged to mate with the power plug. The second set of contacts is arranged to mate with the audio plug to connect sound reproducing means. The sound reproducing means are appropriate for reproducing stereo acoustic signals. The power plug is appropriate to connect the jack with a voltage supply.

**[0002]** At present in many portable audio devices like MP3 or CD players two audio jacks are provided to allow two people to connect their earphones to the device to be able to listen to the same music at the same time. In addition to that, these portable devices require a power jack to connect a power supply for battery recharging purposes. Each jack is a relatively expensive electro-mechanical component creating limitations for the mechanical design of the housing in terms of requirements of space and reduced stability. A common approach to provide the necessary space is to make the housing larger. Providing enforcement ribs or similar mechanical elements can increase the stability. However, both approaches are obstacles in the general trends to reduce the size of a housing even further and to reduce production costs of the device.

**[0003]** The Research Disclosure RD-41884 published on 10 February 1999 in IBM Research Disclosure February 1999 / 259 describes a technique for utilizing stereo phone jacks to automatically enable or provide power on/off control for portable battery powered devices. The technique minimizes cost by eliminating the need for a separate power on/off switch.

**[0004]** However, there remains a need for a connector assembly allowing to reduce the number of jacks on an electronic device e.g. an audio device.

**[0005]** According to the present invention, a connector assembly is suggested to solve this problem.

**[0006]** The inventive connector assembly comprises an audio plug and a power plug, respectively, and a jack. The jack is provided with a first and a second set of contacts. The first set of contacts is arranged to mate with the power plug. The second set of contacts is arranged to mate with the audio plug to connect sound reproducing means. The sound reproducing means are appropriate for reproducing stereo acoustic signals. The power plug is appropriate to connect the jack with a voltage supply. According to the invention the jack is provided with a control means. The control means is effective to enable the first set of contacts and to disable the second set of contacts when the power plug is inserted into the jack. The control means is also effective to disable the first set of contacts and to enable the second set of contacts when the audio plug is inserted into the jack.

**[0007]** In an embodiment of the invention the control means are mechanical means operating a switch ena-

bling and/or disabling the first and second set of contacts, respectively. The switch may comprise an electrical control circuit or it comprises with advantage a movable sleeve inside the jack.

**[0008]** Advantageously the switch comprises a control pin, which is actuated by the audio plug. Preferably, the power plug is provided with a recess to accommodate the control pin when the power plug is inserted into the jack to prevent actuation of the control pin by the power plug.

**[0009]** In one embodiment the control pin is resiliently biased into a position enabling the second set of contacts.

**[0010]** Preferably control pin is provided with a lug extending into a radial direction of the control pin and engaging a slanted slit in the sleeve.

**[0011]** Advantageously the sleeve is rotatably mounted and that the lug and the slit are arranged such that a translational movement of the pin effects a rotational movement of the sleeve.

**[0012]** In an alternative embodiment of the invention the switch comprises a slidable slider mounted in the jack such that a translational movement of the control pin effects a translational movement of the slider.

**[0013]** In this case it is advantageous to provide a mechanical transfer means to couple the control pin and the slider.

**[0014]** In the drawing two exemplary embodiments of the present invention are displayed. It shows

Fig. 1a a schematic illustration of a first embodiment of the inventive connector assembly with a power plug;

Fig. 1b a schematic illustration of the first embodiment of the inventive connector assembly with an audio plug;

Fig. 1c a detailed view of the switch mechanism incorporated in the first embodiment of the invention;

Fig. 2a a schematic illustration of a second embodiment of the invention with a power plug; and

Fig. 2b a schematic illustration of the second embodiment of the invention with an audio plug.

**[0015]** Fig. 1a shows a first embodiment of the inventive connector assembly, which is denoted as a whole with reference number 1. The contact assembly 1 is incorporated in a housing of an electronic device not shown in the drawings. The device may be e.g. a portable audio device. The connector assembly comprises a jack 2 and a power plug 3. The jack 2 has an outer mantle 4 carrying a plurality of contacts. A first set of contacts "+", "-" for the power supply and a second set of contacts L, R, G for the audio signals, where L and R stand for the left and right stereo signals and G for

ground. The two sets of contacts are arranged diametrically opposite on the outer mantle 4. Inside the outer mantle 4 a rotatable sleeve 6 is mounted in a half circular slit 7. The illustrated embodiment, the sleeve 6 extends only about 90 degrees in circumferential direction. Hence, the sleeve 6 fills in only half of the half circular slit 7. The sleeve 6 can take two end positions in which it abuts at the respective ends of a circular slit 7. The sleeve 6 is provided with four contact stripes 8a...8d extending on the inner and outer surface of the sleeve 6. The sleeve is resiliently biased into its first end position, which will be described in more detail in connection with Fig. 1c. In the first end position the contact stripes 8a and 8d contact the power supply contact +, -. When the power plug 3 is inserted into the jack 2, contact areas 9a, 9b are contacting the contact stripes 8a, 8d and electric power is flowing from a power supply (not shown) via the power plug 3 and the jack 2 into the device. The first end position is shown in the sectional view in the upper part of Fig. 1a. The section is along the line A - A.

**[0016]** The top 11 of the power plug 3 is provided with a central blind bore 12 or recess accommodating a control pin 13. In Fig. 1a the control pin 13 is shown separate from the jack 2 for illustrative purposes only. In a real embodiment the control pin 13 is arranged inside the jack 2 as shown in Fig. 1c. When the power plug 3 is inserted into the jack 2 the control pin 13 penetrates into the blind bore 12 accommodating the control pin 13. In this way the power plug 3 does not exert any forces onto the control pin 13.

**[0017]** Fig. 1b shows the first embodiment of the inventive connector assembly associated with an audio plug 14 having a closed tip 16. The sleeve 6 is rotated into the second end position such that the contact stripes 8a, 8b, 8c of the sleeve contact the second contact set providing the audio signals L, R, and G. When the audio plug is inserted into the jack 2 the tip 16 of the audio plug 14 abuts at a certain position on the way into the jack 2 against the control pin 13. When the audio plug 14 continues its way into the jack 2 the control pin 13 is pushed backwards and drives the sleeve 6 from the first end position (Fig. 1a) into the second end position (Fig. 2b). When the sleeve 6 reaches its second end position the audio plug 14 is completely inserted into the jack 2. Then, contact areas 17a, 17b, 17c of the audio plug 14 make contact to the contact stripes 8a, 8b, 8c. The second end position is shown in the sectional view in the upper part of Fig. 1b. The section is along the line B - B.

**[0018]** The mechanism driving the sleeve 6 from the first end position into the second end position will now be described in more detail with reference to Fig. 1c.

**[0019]** Fig. 1c shows sectional views of the jack 2 and the arrangement of the sleeve 6 and the control pin 13 inside the jack 2. In Fig. 1c the sleeve 6 and the control pin 13 are shown approximately in the middle of their respective travelling paths. I.e. the control pin 13 is approximately pushed half way backwards into the jack 2,

and the sleeve 6 is approximately in the middle between its first and second end positions. The middle position is shown in the sectional view in the upper part of Fig. 1c. The section is along the line C - C. For the sake of simplicity the audio plug 14 exerting a translational driving force onto the control pin 13 is not shown in Fig. 1c. A slanted slit 18 is provided in the sleeve 6. A lug 19 fixedly connected with the control pin 13 reaches into the slanted slit 18. A spring 21 resiliently biases the control pin 13 into the most forward position corresponding with a first end position of the sleeve 6 (Fig. 1a). When the control pin 13 is pushed backwards the lug in cooperation with the slanted slit 18 exert a rotational force onto the sleeve 6 until the control pin 13 reaches its most backward position and the sleeve 6 reaches its second end position (Fig. 2b).

**[0020]** In an alternative of the first embodiment of the inventive connector assembly a half circular sleeve 6 is rotated in a circular slit inside the jack 2.

**[0021]** Fig. 2a shows a schematic illustration of a second embodiment of the present invention. Similar or identical elements are denoted with the same reference numbers as in the first embodiment. Fig. 2a shows a second embodiment in association with the power plug 3. The main difference between the first and the second embodiment of the invention is that the second embodiment is provided with a slider 22 replacing the sleeve 6. Similar to the first embodiment the power plug 3 can accommodate the control pin 13 into its blind bore 12 and thus the insertion of the power plug 3 does not have any effect on the configuration of the jack.

**[0022]** Fig. 2b illustrates the second embodiment in association with the audio plug 14. In the same way as in the first embodiment the insertion of the audio plug 14 pushes back the control pin 13 which then drives the slider 22 translationally into a forward direction, i.e. in an opposite direction of the movement of the audio plug 14. An appropriate mechanical connection between the control pin 13 and the slider 22 is provided to achieve this reversal of the movement. Such mechanical means are well-known in the art and do not make part of the subject matter of the present invention. Therefore, the details of this mechanism are not shown in Fig. 2a and 2b.

**[0023]** The translational movement of the slider 22 is effective to contact the appropriate contacts of the jack and the contact areas of the power plug 3 and the audio plug 14, respectively.

## Claims

1. Connector assembly comprising an audio plug (14) and a power plug (3), respectively, and a jack (2), the jack (2) being provided with a first and a second set of contacts (+, -, R, L, G), the first set of contacts (+, -) being arranged to mate with the power plug (3),

the second set of contacts (R, L, G) being arranged to mate with the audio plug (14) to connect sound reproducing means,

the sound reproducing means being appropriate for reproducing stereo acoustic signals,

the power plug (3) being appropriate to connect the jack (2) with a voltage supply, **characterized in that** the jack (2) is provided with a control means (6), that the control means is effective to enable the first set of contacts and to disable the second set of contacts when the power plug (3) is inserted into the jack (2), and that the control means (6) is effective to disable the first set of contacts and to enable the second set of contacts when the audio plug (14) is inserted into the jack.

2. Connector assembly according to claim 1, **characterized in that** the control means (6) are mechanical means operating a switch enabling and/or disabling the first and second set of contacts (+, - ; R, L, G), respectively. 20
3. Connector assembly according to claim 2, **characterized in that** the switch comprises an electrical control circuit. 25
4. Connector assembly according to claim 2, **characterized in that** the switch comprises a movable sleeve (6) inside the jack. 30
5. Connector assembly according to claim 2 **characterized in that** the switch comprises a control pin (13), which is actuated by the audio plug (14).
6. Connector assembly according to claim 5, **characterized in that** the power plug (3) is provided with a recess (12) to accommodate the control pin (13) when the power plug is inserted into the jack (2) to prevent actuation of the control pin (13) by the power plug (3). 40
7. Connector assembly according to claim 5, **characterized in that** the control pin (13) is resiliently biased into a position enabling the second set of contacts. 45
8. Connector assembly according to claim 5, **characterized in that** the control pin being provided with a lug (19) extending into a radial direction of the control pin (13) and engaging a slanted slit (18) in the sleeve (6). 50
9. Connector assembly according to claim 4 or 7, **characterized in that** the sleeve (6) is rotatably mounted and that the lug (19) and the slanted slit (18) are arranged such that a translational movement of the control pin (13) effects a rotational movement of the sleeve (6). 55

10. Connector assembly according to claim 4, **characterized in that** the switch comprises a slidable slider (22) mounted in the jack (2) such that a translational movement of the control pin (13) effects a translational movement of the slider (22).

11. Connector assembly according to claim 10, **characterized in that** a mechanical transfer means is provided to couple the control pin (13) and the slider (22).

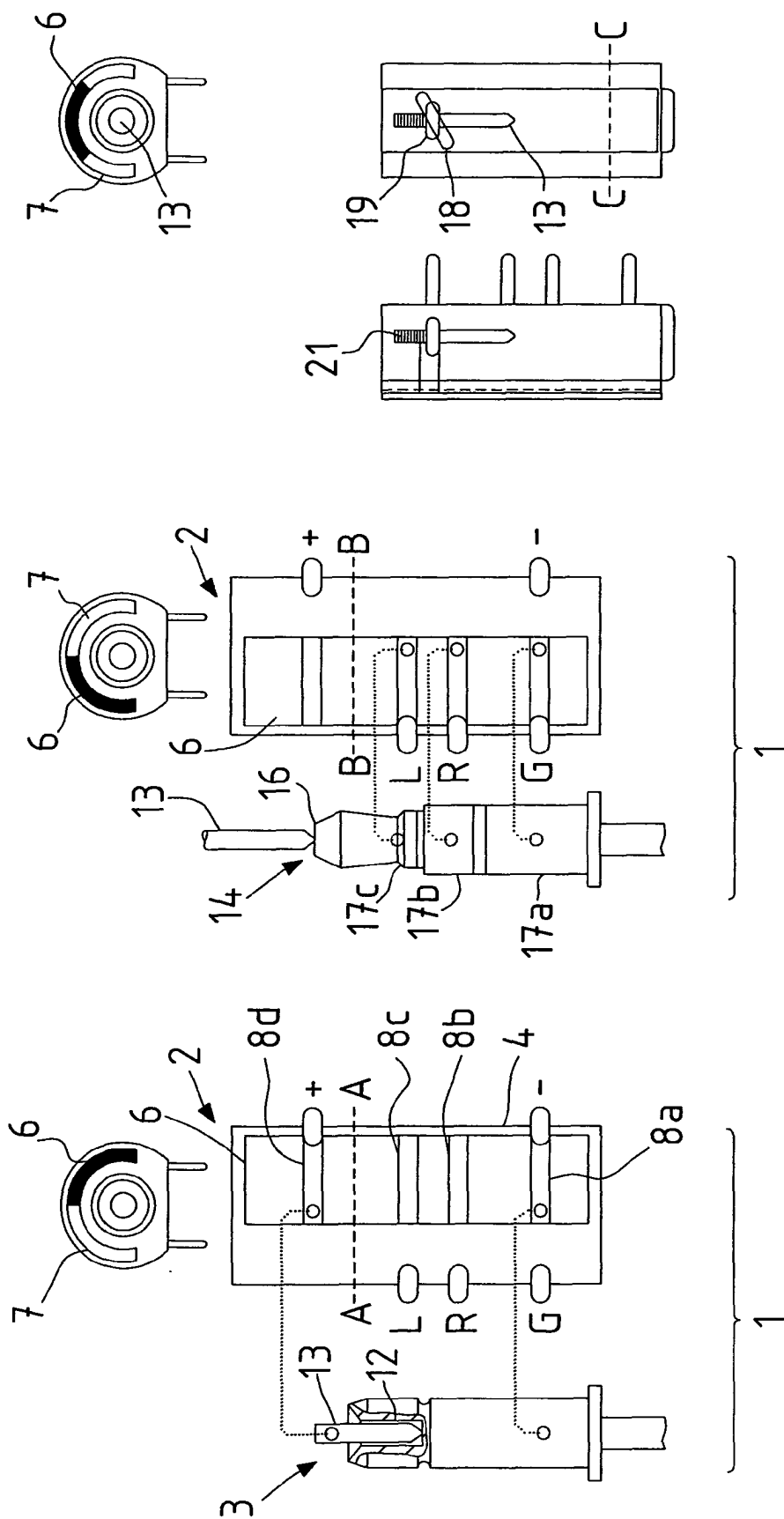


Fig.1c

Fig.1b

Fig.1a

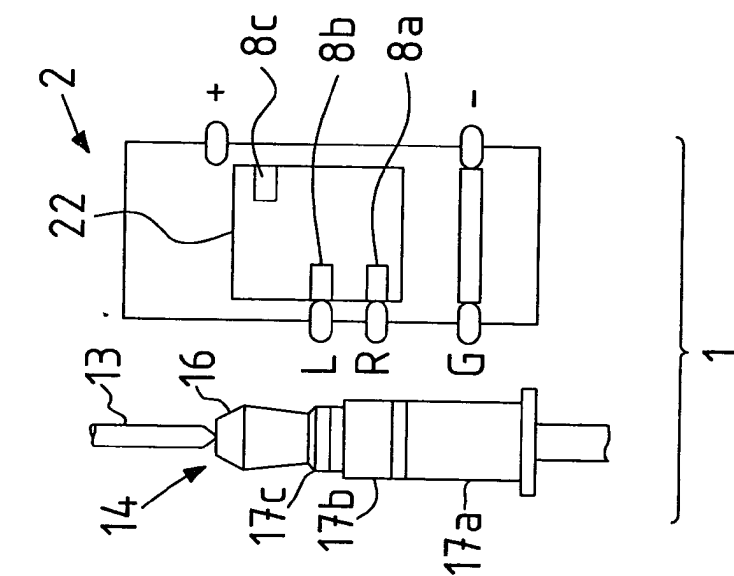


Fig.2a

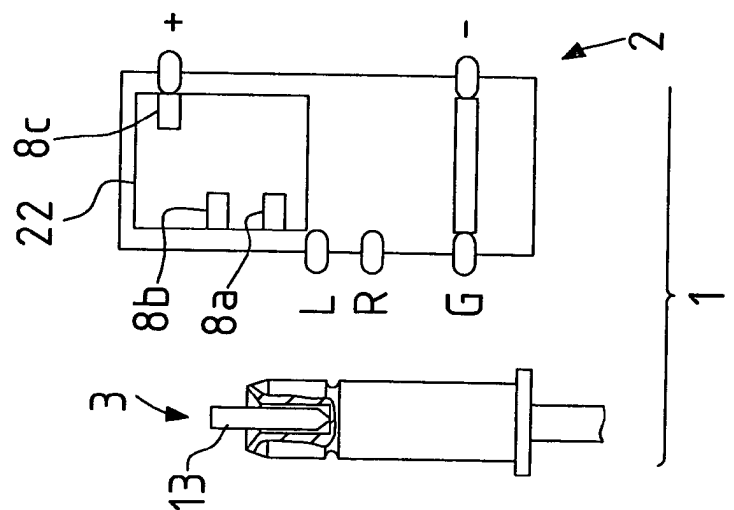


Fig.2b



European Patent  
Office

# EUROPEAN SEARCH REPORT

Application Number  
EP 04 30 0312

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	US 6 109 797 A (ISHIHARA TAKEHISA ET AL) 29 August 2000 (2000-08-29) * column 3, line 59 - line 65 * * column 5, line 19 - line 25 * * column 5, line 54 - column 6, line 9; figures 1-4 * -----	1-3	H01R24/04
A	US 2004/029449 A1 (LIU RICHARD) 12 February 2004 (2004-02-12) * paragraph [0019] - paragraph [0023]; figure 2 * -----	1-11	
A	GB 1 373 215 A (OLYMPUS OPTICAL CO) 6 November 1974 (1974-11-06) * page 2, line 110 - page 3, line 53; figures 1-3 * -----	1-11	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			H01R
The present search report has been drawn up for all claims			
Place of search Berlin		Date of completion of the search 14 October 2004	Examiner Stirn, J-P
<p>CATEGORY OF CITED DOCUMENTS</p> <p>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</p> <p>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 ..... &amp; : member of the same patent family, corresponding document</p>			

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EPO FORM 1503 03/02 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 04 30 0312

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
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