



EP 2 077 601 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
08.07.2009 Bulletin 2009/28

(51) Int Cl.:
H01Q 1/46 (2006.01)

(21) Application number: 08150009.2

(22) Date of filing: 02.01.2008

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HR HU IE IS IT LI LT LU LV MC MT NL NO PL PT
RO SE SI SK TR**
Designated Extension States:
AL BA MK RS

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(54) Power cable and FM cable assembly

(57) A power cable assembly includes a power cable, a first connector and a RF cable. The power cable comprises a core portion, an insulating layer covering the core portion, and a covering layer covering the insulating layer. The first connector is provided at one end of the power cable. One end of the RF cable is connected to

the power cable. The RF cable comprises a signal line and a covering layer covering the signal line. Via the above arrangement, the power cable assembly is connected to the RF cable that can be used with an electronic device, so that the electronic device can receive FM signals via the RF cable.

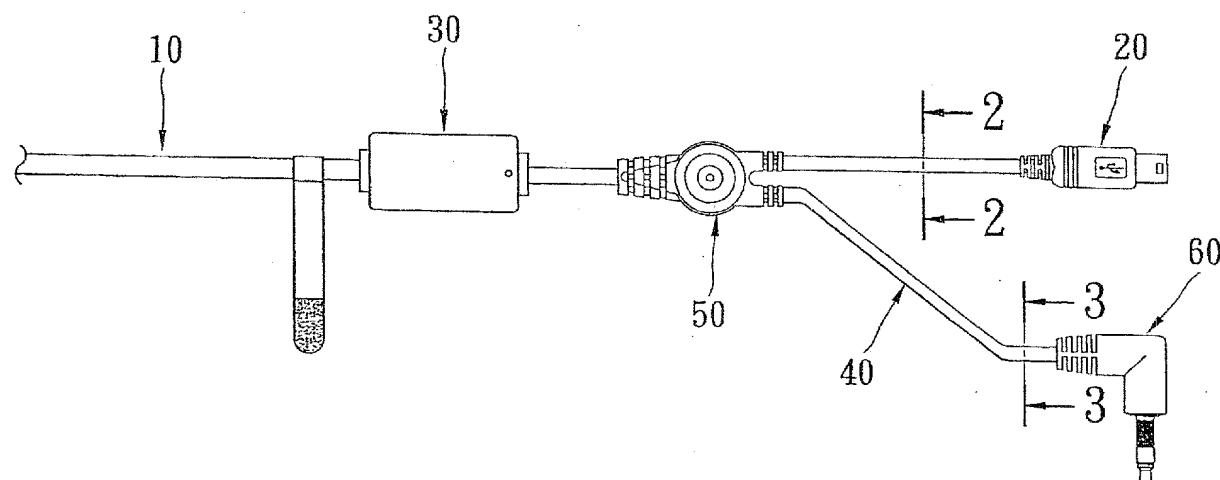


FIG. 1

Description**BACKGROUND OF THE INVENTION****1. Field of the Invention**

[0001] The present invention is related to a power cable assembly, and more particular to a power cable assembly having a function of transmitting FM signals.

2. Description of Related Art

[0002] A conventional power cable assembly comprises a power cable and a connector provided at one end of the power cable. The interior of the power cable is provided with two leads acting as a positive and a negative wire or a lead wire and a ground wire respectively. The two leads are electrically connected to the connector. The connector is used to connect a corresponding connector preset in an electronic device, so that the power cable assembly can provide the power to the electronic device.

[0003] However, since the conventional power cable assembly only has a function of providing power, the functionality thereof is not versatile. If the power cable assembly also has a function of transmitting frequency modulated (FM) signals, the practicability thereof can be increased.

[0004] Consequently, because of the above technical defects, the inventor keeps on carving unflaggingly through wholehearted experience and research to develop the present invention, which can effectively improve the defects described above.

SUMMARY OF THE INVENTION

[0005] The object of the present invention is to provide a power cable assembly, in which a power cable is connected with a radio frequency (RF) cable that can be used with an associated electronic device, whereby the electronic device can transmit FM signals via the RF cable.

[0006] For achieving the object described above, the present invention provides a power cable assembly, which includes a power cable comprising a core portion, an insulating layer covering the core portion, and a covering layer covering the insulating layer; a first connector at one end of the power cable; and at least one RF cable with one end connected to the power cable, the RF cable comprising a signal line and a covering layer covering the signal line.

[0007] The present invention has advantageous effects as follows. When the present invention is connected to an electronic device, the RF cable connected with the power cable can be used as an antenna, thereby transmitting RF signals. In this way, it is unnecessary for the electronic device to further install an antenna in order to listen to FM radio. Therefore, the trouble in installing an

additional antenna can be avoided.

[0008] In order to further understand the characteristics and technical contents of the present invention, a detailed description is made with reference to the accompanying drawings. However, it should be understood that the drawings are illustrative only but not intended to limit the present invention thereto.

BRIEF DESCRIPTION OF THE DRAWINGS

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[0009]

Fig. 1 is a schematic view showing a first embodiment of the present invention;

Fig. 2 is a cross-sectional view along the line 2-2 in Fig. 1;

Fig. 3 is a cross-sectional view along the line 3-3 in Fig. 1;

Fig. 4 is a schematic view showing a second embodiment of the present invention;

Fig. 5 is a cross-sectional view along the line 5-5 in Fig. 4;

Fig. 6 is a cross-sectional view showing another core portion of the present invention;

Fig. 7 is a cross-sectional view showing the interiors of the power cable and RF cable of the present invention being provided with a shielding layer;

Fig. 8 is a cross-sectional view showing the interiors of the power cable and RF cable of the present invention being provided with two shielding layers;

Fig. 9 is a schematic view showing a third embodiment of the present invention;

Fig. 10 is a schematic view showing a fourth embodiment of the present invention;

Fig. 11 is a schematic view showing a fifth embodiment of the present invention;

Fig. 12 is a schematic view showing a sixth embodiment of the present invention;

Fig. 13 is a cross-sectional view along the line 13-13 in Fig. 12; and

Fig. 14 is a cross-sectional view showing the interior of the power cable of the present invention having a plurality of leads.

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DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0010] Please refer to Fig. 1, which shows a first embodiment of the power cable assembly of the present invention. The power cable assembly includes a power cable 10, a first connector 20, an anti-interference portion 30, a RF cable 40, a stress-cushioning portion 50, and a second connector 60.

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[0011] The power cable 10 comprises a core portion 11, an insulating layer 12 and a covering layer 13 (also refer to Fig. 2). In the present embodiment, the core portion 11 comprises two leads 111, but is not limited thereto. The two leads 111 acts as a positive and a negative wire

or a lead wire and a ground wire of the power cable 1 respectively. Each lead 111 comprises a conductor 1111 and an insulator 1112 for covering the conductor 1111.

[0012] The insulating layer 12 of the power cable 10 is a tissue paper that is moisture-proof, refractory and insulating. The insulating layer 12 covers the core portion 11.

[0013] The covering layer 13 of the power cable 10 is made of PVC or PU that has good insulating effect. The covering layer 13 covers the insulating layer 12.

[0014] In the present embodiment, the first connector 20 is a mini-USB connector, but is not limited thereto. The first connector 20 can be other kinds of connectors, and is not limited to a female or male element. The interior of the first connector 20 is provided with a plurality of terminals (not shown). The first connector 20 is provided at a rear end of the power cable 10, and the terminals of the first connector 20 are electrically connected to the leads 111 of the power cable 10. According to the present invention, the power cable 10 can deliver the power to an electronic device that is connected with the first connector 20, such as a mobile phone, MP3 player, global positioning system (GPS) or personal digital assistant (PDA).

[0015] The anti-interference portion is made of insulating materials, and is provided therein with a ferro-powder core (not shown). The ferro-powder core covers the power cable 10, thereby preventing the interference of power signals. In the present embodiment, the anti-interference portion 30 is provided in a middle section of the power cable 10, but it is not limited thereto.

[0016] In the present embodiment, the RF cable 40 is shorter than the power cable 10. The RF cable 40 comprises a signal line 41 and a covering layer 42 (also refer to Fig. 3). The signal line 41 comprises a conductor 411 and an insulator 412 for covering the conductor 411. The covering layer 42 is also made of PVC or PU and has a good insulating effect. The covering layer 42 covers the signal line 41. The front end of the RF cable 40 is connected to the middle section of the power cable 10 near the rear of the anti-interference portion 30, thereby dividing the two cables.

[0017] The stress-cushioning portion 50 is provided at an intersection of the RF cable 40 and the power cable 10. The stress-cushioning portion 50 is made of insulating materials and has a proper elasticity. Therefore, the external appearance of the present invention is more beautiful and scrapes can be avoided. Further, if bent, the life of the power cable 10 can be extended.

[0018] In the present embodiment, the second connector 60 is a phone jack, but it is not limited thereto. The second connector can be other kinds of connectors. The second connector 60 is provided at a rear end of the RF cable 40 and is electrically connected with the signal line 41 of the RF cable 40.

[0019] Please refer to Fig. 4, which shows the second embodiment of the present invention. The difference between the second embodiment and the first embodiment

is described as follows.

[0020] The RF cable 40 and the power cable 10 are juxtaposed. The covering layer 42 of the RF cable 40 is merged with the covering layer 13 of the power cable 10, thereby forming a single cable (please refer to Fig. 5). The rear ends of the RF cable 40 and the power cable 10 are connected to the first connector 20 collectively.

5 The two leads 111 of the power cable 10 are electrically connected to two of the terminals of the first connector 20. The signal line 41 of the RF cable 40 is electrically connected to one of the terminals of the first connector 20.

[0021] Please refer to Fig. 6, which shows the core portion 11 of another kind of power cable 10. The core portion 11 comprises a lead 111 and a winding line 112.

10 The winding line 112 is wound around the periphery of the lead 111, thereby insulating and shielding power noise. The lead 111 and the winding line 112 act as a positive and a negative wire or a lead wire and a ground wire of the power cable 10 respectively. The lead 111

15 and the winding line 112 are electrically connected with two of the terminals of the first connector 20.

[0022] Please refer to Fig. 7. A first shielding layer 14 can be further provided between the insulating layer 12 and the covering layer 13 of the power cable 10. The first

20 shielding layer 14 can be a metallic foil (such as aluminum foil) or a woven shield, thereby insulating and shielding power noise. A first shielding layer 43 can be further provided between the signal line 41 and the covering layer 42 of the RF cable 40. The first shielding layer 43 can be

25 a metallic foil or a woven shield, thereby insulating and shielding external noise.

[0023] Of course, it is not necessary for the first shielding layer 14 of the power cable 10 and the first shielding layer 43 of the RF cable 40 to exist at the same time.

30 Instead, only the interior of the power cable 10 is provided with the first shielding layer 13, or only the interior of the RF cable 40 is provided with the first shielding layer 43.

[0024] Please refer to Fig. 8. A second shielding layer 15 can be further provided between the first shielding

35 layer 14 and the covering layer 13 of the power cable 10. For example, when the first shielding layer 14 is a metallic foil, a woven shield can be provided between the metallic foil and the covering layer 13 to act as a second shielding layer 15, thereby forming a multiple-layer shielding protection.

40 Therefore, the effect of insulating and shielding power noise can be enhanced. Similarly, a second shielding layer 44 (such as woven shield) can be further provided between the first shielding layer 43 and the covering layer 42 of the RF cable 40, thereby enhancing the effect of insulating and shielding external noise.

45 Therefore, this measure can be similarly applied to the first embodiment, thereby enhancing the shielding effect of the divided power cable 10 and RF cable 40.

[0025] Further, the interior of the first connector 20 can 50 be provided with an anti-interference element (such as inductor) by means of soldering, thereby preventing the interference caused by noise. Alternatively, it can be used to lock a fixed frequency band and filter out noise.

of other frequency band, so that the signal-receiving effect in this frequency band is better. Specifically, if the interior of the first connector 20 is provided with five terminals, and the first and fifth ones of these terminals are electrically connected with the positive wire and the negative wire or the lead wire and a ground wire of the power cable 10, respectively, the inductor can be electrically connected between the fourth and fifth terminals by means of soldering, thereby achieving the above effect.

[0026] Please refer to Fig. 9, which shows the third embodiment of the present invention. The difference between the third embodiment and the second embodiment is described as follows.

[0027] The first connector 20 comprises an insulating casing 21, a first pin 22 and a second pin 23. The first and second pins 22, 23 are juxtaposed to extend beyond the insulating casing 21. The core portion 11 of the power cable 10, and the signal line 41 of the RF cable 40 are electrically connected to the first pin 22 and the second pin 23 respectively. Via this arrangement, the power cable 10 and the RF cable 40 can be connected to the first and second pins 22, 23 respectively, thereby preventing the mutual interference among signals. Further, when the present invention is connected with an electronic device, the two pins 22, 23 can be inserted into a corresponding connector preset in the electronic device, thereby increasing the convenience of operation.

[0028] Please refer to Fig. 10, which shows the fourth embodiment of the present invention. The difference between the fourth embodiment and the second embodiment is described as follows.

[0029] The present invention further provides an adapter 70 that can be connected with the first connector 20. The adapter 70 is provided with a first connector 71 and a second connector 72 that are juxtaposed. Therefore, a user can select to use the first connector 20 to connect with the electronic device. Alternatively, the user can combine the first connector 20 and the adapter 70 to form a structure like that of the third embodiment, thereby connecting with the electronic device.

[0030] Please refer to Fig. 11, which shows the fifth embodiment of the present invention. The difference between the fifth embodiment and the second embodiment is described as follows.

[0031] The length of the RF cable 40 is the same as that of the power cable 10, thereby forming a full section of a jointed line.

[0032] Please refer to Figs. 12 and 13, which show the sixth embodiment of the present invention. The difference between the sixth embodiment and the fifth embodiment is described as follows.

[0033] Both sides of the power cable 10 are provided with RF cables 40. The two RF cables 40 and the power cable 10 form a jointed line. According to this, it should be understood that the number of the RF cable in the present invention is not limited to a specific number. The RF cable 40 can be a plurality of cables provided around the periphery of the power cable 10, thereby forming an

annular arrangement.

[0034] Please refer to Fig. 14 again. The core portion 11 of the power cable 10 comprises an even (at least two) number of leads 111. Half of the leads 111 act as positive wires, and the other half of leads act as negative wires or half of the leads 111 act as lead wires and half of the leads as ground wires. Further, leads 111 of smaller diameter and low cost can be used, so that the whole diameter of the power cable 10 can be reduced greatly, thereby reducing the cost.

[0035] Therefore, when the power cable assembly of the present invention utilizes the power cable 10 to supply the electricity to the electronic device, the electronic device can have a function of transmitting FM signals via the RF cable 40, thereby avoiding the installation of an antenna.

[0036] Further, in the present invention, the interior of the first connector 20 can be provided with an anti-interference element (such as inductor) by means of soldering, thereby locking a certain frequency band and filtering out noise other frequency bands. In this way, the signal-receiving effect of an electronic device can be enhanced.

[0037] While the invention has been described in terms of what is presently considered to be the most practical and preferred embodiments, it is to be understood that the invention needs not be limited to the disclosed embodiment. On the contrary, it is intended to cover various modifications and similar arrangements included within the spirit and scope of the appended claims which are to be accorded with the broadest interpretation so as to encompass all such modifications and similar structures.

Claims

1. A power cable assembly, comprising:
a power cable comprising a core portion, an insulating layer covering the core portion, and an covering layer covering the insulating layer;
a first connector provided at one end of the power cable; and
at least one RF cable with one end thereof being connected to the power cable, the RF cable comprising a signal line and a covering layer covering the signal line.
2. The power cable assembly according to claim 1, wherein the core portion of the power cable comprises an even number of leads, and the leads are electrically connected to the first connector.
3. The power cable assembly according to claim 1, wherein the core portion of the power cable comprises a lead and a winding line, the winding line is wound around the periphery of the lead, the lead and the winding line of the power cable are electrically connected to the first connector.

4. The power cable assembly according to claim 1, wherein at least one shielding layer is provided between the insulating layer and the covering layer of the power cable. 5

5. The power cable assembly according to claim 1, wherein a middle section of the power cable is provided with an anti-interference portion.

6. The power cable assembly according to claim 5, 10 wherein the interior of the anti-interference portion is provided with a ferro-powder core.

7. The power cable assembly according to claim 1, wherein the interior of the first connector is provided 15 with an anti-interference element.

8. The power cable assembly according to claim 7, wherein the anti-interference element is an inductor. 20

9. The power cable assembly according to claim 1, wherein the first connector is connected with an adapter, and the adapter is provided with two juxtaposed connectors. 25

10. The power cable assembly according to claim 1, wherein the first connector is a mini-USB connector.

11. The power cable assembly according to claim 1, 30 wherein at least one shielding layer is provided between the signal line and the covering layer of the RF cable.

12. The power cable assembly according to claim 1, wherein one end of the RF cable is provided with a second connector, the signal line of the RF cable is 35 electrically connected to the second connector.

13. The power cable assembly according to claim 12, wherein the second connector is a phone jack. 40

14. The power cable assembly according to claim 1, wherein the RF cable and the power cable are juxtaposed, the covering layers of the RF cable and the power cable are merged to form a single cable. 45

15. The power cable assembly according to claim 14, wherein one end of the RF cable is connected to the first connector, and the signal line of the RF cable is 50 electrically connected to the first connector.

16. The power cable assembly according to claim 14, wherein the first connector comprises an insulating casing, a first pin and a second pin, the first and second pins are juxtaposed and extend beyond the insulating casing, the core portion of the power cable and the signal line of the RF cable are electrically connected to the first pin and the second pin respec-

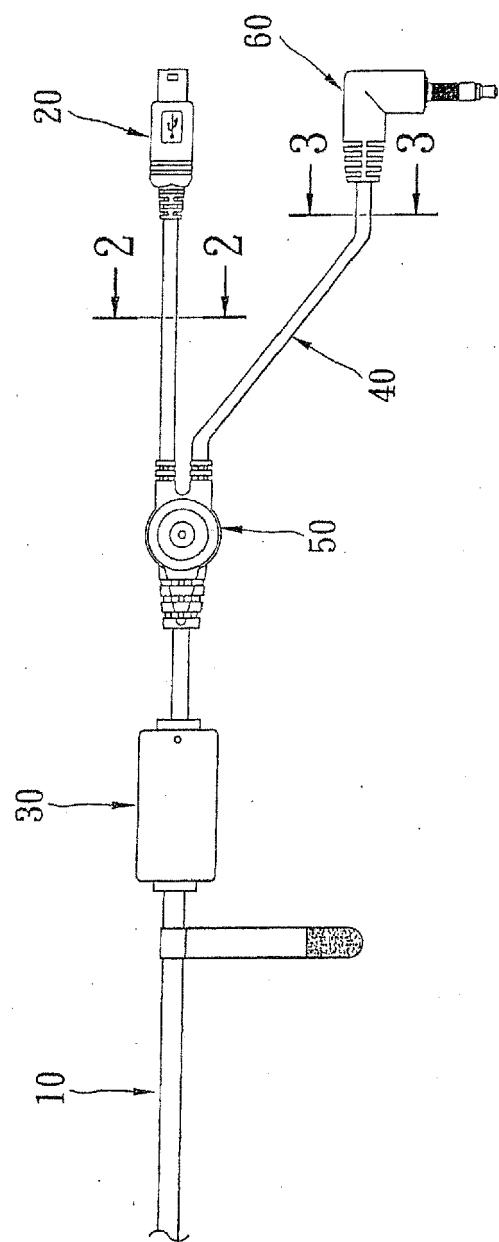
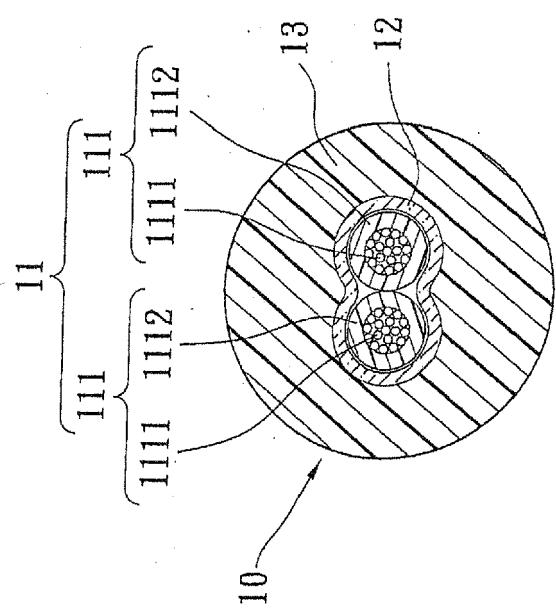
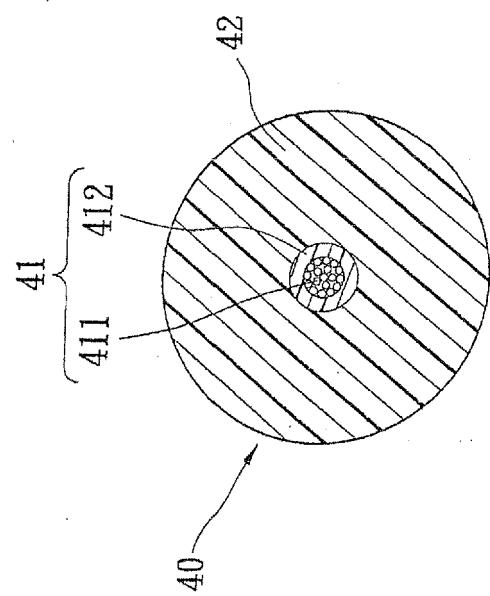


FIG. 1



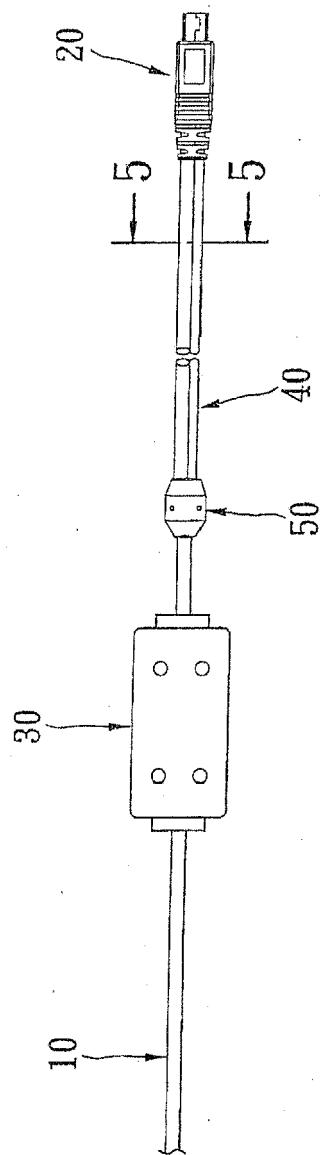
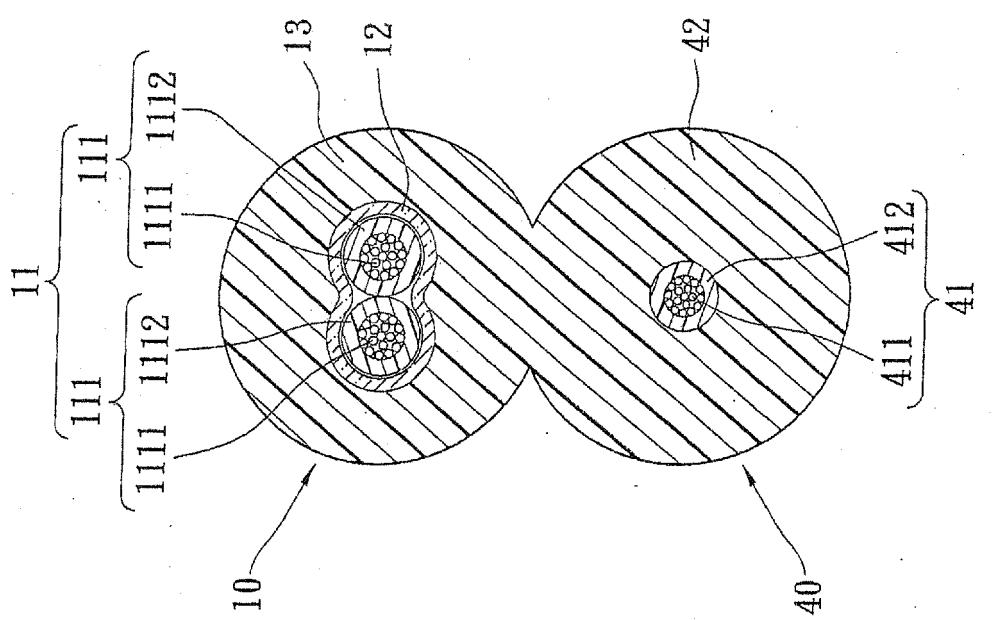
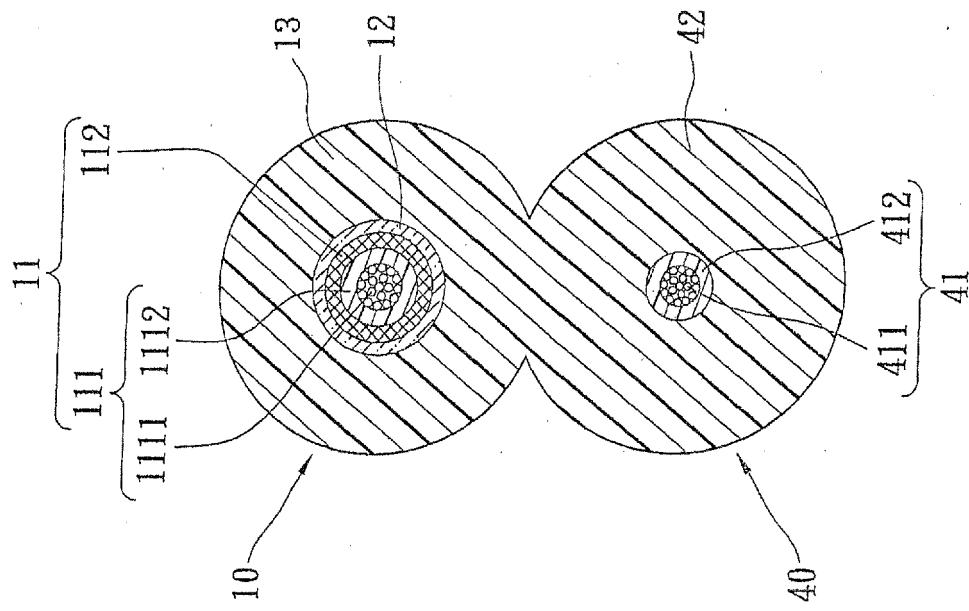


FIG. 4



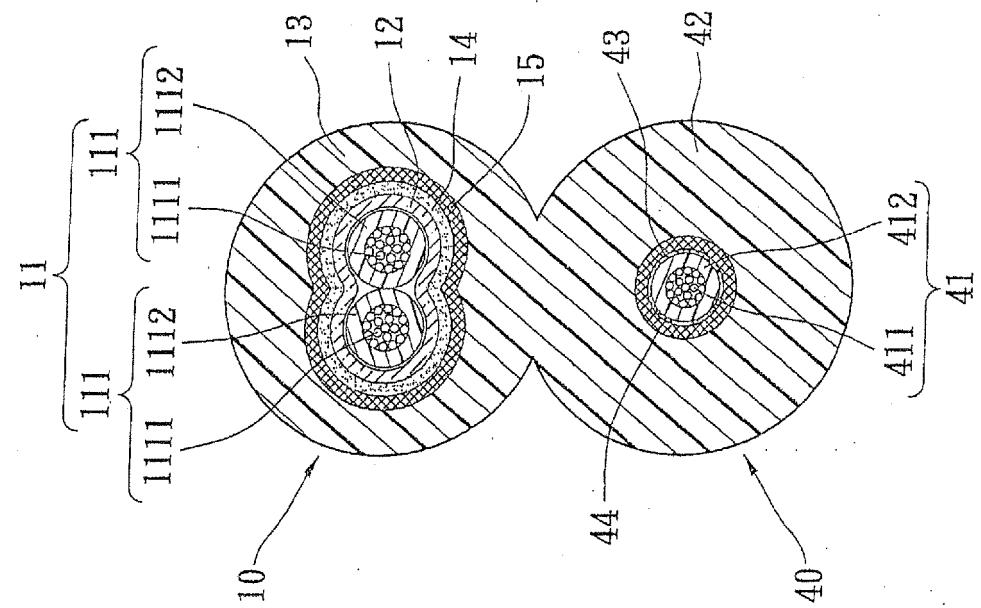


FIG. 8

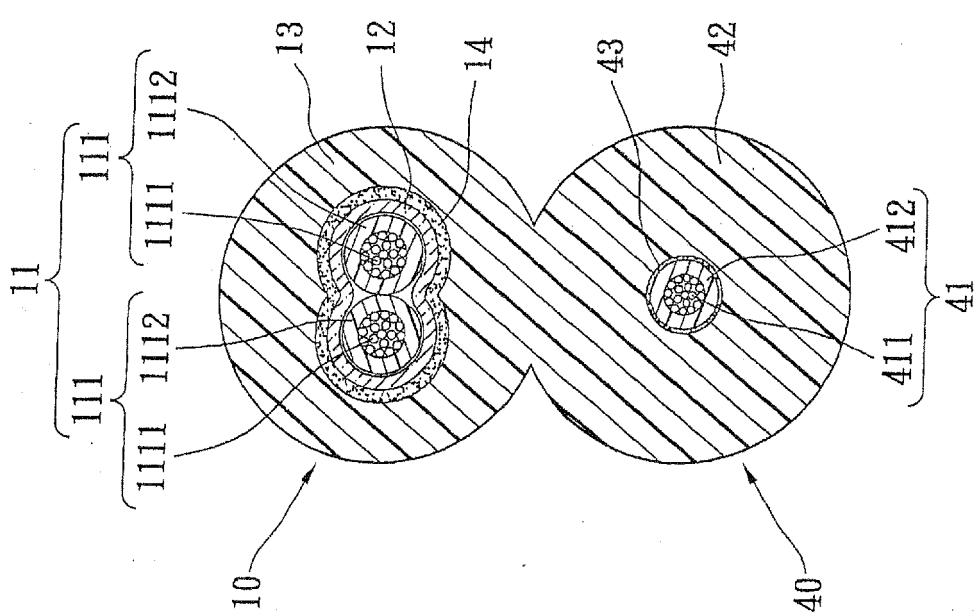


FIG. 7

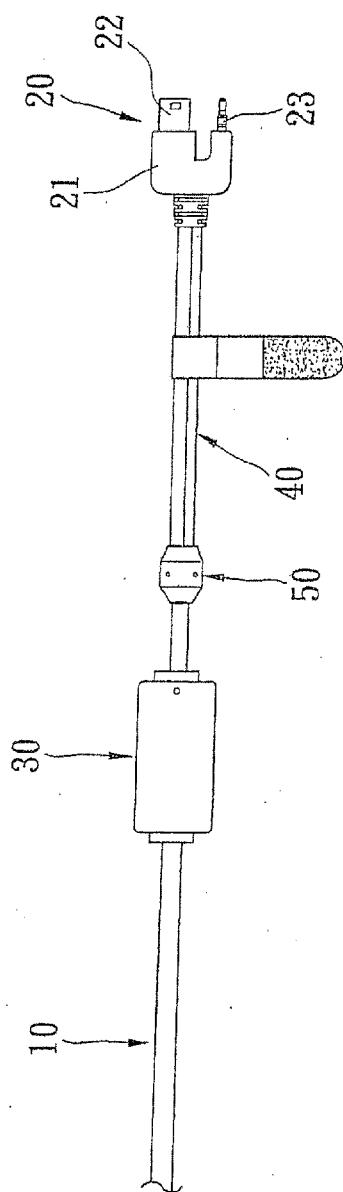


FIG. 9

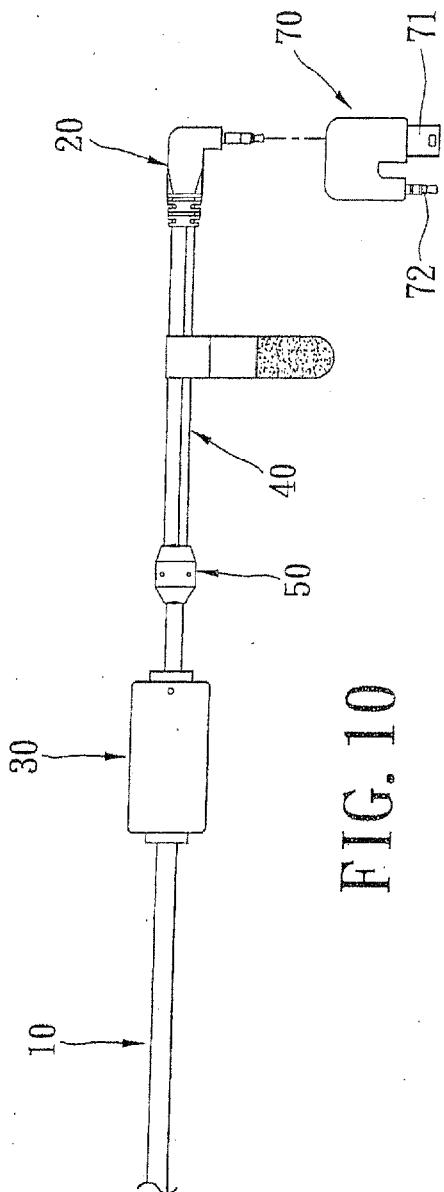
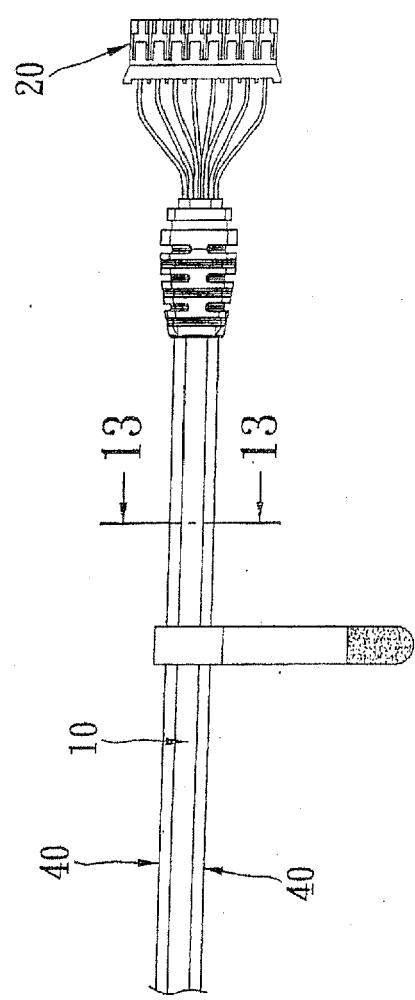
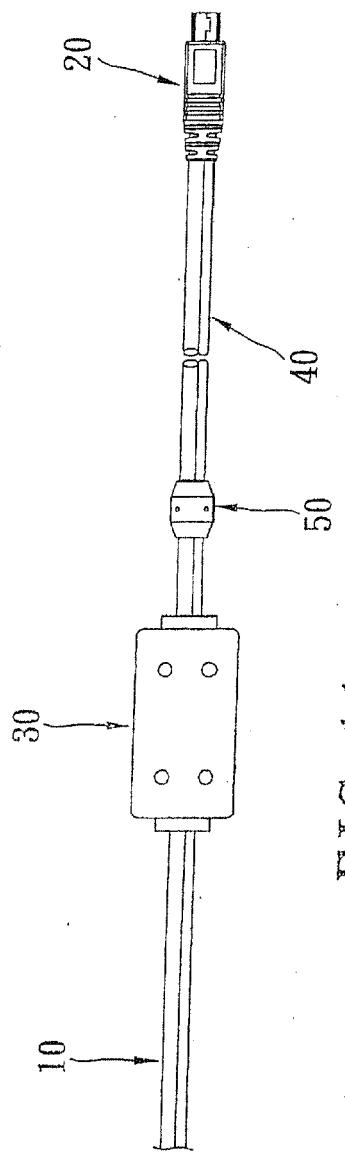


FIG. 10



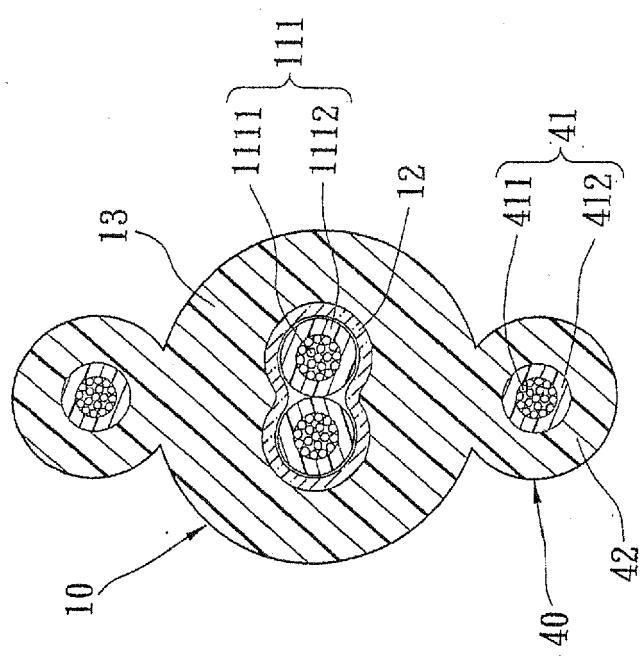


FIG. 13

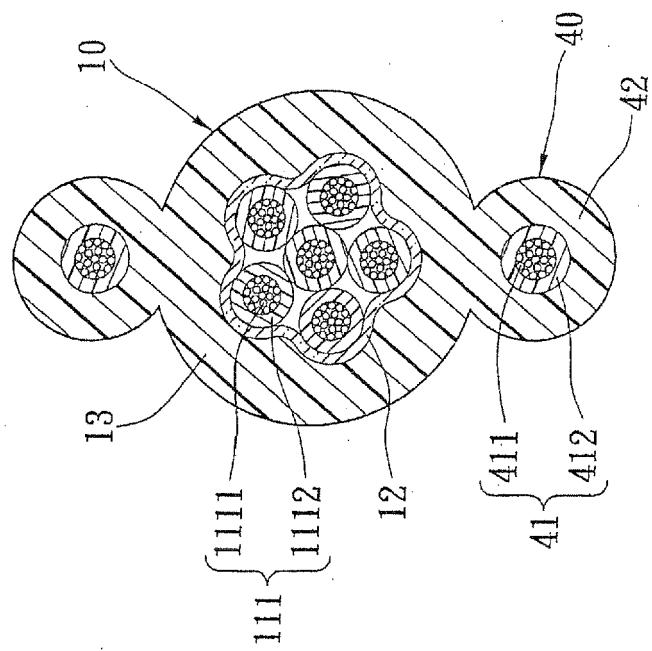


FIG. 14



DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	JP 2005 136907 A (TOKYO SHIBAURA ELECTRIC CO) 26 May 2005 (2005-05-26) * abstract; figure 3 *	1-16	INV. H01Q1/46
X	EP 1 855 351 A (MATSUSHITA ELECTRIC IND CO LTD [JP]) 14 November 2007 (2007-11-14) * paragraph [0042]; figure 4 *	1-16	

TECHNICAL FIELDS SEARCHED (IPC)			
H01Q			

1 The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	
The Hague		15 February 2008	
Examiner		DE IULIS, M	
CATEGORY OF CITED DOCUMENTS			
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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			

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

EP 08 15 0009

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on. The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

15-02-2008

Patent document cited in search report		Publication date		Patent family member(s)		Publication date
JP 2005136907	A	26-05-2005		NONE		
EP 1855351	A	14-11-2007		JP 2006279915 A W0 2006092913 A1	12-10-2006 08-09-2006	