



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
05.10.2005 Bulletin 2005/40

(51) Int Cl.7: **H01Q 1/48**

(21) Application number: **05250497.4**

(22) Date of filing: **31.01.2005**

(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 MC NL PL PT RO SE SI SK TR
 Designated Extension States:
AL BA HR LV MK YU

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(30) Priority: **02.04.2004 JP 2004110323**

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(54) **Antenna device and protection against antenna noise**

(57) An antenna device (17) is composed of an antenna main body (19) and a coaxial cable (11) for connecting between the antenna main body and a signal processor for processing a signal received from the antenna main body.

The coaxial cable is provided with a shielding fitting (25). The shielding fitting has a connection portion (23) to be connected and fixed to a shield portion of the coaxial cable and a mounting portion (27) for making connection and fixing to a ground.

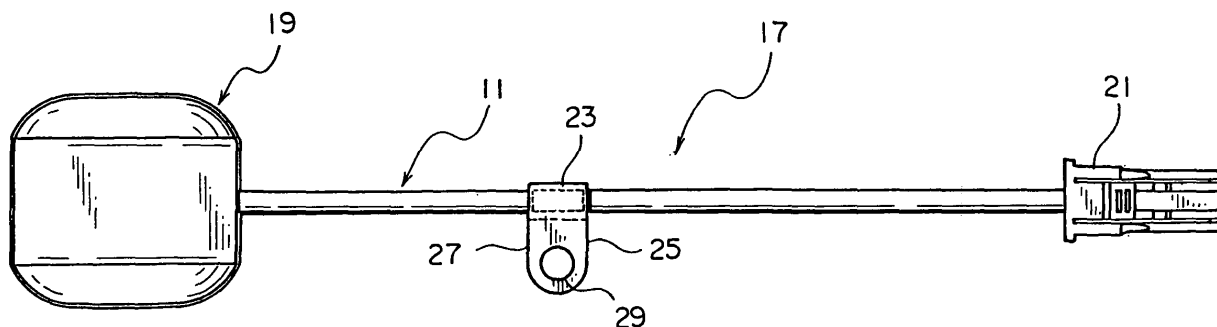


FIG. 3

Description

[0001] The present invention relates generally to an antenna device and a method of decreasing noises produced by an antenna main body, and more specifically, to an on-vehicle antenna device and a method of decreasing noises produced by an antenna main body.

[0002] An antenna device according to the prior art is used as an antenna outside a vehicle. The antenna device comprises an antenna main body which is connected to a plug or connector through a coaxial cable. The antenna main body is provided with a GPS (Global Positioning System) antenna. The plug is connected to a GPS processor.

[0003] In such an antenna device, when the GPS signal is received from the antenna main body through the coaxial cable in the GPS processor, noises produced by the antenna main body may, in some cases, be picked up by the GPS processor through the coaxial cable. Methods for decreasing the noises include a method of mounting a cylindrical ferrite core on the coaxial cable and a method of directly making GND connection by soldering from the coaxial cable.

[0004] In the method using the ferrite core, however, the ferrite core is high in cost and is large. Therefore, there is a malfunction in space-saving wiring.

[0005] Furthermore, in a case where the soldering is used, when stresses such as bending are applied, disconnection occurs.

[0006] Accordingly, it is an object of the present invention to provide an antenna device capable of reducing the costs of materials for components and the number of steps and a method of decreasing noises produced by an antenna main body.

[0007] It is another object of the present invention to provide an antenna device capable of avoiding stresses at the time of folding and bending of a cable and a method of decreasing noises produced by an antenna main body.

[0008] According to one aspect of the present invention, there is provided an antenna device which comprises an antenna main body, a cable for connecting between the antenna main body and a signal processor for processing a signal received from the antenna main body. The antenna device is characterized in that the cable comprises a shielding fitting, the shielding fitting comprising a connection portion to be connected and fixed to a shield portion of the cable and a mounting portion for making connection and fixing to a ground.

[0009] According to another aspect of the present invention, there is provided a method of decreasing noises produced by an antenna device. The antenna device includes an antenna main body and a cable for connecting between the antenna main body and a signal processor for processing a signal received from the antenna main body. The method is characterized by comprising the steps of: preparing a shielding fitting including a mounting portion for making connection and fitting to a

ground and a connection portion to be connected and fixed to a shield portion of the cable; and connecting and fixing the connection portion in the shielding fitting to the shield portion of the cable.

[0010] The foregoing and other objects, features, aspects and advantages of the present invention will become more apparent from the following detailed description of the present invention when taken in conjunction with the accompanying drawings.

[0011] Preferred embodiments according to the present invention will be described in detail with reference to the accompanying drawings.

[0012] Fig. 1 is a partial perspective view for use in explaining a method of measures against noise of a conventional antenna device, which mainly illustrates a ferrite core portion.

[0013] Fig. 2 is a partial perspective view for use in explaining another method of measures against noise of the conventional antenna device, which mainly illustrates a soldered portion.

[0014] Fig. 3 is a plan view showing an antenna device according to a first embodiment of the present invention.

[0015] Fig. 4 is a front view of the antenna device shown in Fig. 3.

[0016] Fig. 5 is an enlarged view of a portion A shown in Fig. 4.

[0017] Figs. 6A, 6B, and 6C are partially enlarged perspective views sequentially showing the assembling the antenna device shown in Figs. 3 and 4.

[0018] Fig. 7 is a side view showing a ground fitting in an antenna device according to a second embodiment of the present invention.

[0019] Figs. 8A, 8B, and 8C are partially enlarged perspective views sequential showing the assembling of the antenna device according to the second embodiment of the present invention.

[0020] Before describing embodiments of the present invention, description will be made as regards a method of decreasing noises produced by an antenna main body according to the prior art in order to facilitate the understanding of the present invention with reference to Figs. 1 and 2.

[0021] Referring to Fig. 1, description will be made as regards a method of decreasing noises according to the prior art. In the conventional antenna device, when a signal is received from an antenna main body (not shown) through a coaxial cable 11 in a signal processor (not shown), noises produced by the antenna main body may, in some cases, be picked up by the signal processor through the coaxial cable 11. One of methods of decreasing noises according to the prior art is a method of mounting a cylindrical ferrite core 13 on the coaxial cable 11. However, the ferrite core 13 shown in Fig. 1 is high in cost and is large. Therefore, there is a malfunction in space-saving wiring.

[0022] Referring to Fig. 2, description will be made as regards another method of decreasing noises according

to the prior art. A part of an outer skin 11a, composed of an insulating material such as synthetic resin, of the coaxial cable 11 is removed. In this state, a portion 15 to which an outer conductor 11 b for shielding is exposed by removing the outer skin 11a is directly soldered to a set plate or the like, to make GND connection. In the case of the method using the soldering shown in Fig. 2, when stresses such as bending are applied to a soldered portion, disconnection occurs.

[0023] With reference now to Figs. 3 to 5, an embodiment of the present invention will be described.

[0024] Referring to Figs. 3 and 4, an antenna device 17 according to a first embodiment of the present invention includes an antenna main body 19 provided with a GPS antenna (not shown) and a coaxial cable 11 drawn from the antenna main body 19. A plug or connector 21 for connection to a signal processor or a GPS processor (not shown) is provided at a front end of the coaxial cable 11.

[0025] A cylindrical ground fitting or shielding fitting 25 is mounted halfway in the coaxial cable 11. The ground fitting 25 has a cylindrical connection portion 23 provided at its one end so as to cover the periphery of a part or a shield portion of the coaxial cable 11. The ground fitting 25 is provided with a mounting portion 27 composed of a plate member extending outward in the radial direction of the cable 11 from the connection portion 23. The mounting portion 27 has a screw hole 29 provided near its tip end.

[0026] The connection portion 23 is mounted on and fixed to the coaxial cable 11 by caulking, as described in detail below.

[0027] Description will be now made as regards a method of mounting the ground fitting 25 on the coaxial cable 11.

[0028] Referring to Fig. 6A, the outer conductor 11 b of the coaxial cable 11 from which the outer skin 11 a composed of an insulating material is stripped is exposed to an intermediate part of the coaxial cable 11. The outer conductor 11b is a conductor forming a shield, as is well known, and is generally composed of a thin conductive wire braided into a cylindrical mesh shape. The connection portion 23 having an opening 35 is inserted into an exposed part of the outer conductor 11 b, to mount the ground fitting 25 such that the outer conductor 11b to which the coaxial cable 11 is exposed is positioned within a cylinder of the connection portion 23.

[0029] As shown in Fig. 6B, the connection portion 23 is then caulked by applying a force, as indicated by an arrow 33, with a jig 31 applied to a part of the outer periphery of the connection portion 23.

[0030] As shown in Fig. 6C, the opening 35 is closed, and a recess 37 in a direction crossing the axial direction is formed in the outer periphery of the cylinder of the connection portion 23. Consequently, the ground fitting 25 is firmly fixed to the exposed part of the outer conductor 11 b of the coaxial cable 11.

[0031] The ground fitting 25 is mounted by being

screwed to a desired grounded area of a vehicle (not shown) through the screw hole 29 provided in the mounting portion 27.

[0032] An antenna device according to a second embodiment of the present invention will be then described using Fig. 7, 8A, 8B, 8C, and 8D. The antenna device according to the second embodiment of the present invention has approximately the same configuration as that of the antenna device according to the first embodiment shown in Figs. 3 and 4 except that it differs in the shape of the ground fitting and a mounting method thereof. Consequently, the same parts as those in the first embodiment are assigned the same reference numerals.

[0033] Referring to Fig. 7, a connection portion 23 in a ground fitting 25 includes a joining portion 39 having a front end folded in a cylindrical shape and a base end previously joined to each other by welding or the like, and has no cuts. Further, the connection portion 23 is formed in the shape of a cylinder comprising a hole having approximately the same thickness as that of the coaxial cable 11.

[0034] Referring to Figs. 8A to 8D, description will be made as regards a method of mounting the ground fitting 25 on the coaxial cable 11.

[0035] Referring to Fig. 8A, an outer conductor exposed portion 41 is formed in an intermediate part of the coaxial cable 11. An outer conductor 11b in the coaxial cable 11 is exposed because an outer skin 11 a composed of an insulating material is stripped. The outer conductor 11b is a conductor forming a shield, as is well known, and is generally composed of a thin conductive wire braided into a cylindrical mesh shape. In order to cover an exposed part of the outer conductor 11 b, a cylindrical member 43 composed of a copper cylinder is previously inserted from one end of the coaxial cable 11, and the connection portion 23 is further similarly inserted from one end of the coaxial cable 11. As shown in Fig. 8B, the cylindrical member 43 is slid and moved to a position of the outer conductor exposed portion 41 in the axial direction of the coaxial cable 11 as indicated by an arrow 45 of Fig. 8A.

[0036] As shown in Fig. 8C, the outer conductor exposed portion 41 in the coaxial cable 11 is positioned in a cylinder of the connection portion 23 in the ground fitting 25, and the ground fitting 25 is slid and moved in the axial direction indicated by an arrow 47 of Fig. 8B such that the connection portion 23 covers the cylindrical member 43.

[0037] As shown in Fig. 8D, both the cylindrical member 43 and the connection portion 23 are then caulked by applying a force with a jig 31 applied to a part of the outer periphery of the connection portion 23.

[0038] A recess (37 in Fig. 6C) in a direction crossing the axial direction is formed in the outer periphery of the cylinder of the connection portion 23, similarly to that shown in Fig. 6C. Consequently, the ground fitting 25 is firmly fixed to the exposed part of the outer conductor

11b of the coaxial cable 11 through the cylindrical member 43.

[0039] The ground fitting 25 is screwed to a desired grounded area of a vehicle (not shown) through a screw hole 29 provided in a mounting portion 27, as in the above-mentioned first embodiment.

[0040] As described in the foregoing, according to the first and second embodiments of the present invention, an antenna device can be provided which is capable of reducing the costs of materials for components and the number of steps and a method of decreasing noises produced by an antenna main body.

[0041] According to the first and second embodiments of the present invention, an antenna device can be provided which is capable of avoiding stresses at the time of folding and bending of a cable and a method of decreasing noises produced by an antenna main body.

[0042] As described in the foregoing, the antenna device and the method of decreasing noises produced by the antenna according to the present invention can be applied to measures of decreasing noises of a GPS receiving device of a vehicle and an antenna device which has been subjected to the measures of decreasing noises.

[0043] Although the present invention has been described and illustrated in detail, it is clearly understood that the same is by way of illustration and example only and is not to be taken by way of limitation, the spirit and scope of the present invention being limited only by the terms of the appended claims. For example, in the above-embodiment, use is made of the coaxial cable as a cable, the present invention is not limited to the coaxial cable. Further, in the above-embodiment, use is made of the GPS antenna device as an antenna device, the present invention is not limited to the GPS antenna device.

Claims

1. An antenna device (17) comprising an antenna main body (19), a cable (11) for connecting between the antenna main body (19) and a signal processor for processing a signal received from the antenna main body (19), **characterized in that** the cable (11) comprises a shielding fitting (25), the shielding fitting (25) comprising a connection portion (23) to be connected and fixed to a shield portion of the cable (11) and a mounting portion (27) for making connection and fixing to a ground.
2. The antenna device (17) according to claim 1, **characterized in that** the cable (11) is a coaxial cable (11) comprising an outer conductor (11b) as the shield portion, the connection portion (23) in the shielding fitting (25) being in a cylindrical shape, the mounting portion (27) comprising a plate member extending from the connection portion (23), and the

connection portion (23) being caulked and mounted so as to cover the outer conductor (11b) exposed to a part of the coaxial cable (11).

3. The antenna device (17) according to claim 2, **characterized in that** the mounting portion (27) comprises a screw hole (29).
4. The antenna device (17) according to any one of claims 1 to 3, further comprising a conductive cylindrical member (43) mounted on the periphery of the outer conductor (11b), and **characterized in that** the connection portion (23) is caulked and mounted so as to cover the exposed outer conductor (11b) through the conductive cylindrical member (43).
5. The antenna device (17) according to any one of claims 1 to 4, **characterized in that** the antenna device (17) is mounted on a vehicle.
6. A method of decreasing noises produced by an antenna device (17), said antenna device (17) including an antenna main body (19) and a cable (11) for connecting between the antenna main body (19) and a signal processor for processing a signal received from the antenna main body (19), the method is **characterized by** comprising the steps of:

preparing a shielding fitting (25) including a mounting portion (23) for making connection and fitting to a ground and a connection portion to be connected and fixed to a shield portion of the cable (11); and
connecting and fixing the connection portion (23) in the shielding fitting (25) to the shield portion of the cable (11).

7. The method according to claim 6, the cable (11) being a coaxial cable (11) comprising an outer conductor (11b) as the shield portion, the connection portion (23) in the shielding fitting (25) being in a cylindrical shape, the mounting portion (27) comprising a plate member extending from the connection portion (23), **characterized in that** the connecting and fixing step comprises the step of caulk-ing and mounting the connection portion (23) so as to cover the outer conductor (11 b) exposed to a part of the coaxial cable (11)..
8. The method according to claim 7, **characterized by** using the shielding fitting (25) comprising the mounting portion (27) provided with a screw hole (29).
9. The method according to any one of claims 7 to 8, **characterized in that** said connecting and fitting step comprises the steps of mounting a conductive cylindrical member (43) mounted on the periphery

of the outer conductor (11b), and of caulking and mounting the connection portion (23) so as to cover the exposed outer conductor (11 b) through the cylindrical member (43).

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10. The method according to any one of claims 6 to 9, **characterized in that** the method is used for a vehicle.

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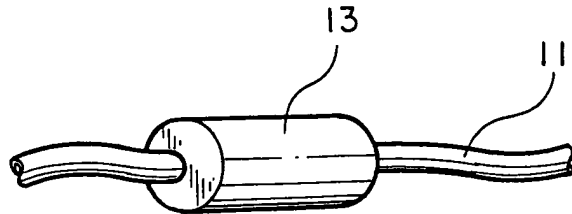


FIG. 1 PRIOR ART

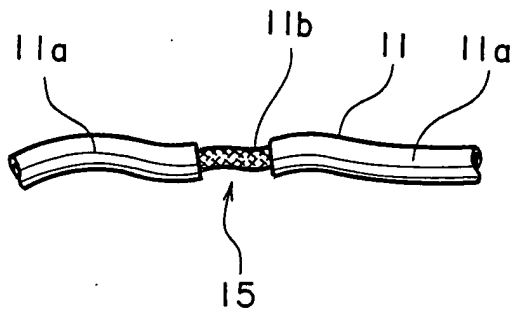


FIG. 2 PRIOR ART

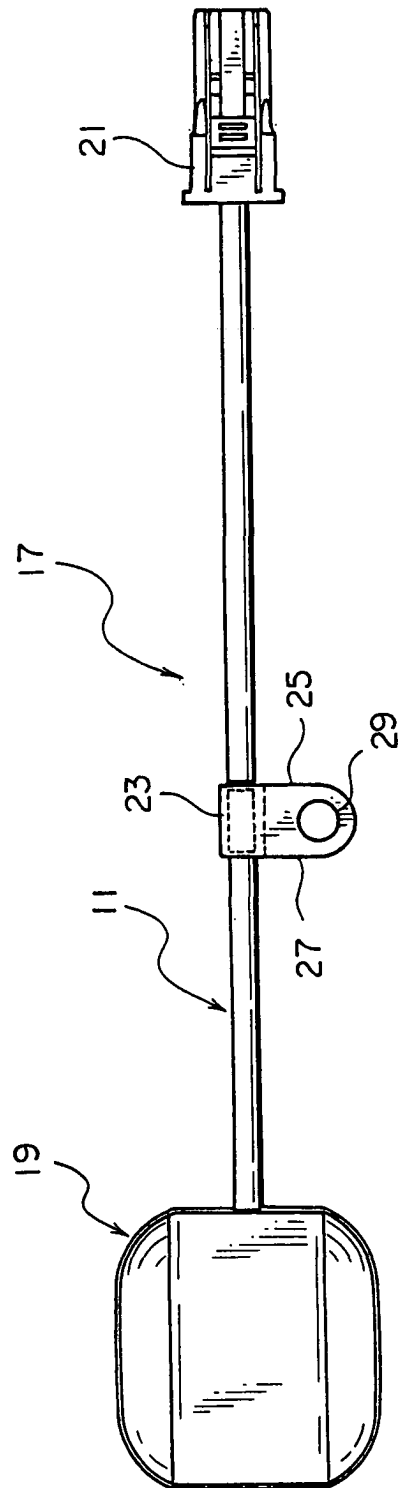


FIG. 3

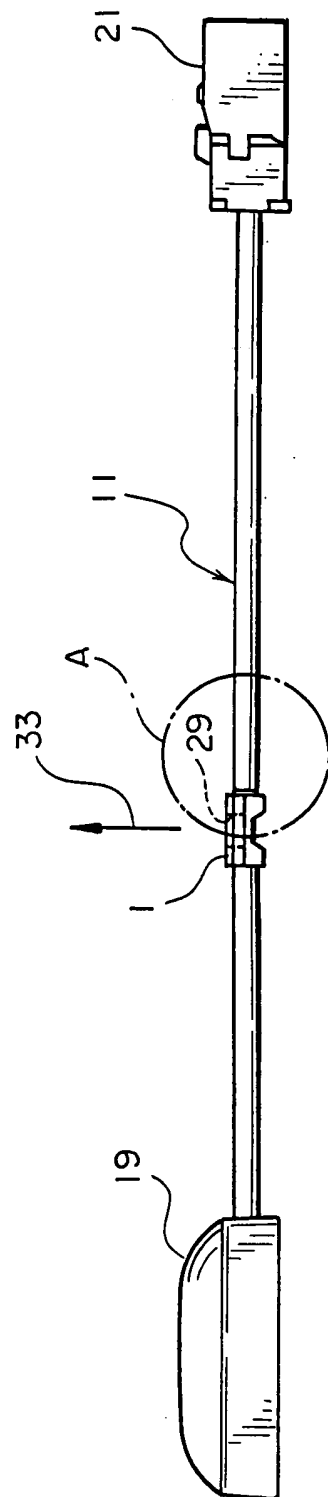


FIG. 4

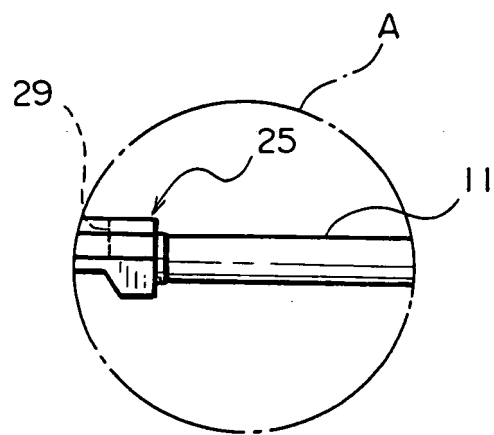
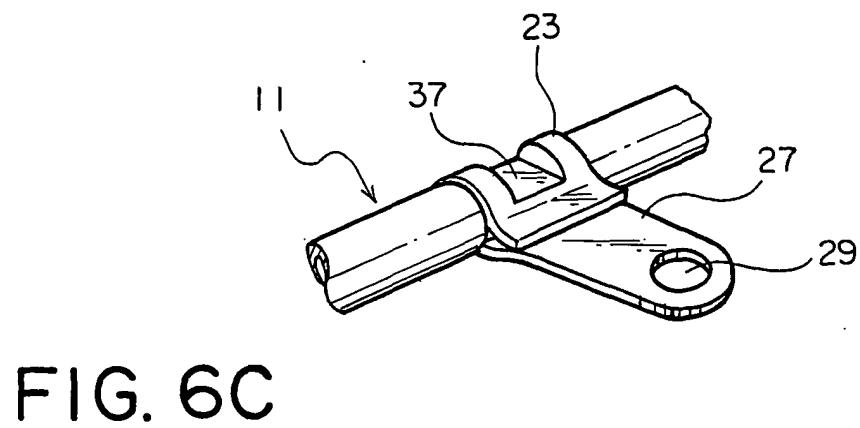
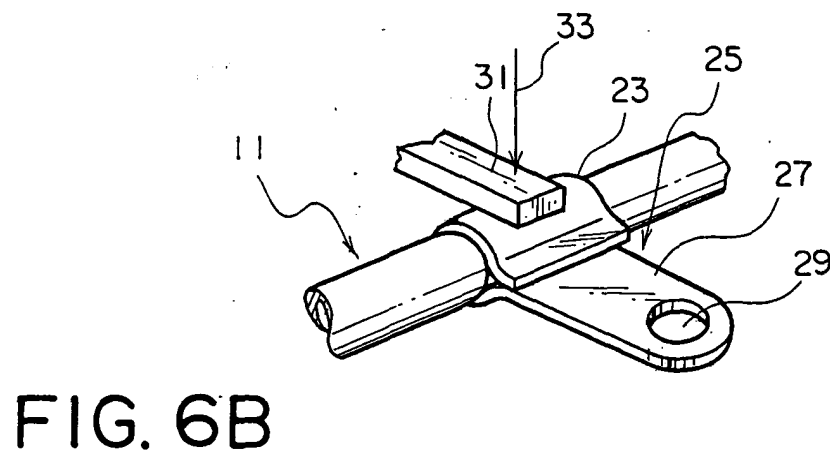
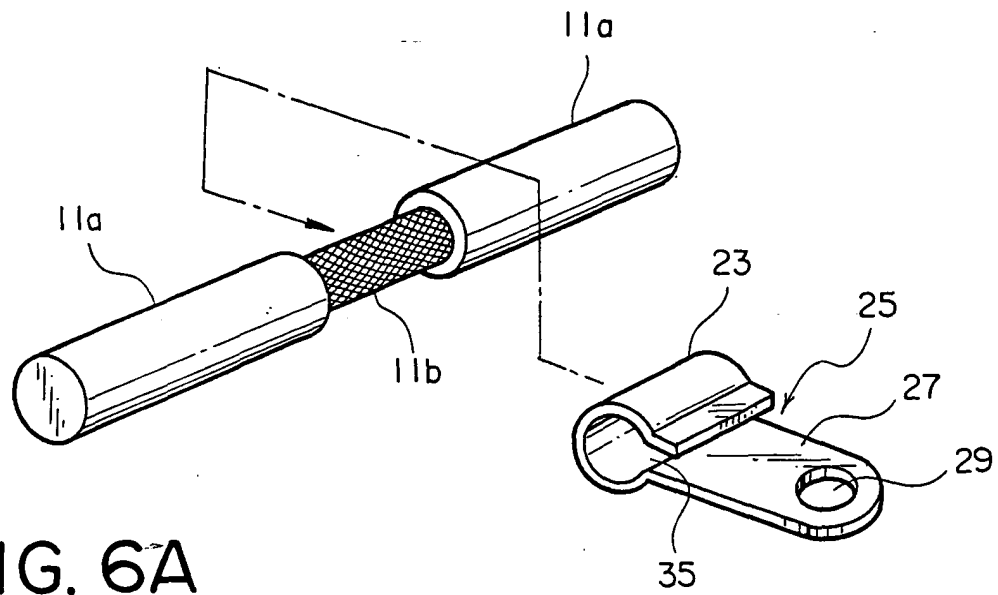


FIG. 5



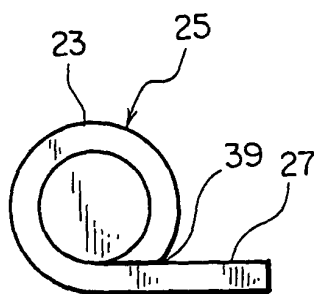


FIG. 7

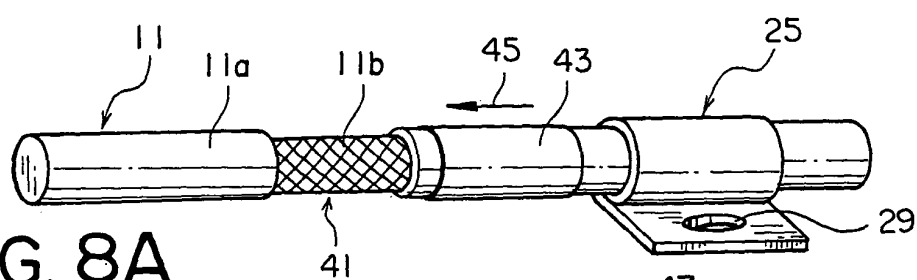


FIG. 8A

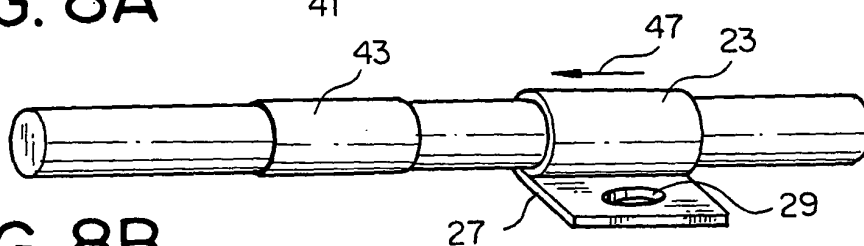


FIG. 8B

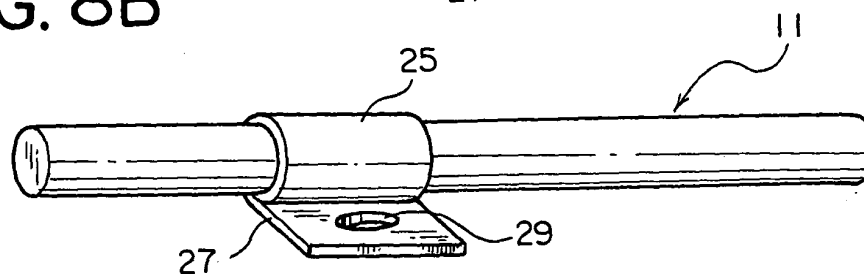


FIG. 8C

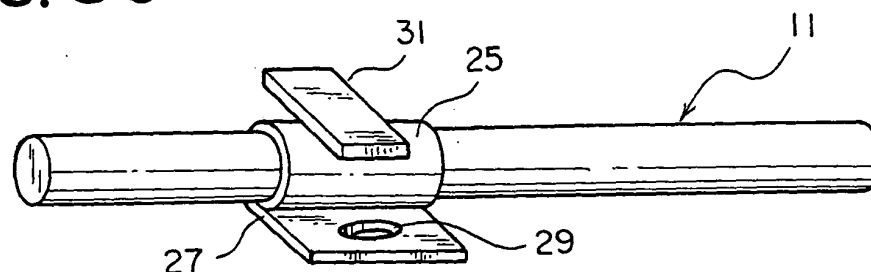


FIG. 8D



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 05 25 0497

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	EP 0 262 755 A (GENERAL MOTORS CORPORATION) 6 April 1988 (1988-04-06) * column 4, lines 31-53 * * figures 2,3 *	1-3,5-8, 10	H01Q1/48
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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.7) H01Q H04B
Place of search Munich		Date of completion of the search 19 May 2005	Examiner Kruck, 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
ON EUROPEAN PATENT APPLICATION NO.**

EP 05 25 0497

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