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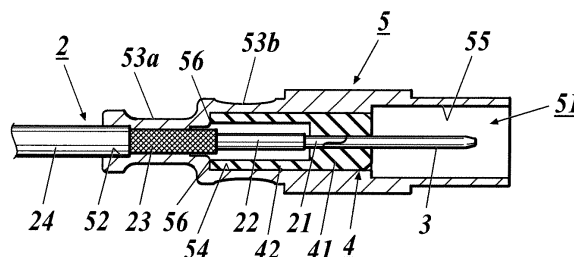
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(54) **Cable attaching method, method of manufacturing coaxial cable to which connector cover is attached, coaxial cable to which connector cover is attached**

(57) A cable attaching method of attaching a coaxial cable to a connector cover having a through tube from a tip section to a base end section, a diameter of the base end section in the through tube and an outer diameter of the coaxial cable being almost same and the diameter of the tip section in the through tube is larger than the outer diameter of the coaxial cable, comprises: an exposing step for exposing an inner conductor and an outer conductor in a tip section of the coaxial cable; a positioning section attaching step of attaching a positioning section to be locked near the base end section of the through tube to the tip section of the coaxial cable so as not to cover at least a part of the outer conductor exposed in the exposing step, the positioning section being used to perform positioning when the positioning section is inserted to the through tube; an inserting step of inserting the base end section of the coaxial cable from the tip section of the connector cover to the through tube after the positioning attaching step; a positioning step of arranging an inner surface of the base end section of the connector cover and the outer conductor of the coaxial cable face to face by performing the positioning of the connector cover and the coaxial cable so as to lock the positioning section in a step section made by different diameters of the through tube after the inserting step; and a swaging step of swaging the base end section of the connector cover to contact and fix the connector cover and the outer conductor.

FIG 1



Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The invention relates to a cable attaching method, a method of manufacturing a coaxial cable to which a connector cover is attached, and a coaxial cable to which a connector cover is attached.

2. Description of Related Art

[0002] Conventionally, as shown in FIG. 9, a conductive connector cover 200 is connected to a tip section of a coaxial cable 100 in order to easily connect to an electronic equipment. The connection between the coaxial cable 100 and the connector cover 200 will be described in details as follows. FIG. 10 is a cross-sectional view of attachment structures of the coaxial cable 100 and the connector cover 200. As shown in FIG. 10, a center pin 102 is attached to an inner conductor 101 of the coaxial cable 100.

Also, a holding member 103 for holding the inner conductor 101 and the center pin 102 is attached to a tip section of the coaxial cable 100. A spacer 104 for filling a gap between the coaxial cable 100 and the connector cover 200 is provided at the base end side of the holding member 103. The spacer 104 is attached to the coaxial cable 100. The tip section of the spacer 104 is covered in a status that the outer conductor 105 of the coaxial cable 100 is folded so as to cover the spacer 104. Thereby, the outer conductor 105 and the connector cover 200 is electrically connected, the outer conductor 105 is capable of performing the grounding via the connector cover 200.

[0003] On the other hand, in the inside of the connector cover 200, the convex section 201 of the connector cover 200 is engaged to the holding member 103, and the convex section 201 used to perform the positioning the center pin 102 is projected to an inner side. According to this, when attaching the coaxial cable 100 to the connector cover 200, the coaxial cable 100 is not inserted from a tip section 202 of the connector cover 200 connected to the electronic equipment, but is inserted from base end section 203 of the connector cover 200 (arrow Y1). Then, after inserting the coaxial cable 100 into the connector cover 200, the coaxial cable 100 and the connector cover 200 are fixed by swaging a base end section 203.

[0004] Also, there is a grounding method other than the method of performing the contact of the connector cover 200 and the outer conductor 105. For example, as shown in Publication of unexamined Japanese utility model application Heisei 5-81971, it is well known to perform the grounding by contacting the grounding terminal section which is provided as another member different from the connector cover and the outer conductor. In this case, the coaxial cable is strongly fixed to a cover by

fitting an insulation sleeve attached to the coaxial cable into the cover while maintaining the contact between the grounding terminal section and the outer conductor.

[0005] By the way, in each of the attaching methods, the spacer 104 or insulation sleeve, and so on are used in order to certainly perform the contact of the outer conductor. When these members are omitted, it is effective to save component costs and the assembly costs if the contact is certainly performed.

SUMMARY OF THE INVENTION

[0006] It is, therefore, a main object of the present invention to provide a cable attaching method capable of reducing components while keeping the contact with the outer conductor.

[0007] To achieve at least one of the aforementioned objects or other objects, a cable attaching method of attaching a coaxial cable to a connector cover having a through tube from a tip section to a base end section, a diameter of the base end section in the through tube and an outer diameter of the coaxial cable being almost same and the diameter of the tip section in the through tube is larger than the outer diameter of the coaxial cable, comprises:

an exposing step for exposing an inner conductor and an outer conductor in a tip section of the coaxial cable;

a positioning section attaching step of attaching a positioning section to be locked near the base end section of the thorough tube to the tip section of the coaxial cable so as not to cover at least a part of the outer conductor exposed in the exposing step, the positioning section being used to perform positioning when the positioning section is inserted to the through tube;

an inserting step of inserting the base end section of the coaxial cable from the tip section of the connector cover to the through tube after the positioning attaching step; a positioning step of arranging an inner surface of the base end section of the connector cover and the outer conductor of the coaxial cable face to face by performing the positioning of the connector cover and the coaxial cable so as to lock the positioning section in a step section made by different diameters of the through tube after the inserting step; and a swaging step of swaging the base end section of the connector cover to contact and fix the connector cover and the outer conductor.

[0008] In accordance with a second aspect of the present invention, a method of manufacturing a coaxial cable to which a connector cover is attached, the connector cover having a through tube from a tip section to a base end section, a diameter of the base end section in the through tube and an outer diameter of the coaxial cable being almost same and the diameter of the tip sec-

tion in the through tube is larger than the outer diameter of the coaxial cable, comprises:

an exposing step for exposing an inner conductor and an outer conductor in a tip section of the coaxial cable;
 a positioning section attaching step of attaching a positioning section to be locked near the base end section of the thorough tube to the tip section of the coaxial cable so as not to cover at least a part of the outer conductor exposed in the exposing step, the positioning section being used to perform positioning when the positioning section is inserted to the through tube;
 an inserting step of inserting the base end section of the coaxial cable from the tip section of the connector cover to the through tube after the positioning attaching step;
 a positioning step of arranging an inner surface of the base end section of the connector cover and the outer conductor of the coaxial cable face to face by performing the positioning of the connector cover and the coaxial cable so as to lock the positioning section in a step section made by different diameters of the through tube after the inserting step; and
 a swaging step of swaging the base end section of the connector cover to contact and fix the connector cover and the outer conductor.

[0009] In accordance with a third aspect of the present invention, a coaxial cable to which a connector cover is attached, comprises:

a coaxial cable having an exposed inner conductor and an exposed outer conductor;
 a connector cover having a through tube from a tip section to a base end section, and a step section made by different diameters of the through tube, the diameter of the base end section in the through tube and an outer diameter of the coaxial cable being almost same and the diameter of the tip section in the through tube being larger than the outer diameter of the coaxial cable;
 a positioning section locked in the step section, the positioning section attached to the tip section of the coaxial cable in a state that at least a part of the exposed outer conductor is not covered, an outer diameter of the positioning section being larger than the outer diameter of the coaxial cable,

wherein the base end section of the connector cover is swaged to contact and fix the exposed outer conductor of the coaxial cable which is not covered by the positioning section.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The above and other objects, advantages and

features of the present invention will become more fully understood from the detailed description given below and the appended drawings, and the following descriptions pertain to the embodiment of the present invention are not intended to limit the present invention, and wherein:

FIG. 1 is a view showing attachment structures of a coaxial cable and a connector cover in the embodiment;

FIG. 2 is a view showing a step of the cable attachment method in the embodiment;

FIG. 3 is a view showing a step of the cable attachment method in the embodiment;

FIG. 4 is a view showing a step of the cable attachment method in the embodiment;

FIG. 5 is a view showing a step of the cable attachment method in the embodiment;

FIG. 6 is a view showing a step of the cable attachment method in the embodiment;

FIG. 7 is a view showing a step of the cable attachment method in the embodiment;

FIG. 8 is a view showing a step of the cable attachment method in the embodiment;

FIG. 9 is a perspective view of conventional attachment structures of the coaxial cable and the connector cover; and

FIG. 10 is a cross-sectional view of conventional attachment structures of the coaxial cable and the connector cover.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0011] Hereinafter, the cable attaching method and a method of manufacturing a coaxial cable to which a connector cover is attached relating to this embodiment will be described in view of drawings. First, the attachment structures of the connector cover to which the coaxial cable is attached will be described.

Hereinafter, the right side in the drawings is a tip side and the left side in the drawings is a base end side.

[0012] FIG. 1 is a view showing the attachment structures of a coaxial cable and a connector cover with respect to the coaxial cable to which the connector cover is attached. As shown in FIG. 1, with respect to a coaxial cable 2, an inner conductor 21, an insulator 22, and an outer conductor 23 are exposed from an outer covering 24 in order from the tip side. A center pin 3 composed of conductor is attached to a tip section of the inner conductor 21. Also, a positioning section 4 having insulation properties for covering the inner conductor 21 and the insulator 22 is attached to a tip section of the coaxial cable 2 so as not to cover at least a part of the outer conductor 23.

[0013] The positioning section 4 has almost same appearance of appearance of a cylinder. The outer diameter is set so as to become slightly large than the outer diameter of the coaxial cable 2. Also, The positioning section 4 is composed of (i) an engagement section 41 for en-

gaging the inner conductor 21 of the coaxial cable 2 and the center pin 3 and (ii) a covering section 42 for covering the insulator 22 in a status of having a gap in the base end side than in a side of the engagement section 41.

[0014] For example, the connector cover 5 is made by the conductive material of metal, and so on. A through tube 51 penetrated from a tip section to a base end section is formed in a connector cover 5. A diameter of the base end section 52 in the through tube 51 and an outer diameter of the coaxial cable 2 are set to an almost same diameter the outer conductor 23 of the coaxial cable 2 is arranged inside the base end section 52 of the through tube 51. Here, the base end section 52 of the connector cover 5 has a part 53a to be swaged, and the part 53a is pressed by external pressure. The connector cover 5 and the outer conductor 23 are fixed and contacted by the swaged part 53a.

[0015] The diameter of tip section 55 of the through tube 51 is set so as to become larger than an outer diameter of the positioning section 4. A center pin 3 is arranged inside a tip section 55 of the through tube 51.

[0016] A diameter of middle section 54 of the through tube 51 is set so as to become almost same diameter in comparison with the outer diameter of the positioning section 4. The positioning section 4 is arranged inside the middle section 54 of the through tube 51. When the positioning section 4 is inserted into the middle section 54 of the through tube 51, the end of the covering section 42 is contacted and locked in a step section 56 made by different diameters of the connector cover. The step section is formed in a boundary between the base end section 52 of the through tube 51 and the middle section 54. According to this, the positioning of the connector cover 5 and the coaxial cable 2 is performed. Also, a part 53b to be swaged is provided in the middle section 54 of the connector cover 5. The part 53b to be swaged is pressed by external pressure. The connector cover 5 and the positioning section 4 are fixed by the swaged part 53b.

[0017] Next, the cable attaching method and the method of manufacturing the coaxial cable to which the connector cover is attached will be described.

[0018] First, As shown in FIGs. 2 and 3, the inner conductor 21, the insulator 22 and the outer conductor 23 are exposed in the tip section of the coaxial cable 2 (exposure step), and the center pin 3 is attached to the inner conductor 21 by soldering. Here, a length of the exposed section is set so as to keep the above mentioned position relationship between each section and the through tube 51.

[0019] After that, as shown in FIGs. 4 and 5, the positioning section 4 is attached to the tip section of the coaxial cable 2 so as to expose at least a part of the outer conductor 23 (positioning section attaching step). The positioning section 4 is pre-divided into two parts in a diameter direction before attaching. The inner conductor 21 of the coaxial cable 2 and center pin 3 are sandwiched by these two parts, and the positioning section 4 is attached to the coaxial cable 2. Thereby, the attachment

of the positioning section 4 to the coaxial cable 2 is ended.

[0020] After the positioning section attaching step, as shown in FIG. 6, the base end section of the coaxial cable 2 is inserted from a tip section of the connector cover 5 to the through tube 51 (inserting step).

[0021] After the inserting step, as shown in FIG. 7, the coaxial cable 2 is pulled out from the base end section 52 of the connector cover 5 until the end of the covering section 42 of the positioning section 4 is contacted and locked in the step section made by different diameters by inserting the positioning section 4. The step section is formed in the boundary between the base end section 52 of the through tube 51 and the middle section 52. When the positioning section 4 is inserted into the middle section 54 of the through tube 51 by the pulling out it, the positioning section 4 is contacted and locked in the step section 56 made by different diameters, which is formed in the boundary between the base end section 52 of the through tube 51 and the middle section 54. Thereby, the positions of the connector cover 5 and the coaxial cable 2 are determined, and the inner surface of the base end section 52 of the through tube 51 and the outer conductor 23 of the coaxial cable 2 are arranged face to face (positioning step: see FIG. 1).

[0022] Then, as shown in FIG. 8, the base end section 52 of the connector cover 5 and the middle section 54 are pressed respectively from the external to swage it. The swaged part 53a and the swaged part 53b are formed (swaging step). Thereby, the positioning section 4 and the outer conductor 23 are contacted to the connector cover 5 in a respective fixed status.

[0023] As mentioned above, since the diameter of the base end section 52 in the through tube 51 of the connector cover 5 and the outer diameter of the coaxial cable 2 are almost same diameter, it is possible to arrange the outer conductor 23 in the base end section 52 of the through tube 51 when inserting the coaxial cable 2 into the through tube 51. Then, when the positioning of the coaxial cable 2 is performed, an inner surface of the base end section of the connector cover 5 and the outer conductor 23 of the coaxial cable 2 are arranged face to face in a contactable status. After that, the connector cover 5 and the outer conductor 23 are contacted and fixed by swaging the base end section of the connector cover 5. According to this, the contact between the connector cover 5 and the outer conductor 23 is kept without using a dedicated member for contacting and fixing the outer conductor 23 and the connector cover 5.

[0024] Also, since the coaxial cable 2 is inserted from the tip section 55 of the connector cover 5 to the through tube 51, the positioning section 4 is contacted and locked in the step section 56 made by different diameters formed in the boundary between the base end section 52 of the through tube 51 and the middle section 54. Thereby, it is possible to prevent that the coaxial cable 2 is pulled out from the base end section 52 of the connector cover 5.

[0025] In addition, the invention is suitably changed without limiting the embodiment.

[0026] According to the invention, since the inner diameter of the connector cover and the outer diameter of the coaxial cable are almost same, it is possible to arrange the outer conductor in the base end section of the through tube when inserting the coaxial cable in the through tube. Then, when the positioning of the coaxial cable is performed, the inner surface of the base end section of the connector cover and the outer conductor of the coaxial cable are arranged face to face in a state capable of contacting with each other. Then, the contacting portion of the connector cover and the outer conductor is fixed by swaging the base end section of the connector cover. Accordingly, it is possible to ensure the contacting status of the outer conductor without using a dedicated member for fixing to contact the outer conductor.

[0027] Also, when the coaxial cable to which the positioning section is attached is inserted from the tip section of the connector cover to the through tube, the positioning section is locked near the base end section of the through tube in a contacting state. Thereby, it is possible to prevent that the coaxial cable is pulled out from the base end section side of the connector cover.

Claims

1. A cable attaching method of attaching a coaxial cable to a connector cover having a through tube from a tip section to a base end section, a diameter of the base end section in the through tube and an outer diameter of the coaxial cable being almost same and the diameter of the tip section in the through tube is larger than the outer diameter of the coaxial cable, comprising:

an exposing step for exposing an inner conductor and an outer conductor in a tip section of the coaxial cable;

a positioning section attaching step of attaching a positioning section to be locked near the base end section of the through tube to the tip section of the coaxial cable so as not to cover at least a part of the outer conductor exposed in the exposing step, the positioning section being used to perform positioning when the positioning section is inserted to the through tube;

an inserting step of inserting the base end section of the coaxial cable from the tip section of the connector cover to the through tube after the positioning attaching step; a positioning step of arranging an inner surface of the base end section of the connector cover and the outer conductor of the coaxial cable face to face by performing the positioning of the connector cover and the coaxial cable so as to lock the positioning section in a step section made by different diameters of the through tube after the inserting step; and

a swaging step of swaging the base end section of the connector cover to contact and fix the connector cover and the outer conductor.

2. A method of manufacturing a coaxial cable to which a connector cover is attached, the connector cover having a through tube from a tip section to a base end section, a diameter of the base end section in the through tube and an outer diameter of the coaxial cable being almost same and the diameter of the tip section in the through tube is larger than the outer diameter of the coaxial cable, comprising:

an exposing step for exposing an inner conductor and an outer conductor in a tip section of the coaxial cable;

a positioning section attaching step of attaching a positioning section to be locked near the base end section of the through tube to the tip section of the coaxial cable so as not to cover at least a part of the outer conductor exposed in the exposing step, the positioning section being used to perform positioning when the positioning section is inserted to the through tube;

an inserting step of inserting the base end section of the coaxial cable from the tip section of the connector cover to the through tube after the positioning attaching step;

a positioning step of arranging an inner surface of the base end section of the connector cover and the outer conductor of the coaxial cable face to face by performing the positioning of the connector cover and the coaxial cable so as to lock the positioning section in a step section made by different diameters of the through tube after the inserting step; and

a swaging step of swaging the base end section of the connector cover to contact and fix the connector cover and the outer conductor.

3. A coaxial cable to which a connector cover is attached, comprising:

a coaxial cable having an exposed inner conductor and an exposed outer conductor;

a connector cover having a through tube from a tip section to a base end section, and a step section made by different diameters of the through tube, the diameter of the base end section in the through tube and an outer diameter of the coaxial cable being almost same and the diameter of the tip section in the through tube being larger than the outer diameter of the coaxial cable;

a positioning section locked in the step section, the positioning section attached to the tip section of the coaxial cable in a state that at least a part of the exposed outer conductor is not covered,

an outer diameter of the positioning section being larger than the outer diameter of the coaxial cable,

wherein the base end section of the connector cover is swaged to contact and fix the exposed outer conductor of the coaxial cable which is not covered by the positioning section.

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FIG. 1

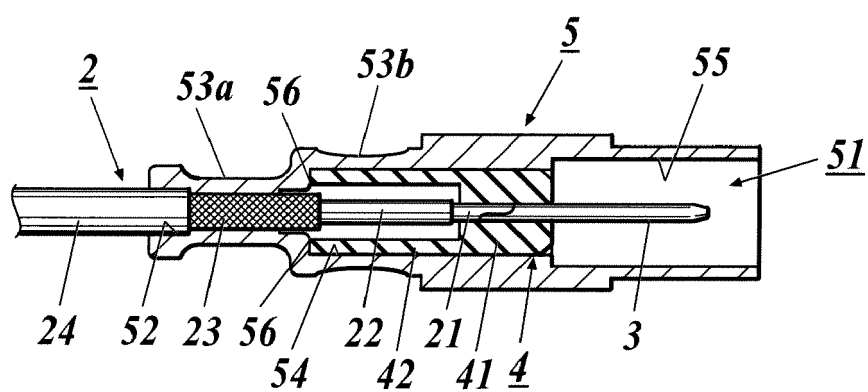


FIG. 2

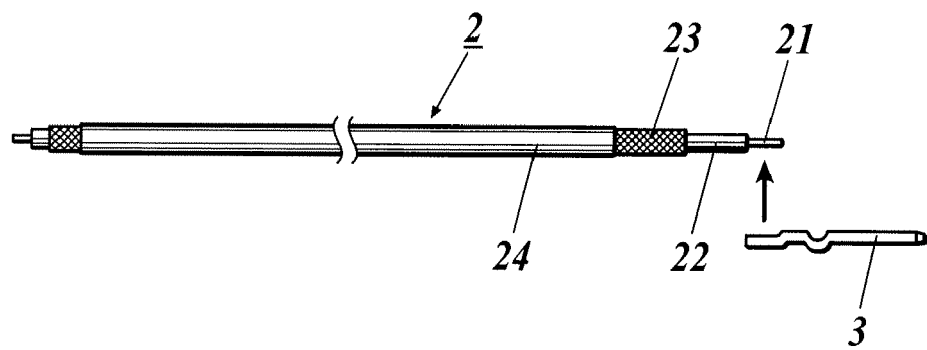


FIG.3

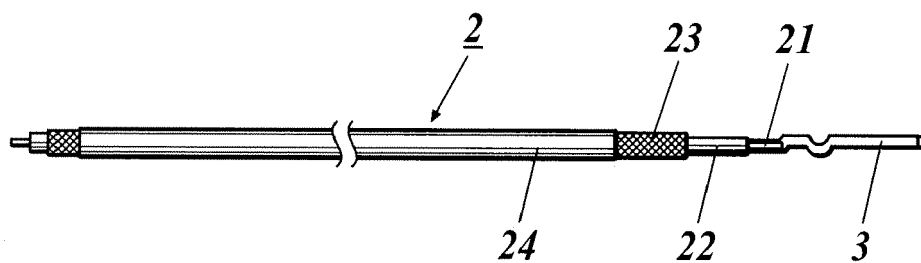


FIG.4

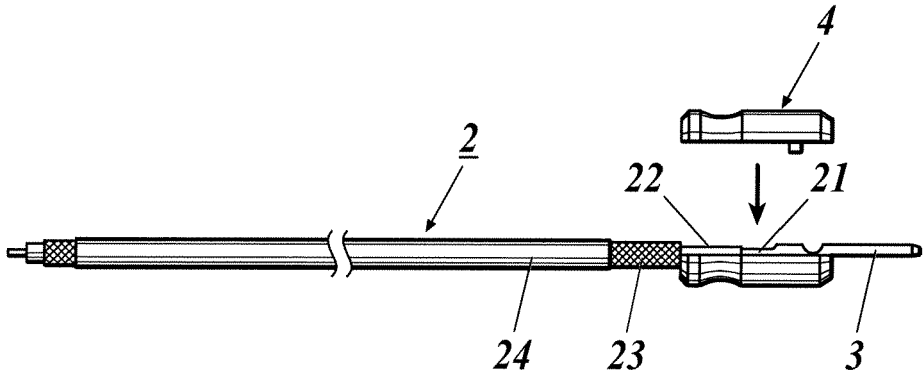


FIG. 5

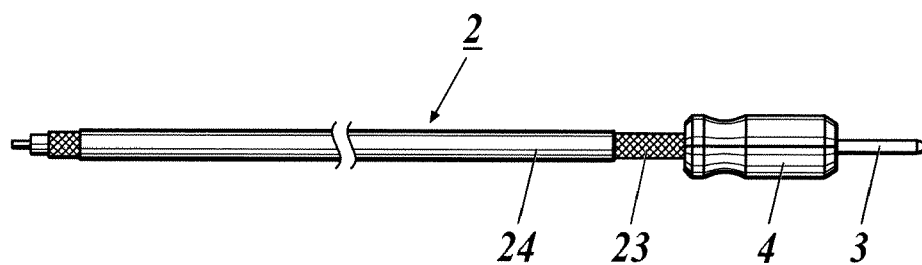


FIG. 6

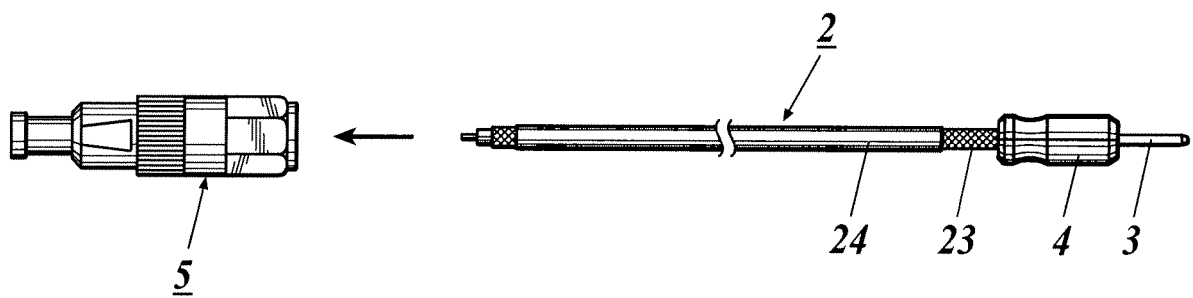


FIG. 7

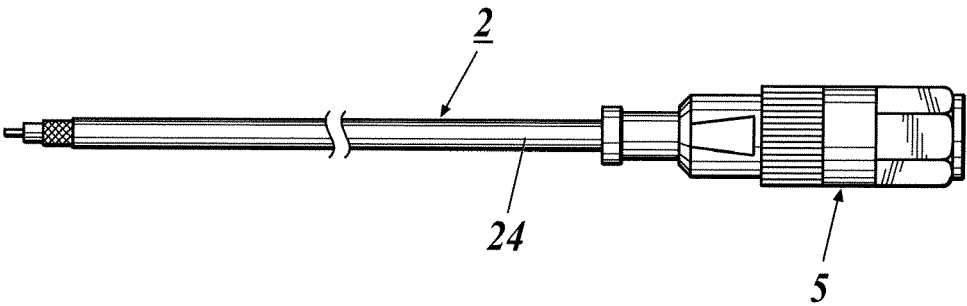


FIG. 8

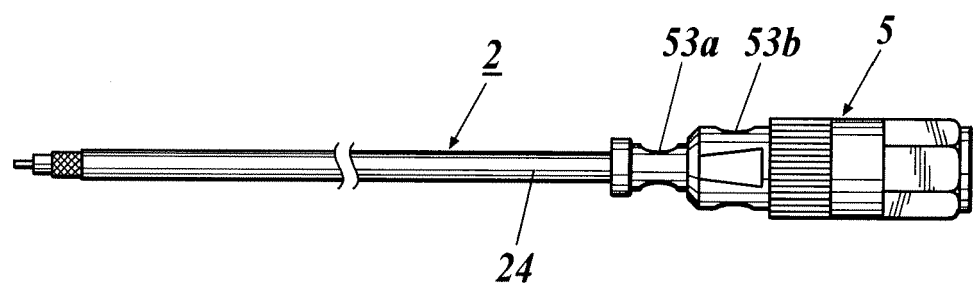


FIG. 9

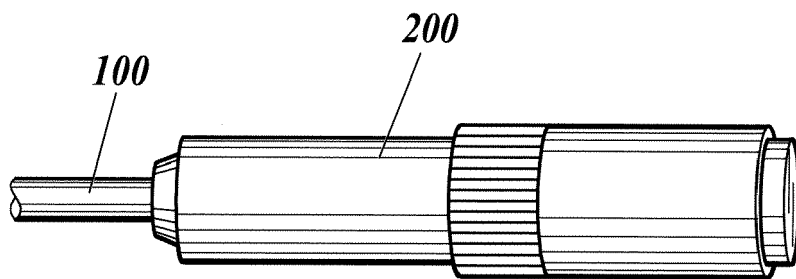
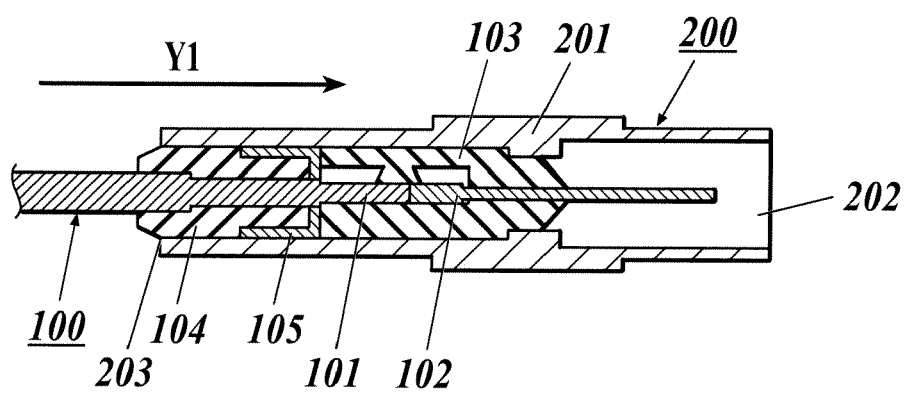


FIG.10





EUROPEAN SEARCH REPORT

Application Number
EP 09 17 0146

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	US 3 828 305 A (HOGENDOBLER R) 6 August 1974 (1974-08-06) * abstract; figures * * column 2, line 12 - column 3, line 24 * -----	1-3	INV. H01R43/20 H01R9/05
A	DE 10 2004 024792 A1 (IMS CONNECTOR SYSTEMS GMBH [DE]) 15 December 2005 (2005-12-15) * abstract; figures 1,2 * * paragraph [0002] - paragraph [0006] * * paragraph [0032] - paragraph [0034] * -----	1-3	
A	ROTHENBERGER R ET AL: "High-density zero insertion force microcoaxial cable interconnection technology" 18 May 1992 (1992-05-18), PROCEEDINGS OF THE ELECTRONIC COMPONENTS AND TECHNOLOGY CONFERENCE. (ECTC). SAN DIEGO, MAY 18 - 20, 1992; [PROCEEDINGS OF THE ELECTRONIC COMPONENTS AND TECHNOLOGY CONFERENCE. (ECTC)], NEW YORK, IEEE, US LNKD-DOI:10.1109/ECTC.1992.204218, PAGE(S) 268, XP010052541 ISBN: 9780780301672 * the whole document * -----	1-3	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC) H01R
Place of search Munich		Date of completion of the search 1 April 2010	Examiner Serrano Funcia, J
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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EPO FORM 1503 03.82 (P04C01)

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

EP 09 17 0146

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
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01-04-2010

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3828305 A	06-08-1974	NONE	
DE 102004024792 A1	15-12-2005	NONE	

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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