(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 768 078 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
20.08.2014 Bulletin 2014/34

(21) Application number: **12840226.0**

(22) Date of filing: **27.07.2012**

(51) Int Cl.:
H01R 4/30 *(2006.01)* ***H01R 4/36*** *(2006.01)*

(86) International application number:
PCT/ES2012/070578

(87) International publication number:
WO 2013/053964 (18.04.2013 Gazette 2013/16)

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

(30) Priority: **10.10.2011 ES 201131630**

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(54) MECHANICAL CONNECTOR ASSEMBLY WITH INTEGRAL CABLE CENTERING DEVICE

(57) The invention relates to improvements to a connector assembly/centring device, the purpose of which is for the metal connector to be totally sealed and electrically insulated once the electric cable has been inserted and immobilised in said connector by the corresponding gripping screw/s. To that end, the connector assembly comprises at least: a mechanical connector with respective hole/s for receiving respective gripping screw/s; an intermediate component that surrounds the body of the connector on the outside and also has one or more holes coinciding with the holes in the connector; and a centring component arranged on the outer surface of the intermediate body that also has one or more holes coinciding with the respective holes in the connector and the intermediate component, and the centring device being rotatable manually by the user with respect to the intermediate body.

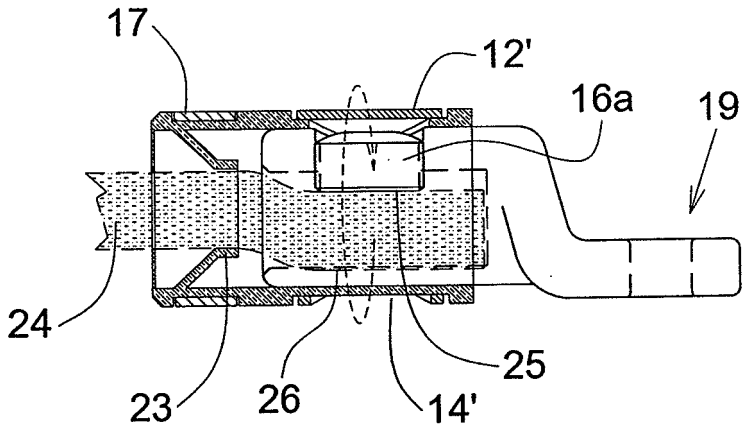

Fig. 8

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Description

Field of the invention:

[0001] More specifically the invention refers to improvements to a connector assembly/centring device, the connector consisting of a mechanical connector with fasteners especially designed to secure one or more cables inserted into it by means of screws, and the centring device consisting of an element that covers the outside of the body of the connector in the form of a cover.

State of the art:

[0002] On the market there are, and therefore can be considered as State of the Art, other types of mechanical connectors with fasteners, especially designed for gripping one or more wires inserted inside it by means of one or several screws that radially penetrate the body of the connector and finally break off, as they have a narrowing where the portion breaks off when the planned tightening torque is reached.

[0003] With regard to the screws gripping the cable to be connected, they are threaded into drilled holes on the connector, there are many different types, among which are Spanish patents of the same holder: no. 200502821, 200600568, 200600954, and others of the applicant, among which is no. 200602698 subject matter of the present invention.

[0004] Specifically, in patent no. 200602698, and according to claim 1, there is a mechanical connector incorporating a cable centring device in the manner of a cover on at least one of its ends, comprising at least one rim to be fitted to the end of the connector, which has flexible means to adapt to cables of different diameters, in which each cable goes through these flexible means of the rim fitted to the connector, which is housed inside the same, and it is kept in its position by means of clamping screws, which tighten and the portion breaks off at the point of the corresponding narrowing, with which on the inside of the connector, the geometrical axes of the connector and of the cable, are parallel and spaced out, and the centring device within connector forces the cable to bend slightly before leaving the connector, and from the centring device the cable, at the end of the connector it is forced to make a compact bend in the opposite direction, both axes being geometrical to the connector and the cable, on the outside of the connector essentially coinciding axially.

Purpose of the Invention:

[0005] The primary purpose of the invention is to achieve, in addition to the same functions that were already present in the mechanical connector device with a built-in cable centring device, purpose of the Spanish patent no. 200602698, that the metal connector is totally sealed and electrically insulated once the cable has been inserted in said connector and has been immobilised by the corresponding clamping screw/s.

[0006] An additional purpose of the invention is to achieve a mechanical connector device with a built-in cable centring device, having a different identifier element for each of the electrical phases (such as the phases U, V, Z of a three-phase electrical system), allowing the operator to easily identify visually the type of cable (for example U, V, Z) in the connector, which is an enormous advantage when fitting cables, as well as for maintenance, as it enables substantial time saving by eliminating the need to measure each phase that heretofore had to be done by the operator so as to identify them.

Description of the invention:

[0007] The present invention consists of a connector assembly comprising at least:

- one connector, preferably made of metal, with a tubular and preferably cylindrical body with one or more holes through the wall of the body to secure one or more cables of equal or different diameter inside by means of respective clamping screws;
- an intermediate component, with a tubular body, acting as a cover, surrounds the outside of the body of the connector, occupying a part or all of the body of the connector and also having one or more holes of the same size and position as the holes in the connector; and
- a tubular bodied centring component on the outer surface of the intermediate component that also has one or more holes coinciding with the respective holes in the connector and the intermediate component, and the centring device being rotatable manually by the user with respect to the intermediate component.

[0008] This particular configuration of the connector enables, once the electric cable/s (as applicable) have been inserted inside the metal connector and the clamping screw/s have been secured by threading into their respective orifices, coinciding in the three members that form the connector (namely in the connector, the intermediate component and the centring device), and said screw/s have been duly broken off at their narrowing, then the user turns the centring component with regard to the intermediate component until it totally covers the hole/s and consequently insulates electrically and hermetically the inside of the connector from the outside, namely the cable, and all the live parts such as the connector, which is metal.

[0009] Therefore, on the one hand, the entry of moisture and liquids product of the weather that could affect connectivity between the gripping screw/s and the cable is impeded, and on the other, the cable and its live parts are totally insulated, as there are no metal parts (which could be live) which after assembly are on the outside

can be touched by the user, with the resulting danger. Hence, there is no risk of a user accidentally touching any live part of the connector assembly, as all its metal parts are covered under an insulated surface. To achieve this aim, the materials used, both for the intermediate component and the centring device are insulating, as both are parts that are outside when the connector assembly is fitted and hence can be touched and manipulated by an operator.

[0010] The body of the connector has no modification inside, with regard to the configuration described in the main patent, therefore its use remains the same, namely the user places the cable/s inside it, inserting them by the rim of the connector body, then the clamping screw/s are placed in their respective threaded through hole/s in the wall of the connector, until the tightening torque exceeds the breakage torque and the upper part of the screw/s breaks off, the lower part remaining threaded and securing the cable/s without projecting above the surface of the connector, so the user may turn manual and easily (between 45° - 315°, preferably 180°) the centring device on the intermediate component and on the connector, so that the area with holes where the respective clamping screw/s have been inserted are hidden and covered below the cylindrical surface of the centring device. In addition, under the area with holes of the centring device (after having been turned) is the intermediate component, which is insulating and hence not live. Therefore, there is total electrical insulation on the outside of the connector assembly and also total sealing of the cable/s as well as the metal connector.

[0011] There are different configurations of metal connectors used according to the type and diameter of cable, for instance, variations of one or several holes for clamping screws, or variations with regard to the configuration of the end part: such as terminal type or connector type end portion. Therefore, the present invention may have several different configurations, according to the type of metal connector.

[0012] The intermediate component is made preferably of insulating material with certain flexibility, such plastic, although other materials different to plastic and with similar properties can also be used. With these properties of flexibility and deformability, the user can easily fit the intermediate component on one side of the connector in the correct position, namely coinciding the respective hole/s of the connector with those of the intermediate component, and on the other hand the centring device turns easily with regard to the intermediate component once the corresponding clamping screws have been positioned and broken off when tightening.

[0013] Additionally, near one of its rims there may be an internal conical portion to retain the cable, the function of which is to secure the cable in its position when it is fitted inside.

[0014] In addition, there may be at least one identifier ring optionally fitted to the outer surface of the intermediate component, so that the user can identify (without having to test) what cable phase is in the connector. For this purpose, the intermediate component has on its outer surface some means for securing the identifier ring composed preferably of a cylindrical recess with a width and depth sufficient to hold the identifier ring. Additionally, it may have on its outer surface some means to retain the centring device formed preferably by a second cylindrical recess with a width and depth sufficient to hold the centring device.

[0015] The centring device is preferably made of an insulating material and with greater stiffness than the intermediate component, such as plastic, although other materials plastic with similar properties can also be used, so it may be fitted to said intermediate component easily without slipping, and can also be turned manually by the user with regard to its longitudinal axis, so as to cover the hole/s on the intermediate component.

[0016] Other details and characteristics shall be shown throughout the description below referring to drawings attached to this report which are shown for illustrative but not limiting purposes only in a drawing of the invention. Preferably, the identifier ring projects above the centring device, and the intermediate component has a slightly recessed surface to hold said ring, fitted manually in the recessed area.

Description of the drawings:

[0017] Below is a list of the different parts of the invention, that can be seen in the attached drawings, and are indicated with their respective numbers: (10) connector assembly, (11) connector, (12) centring device, (12) centring device once it has been turned, (13) intermediate component, (14) hole/s of the centring device (12), (14') hole/s of the centring device (12') once it has been turned, (15) threaded through holes of the connector (11), (16) gripping screws, (16a) internal remaining part of the clamping screw, (16b) outer releasing part of the clamping screw, (17) identifier ring, (18) hole/s of the intermediate component (13), (19) end part of the terminal type connector, (19') end part of the connector type connector, (20) through hole of the end part (19), (21) internal hole of the connector (11), (22) internal conical part for retaining the cable of the intermediate component (13), (23) cylindrical end part for retaining the cable, (24) electric cable, (25) lower surface of the gripping screw (16), (26) lower surface of the internal hole of the connector (21), (27) rim of the connector (11), (28) recess for the identifier ring of the intermediate component (13), (29) recess for the centring device of the intermediate component (13).

Figure 1 is a front elevation view of a first embodiment of the connector assembly (10), in which there is a single clamping screw (16), in which the connector (11) has a terminal type end part (19), and at the moment of threading the clamping screw (16).

Figure 2 is a top plan view of the first embodiment of the connector assembly (10) shown in Figure 1,

in which the centring device (12) can be seen in its unturned position.

Figure 3 is a bottom plan view of the first embodiment of the connector assembly (10) shown in Figure 1, in which the centring device (12) can be seen in its unturned position.

Figure 4 is a side elevation view of the first embodiment of the connector assembly (10) shown in Figure 1.

Figure 5 is a front elevation view of the first embodiment of the connector assembly (10) shown in Figure 1, but in exploded view -before being fitted-, in which the different parts forming the connector assembly (10) can be seen: the connector (11), the intermediate component (13), the centring device (12), and the identifier ring (17).

Figure 6 is a front elevation view of the first embodiment of the connector assembly (10) shown in Figures 1 and 5, when the cable/s (24) have been inserted in the internal hole (21) of the centring device (11) and the clamping screw (16b) is going to be fitted, in which the different parts that form the connector assembly (10) can be seen in section, showing the hole of the unrotated centring device (14), located in the upper part.

Figure 7 is also a front elevation view, of the first embodiment of the connector assembly (10) shown in Figures 1 and 5, when it has been secured by threading the lower end of the screw (16a) and the outer releasing part of the clamping screw (16b) has been break off, in which the different parts that form the connector assembly (10) can be seen in section, showing the hole of the unrotated centring device (14), located in the upper part.

Figure 8 is also a front elevation view of the first embodiment of the connector assembly (10) shown in Figures 1 and 5, when the centring device (12') has been rotated about 180° on the intermediate component (13), showing the hole of the rotated centring device (14') which is located in the lower part.

Figure 9 is a front elevation view of a second embodiment of the connector assembly (10), in which there is a single clamping screw (16), but in which the connector (11) has a connector type end part (19').

Figure 10 is a top plan view of the second embodiment of the connector assembly (10) shown in Figure 9, in which the centring device (12) can be seen in its unturned position.

Figure 11 is a bottom plan view of the second embodiment of the connector assembly (10) shown in Figure 9, in which the centring device (12) can be seen in its unturned position.

Figure 12 is a side elevation view of the second embodiment of the connector assembly (10) shown in Figure 9.

Figure 13 is a front perspective view of a third embodiment of the connector assembly (10), in which there are two clamping screws (16), and the connector (11) has a terminal type end part (19), so that both the connector (11), the centring device (12), and the intermediate component (13) will also display their respective holes for the clamping screws (16).

Figure 14 is a front perspective view of the third embodiment of the connector assembly (10) shown in Figure 13, in which the two clamping screws (16) have been break off and the outer parts (16b) released, the internal parts remaining (16a).

Figure 15 is a front perspective view of a third embodiment of the connector assembly (10) shown in Figure 13, in which the centring device (12') has been rotated and therefore the holes of the connector (15) are covered as well as the internal parts of the screws (16a).

Description of the embodiments of the drawings:

[0018] In one of the preferred embodiments of the invention, as may be seen in the attached drawings, the connector assembly (10) is formed by a connector (11), surrounded by an intermediate component (13), and this is surrounded by a centring device (12).

[0019] As shown in Figure 5, said connector (11), preferably made of metal, has a cylindrical tubular body (11) with some threaded through holes (15) on the side surface of said cylindrical body (11) near its rim (27), and into which the respective screws (16) will be threaded, one in each hole (15). On the opposite part, the rim (27), an end part, that may be terminal type (19), see Figures 1-8, or connector type (19'), see Figures 9-12. Inside, there is an internal hole (21) designed to hold different types of electric cables of several diameters. The attached drawings show two different preferred embodiments of the connector, one which has a single threaded through hole (15), and another with two threaded through holes (15), although there could also be other variants.

[0020] Surrounding the exterior body (11) of the connector (10) there is an intermediate component (13), preferably made of insulating plastic material with certain flexibility, also cylindrical and tubular, with one or more holes on its upper part (18). In addition, it may have on its outer surface a cylindrical recess (28) to hold the identifier ring (17) into said recess (28) and another cylindrical recess (29) to hold the centring device (12) into said recess (29), see Figure 5.

[0021] Additionally, it has an internal conical portion (22) near one of its rims to retain the cable, the function of which is to secure the cable (24) in its position when it is fitted inside, see Figures 5 and 8.

[0022] The centring device, preferably made of a stiffer insulating material than the intermediate component, is preferably cylindrical and shorter than the intermediate component, and which also has one or more holes coinciding in size and position with the holes in the connector and on the intermediate part. The centring device is fitted

on the outer surface of the intermediate component (13), inserting it in the corresponding part to the rim (27) of the connector (11), and remaining in position in a recess (29) in the outer surface of said intermediate component (13), see Figure 5.

[0023] The operation of fitting the connector assembly (10) is shown clearly in Figures 5-8 and is as follows:

- 1.: The user installs the connector assembly (10), namely first fitting the intermediate component (13) on the outer surface of the connector (11), then fitting the centring device (12) on the outer surface of the intermediate component (13), and optionally -if necessary- fitting the identifier ring (17) on the outer surface of the intermediate component (13), see Figure 5.
- 2.: The user removes, with suitable tools, the insulation from the cable, to specified length "L" and wire brushes the conductive wire, the cable/s (24) is/are inserted inside (21) the connector (11) by its rim (27).
- 3.: The clamping screw/s (16) are threaded into the threaded through hole/s (15) on the connector body (11) until they immobilise the cable/s (24) by the pressure of the end of the clamping screw (25) on the connector (11), pushing it against the lower surface of the inner hole of the connector (26); As is logical (14), the holes of the centring device-cover (12) and the intermediate component (18) are aligned with the holes (15) of the connector body (11), see Figure 6.
- 4.: Tightening proceeds on the gripping screws (16) until their head breaks off (16b), see Figure 7.
- 5.: Finally the centring device (12) is manually turned about 180° (although it maw be turned less or more, as long as the centring device (12) covers the hole/s), so that the holes (15) are totally covered by the centring device (12) and therefore the cable/s (24) are totally insulated from the outside, see Figures 8 and 9.

[0024] Having sufficiently described this invention using the figures attached, it is easy to understand that any modification may be made to the detail which may be deemed to be appropriate, whenever these changes do not alter the essence of the invention summarised in the following claims.

Claims

1. **"MECHANICAL CONNECTOR ASSEMBLY WITH A BUILT-IN CABLE CENTRING DEVICE"** corresponding to a junction connector, shunt and terminal, by fasteners used in electrical connectors, which have one or more holes into which the respective clamping screws for the cable are threaded, securing the cable inside the connector and keeping the cable/s secured by the pressure of said clamping screw/s, that are fitted and whose top end breaks off at a designed narrowing point, **characterised in that** the connector assembly comprises at least:

   - one connector, with a tubular body, with one or more holes through the wall of the body to secure one or more cables of equal or different diameter inside by means of respective clamping screws;
   - an intermediate component, with a tubular body, acting as a cover, surrounds the outside of the body of the connector, occupying a part or all of the body of the connector and also having one or more holes of the same size and position as the holes in the connector; and
   - a tubular bodied centring component on the outer surface of the intermediate component that also has one or more holes coinciding with the respective holes in the connector and the intermediate component, and the centring device being rotatable manually by the user with respect to the intermediate component, so that once the cable/s have been fitted inside the centring device, secured by the gripping screw/s the user manually rotates the centring component with regard to the intermediate component until it totally covers the hole/s and consequently insulates and seals the cables in the connector from the outside, including live parts.

2. **"MECHANICAL CONNECTOR ASSEMBLY WITH A BUILT-IN CABLE CENTRING DEVICE"** according to the claim 1, **characterised in that**, optionally, there may be at least one identifier ring fitted to the outer surface of the intermediate component, so that the user can visually identify what cable phase is in the connector.

3. **"MECHANICAL CONNECTOR ASSEMBLY WITH A BUILT-IN CABLE CENTRING DEVICE"** according to the claim 1, **characterised in that** the intermediate component is made of insulating plastic material with certain flexibility.

4. **"MECHANICAL CONNECTOR ASSEMBLY WITH A BUILT-IN CABLE CENTRING DEVICE"** according to the claim 4, **characterised in that** the intermediate component is made of plastic material.

5. **"MECHANICAL CONNECTOR ASSEMBLY WITH A BUILT-IN CABLE CENTRING DEVICE"** according to the claims 1, 2, 3 or 4, **characterised in that** near one of its rims there may be an internal conical portion to retain the cable, the function of which is to secure the cable in its position when it is fitted inside the connector.

6. **"MECHANICAL CONNECTOR ASSEMBLY WITH**

A BUILT-IN CABLE CENTRING DEVICE" according to the claims 1 and 2, **characterised in that** the intermediate component has on its outer surface some means for securing the identifier ring.

7. **"MECHANICAL CONNECTOR ASSEMBLY WITH A BUILT-IN CABLE CENTRING DEVICE"** according to the claim 6, **characterised in that** the means for securing the identifier ring are composed of a cylindrical recess with a width and depth sufficient to hold the identifier ring.

8. **"MECHANICAL CONNECTOR ASSEMBLY WITH A BUILT-IN CABLE CENTRING DEVICE"** according to the claim 1, **characterised in that** the intermediate component has on its outer surface some means for securing the centring device.

9. **"MECHANICAL CONNECTOR ASSEMBLY WITH A BUILT-IN CABLE CENTRING DEVICE"** according to the claim 8, **characterised in that** the means to retain the centring device of the intermediate component are formed by a second cylindrical recess with a width and depth sufficient to hold the centring device.

10. **"MECHANICAL CONNECTOR ASSEMBLY WITH A BUILT-IN CABLE CENTRING DEVICE"** according to the claim 1, **characterised in that** the centring device body has a cylindrical configuration.

11. **"MECHANICAL CONNECTOR ASSEMBLY WITH A BUILT-IN CABLE CENTRING DEVICE"** according to the claims 1 or 10, **characterised in that** the centring device is made of an insulating material and with greater stiffness than the intermediate component, so it may be fitted to said intermediate component easily without slipping, and can also be turned manually with regard to its longitudinal axis to cover the hole/s on the intermediate component.

12. **"MECHANICAL CONNECTOR ASSEMBLY WITH A BUILT-IN CABLE CENTRING DEVICE"** according to the claim 11, **characterised in that** the centring device is made of a plastic material.

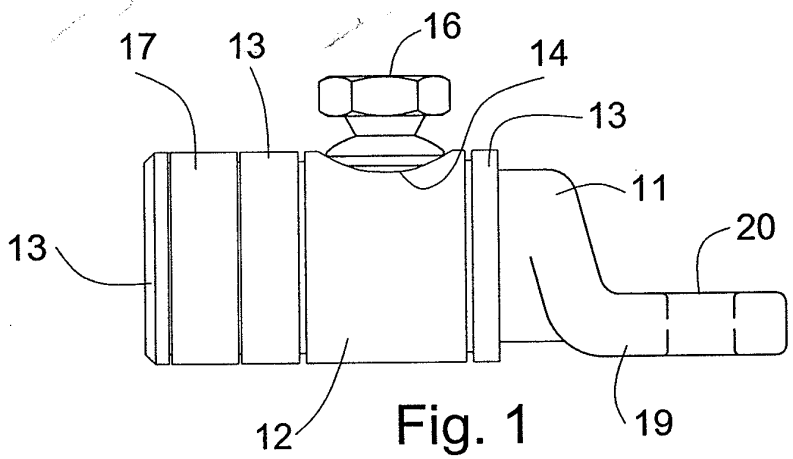

Fig. 1

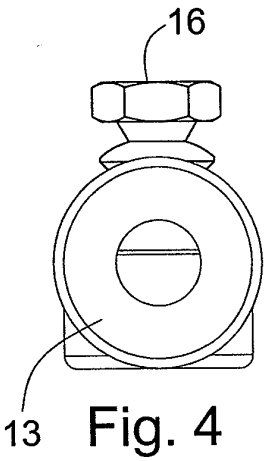

Fig. 4

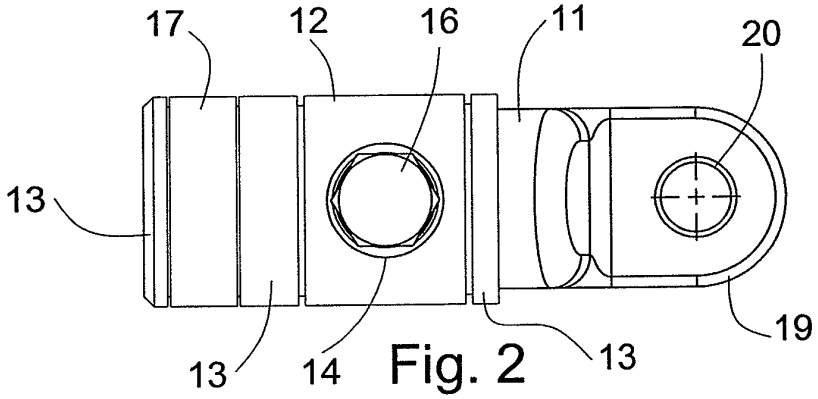

Fig. 2

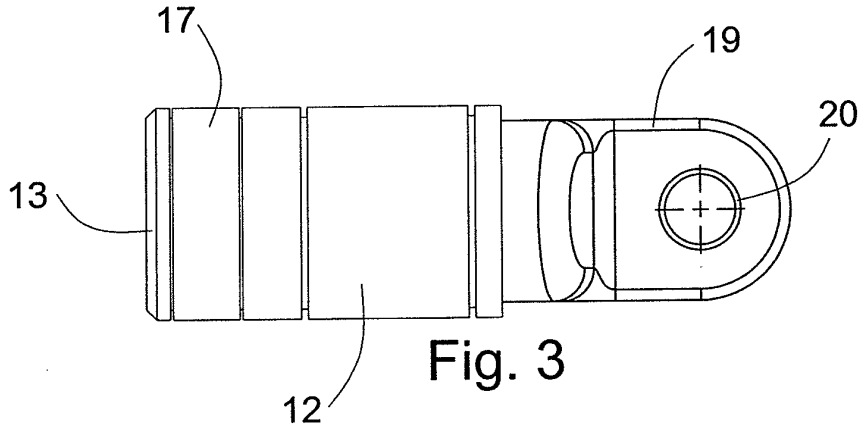

Fig. 3

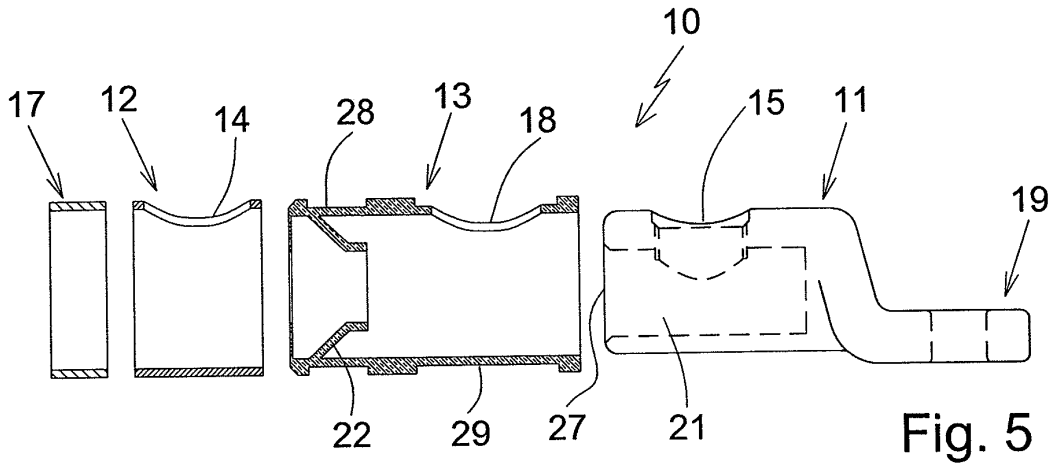

Fig. 5

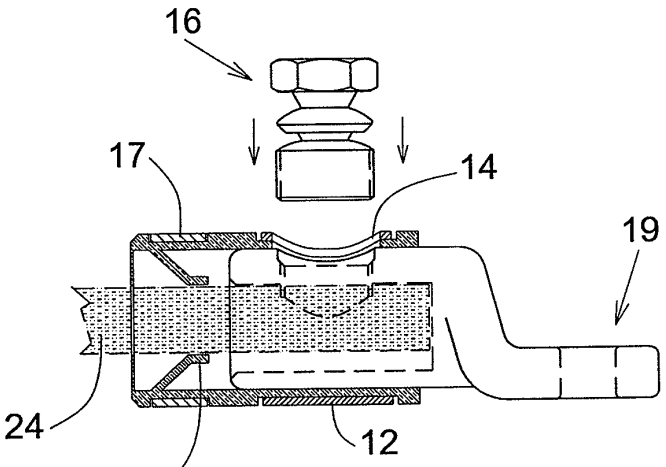

Fig. 6

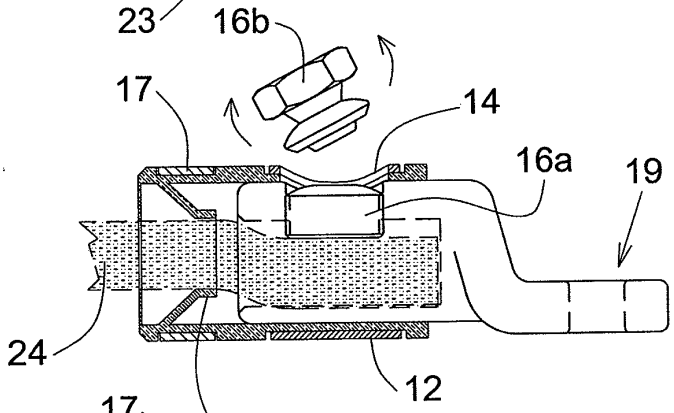

Fig. 7

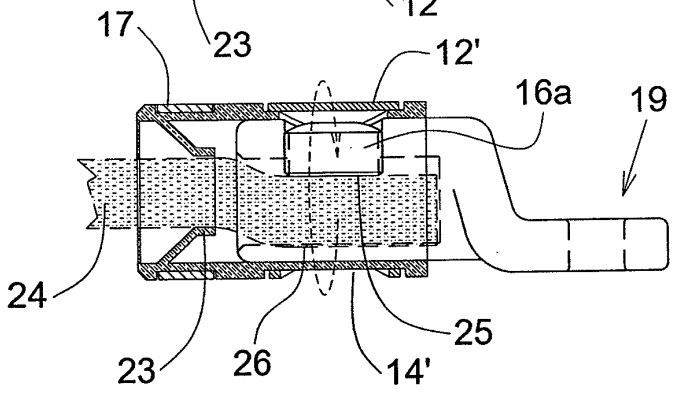

Fig. 8

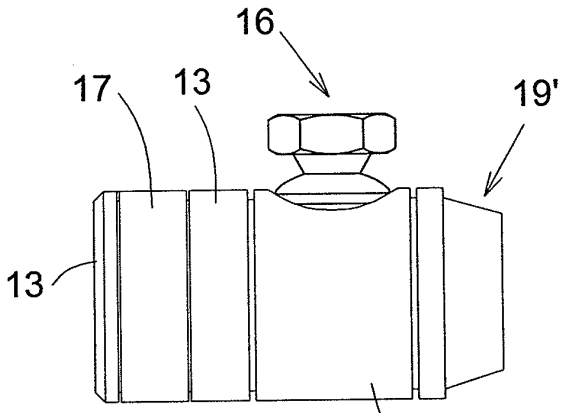

Fig. 9

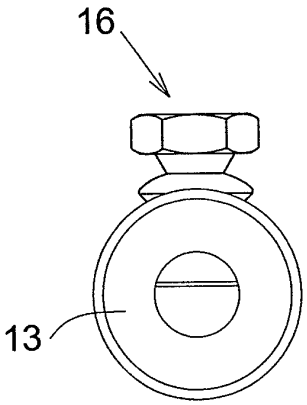

Fig. 12

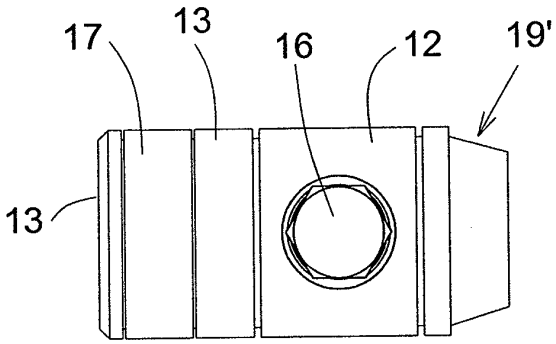

Fig. 10

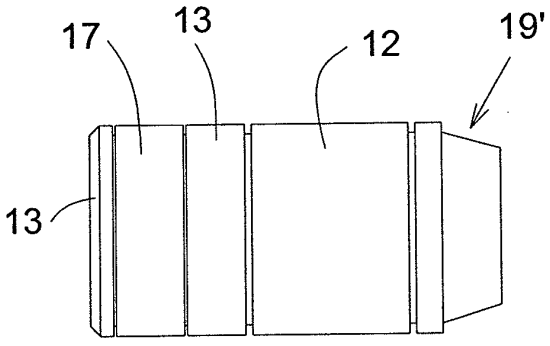

Fig. 11

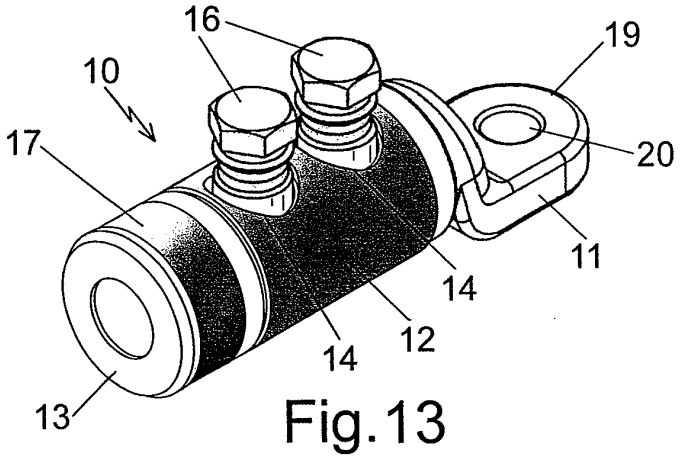

Fig.13

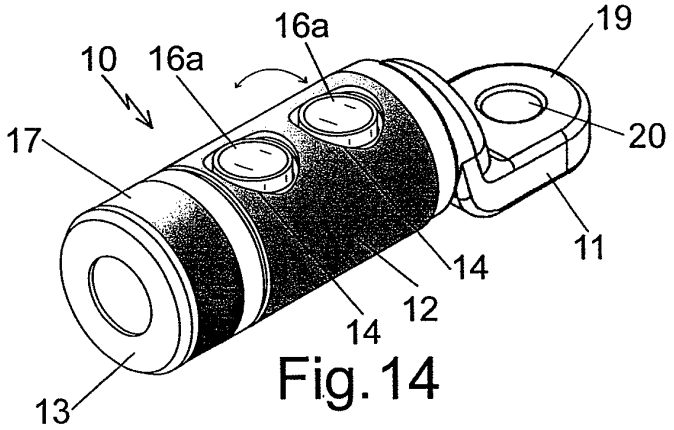

Fig.14

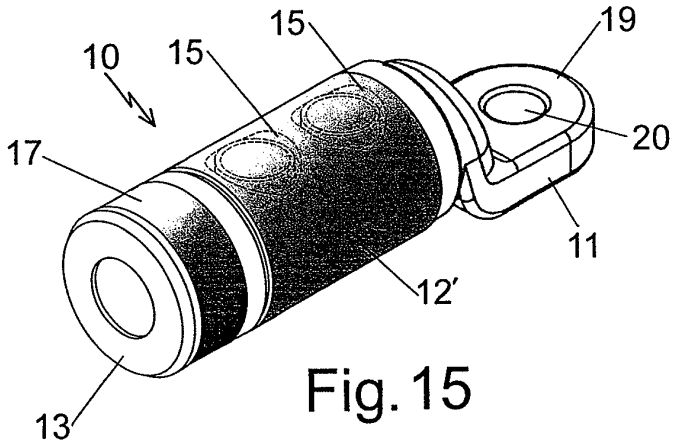

Fig.15

INTERNATIONAL SEARCH REPORT

International application No.
PCT/ES2012/070578

A. CLASSIFICATION OF SUBJECT MATTER

H01R4/30 (2006.01)
H01R4/36 (2006.01)
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H01R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPODOC, INVENES

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3693138 A (PERTUIT JOHN R) 19/09/1972, column 2, lines 9-36; figure 2	1
A	GB 2262396 A (B & H LTD) 16/06/1993, abstract; figures 1-8	1
A	ES 2281291 A1 (RIDELIN S L) 16/09/2007, abstract; figures 5-8	1
A	WO 2009101068 A1 (ABB TECHNOLOGY AG ET AL.) 20/08/2009, abstract;figures 1-6	1

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
25/10/2012	**(07/11/2012)**
Name and mailing address of the ISA/ OFICINA ESPAÑOLA DE PATENTES Y MARCAS Paseo de la Castellana, 75 - 28071 Madrid (España) Facsimile No.: 91 349 53 04	Authorized officer M. Pérez Moreno Telephone No. 91 3498490

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/ES2012/070578

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US3693138 A	19.09.1972	US3818422 A USRE28877 E	18.06.1974 22.06.1976
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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- ES 200502821 **[0003]**
- ES 200600568 **[0003]**
- ES 200600954 **[0003]**
- ES 200602698 **[0003] [0004] [0005]**