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(54) Connector

Steckverbinder

Connecteur

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(56) References cited:
EP-A1- 0 087 267

- **Nexans: "Medium voltage symmetrical separable connectors -Interface C", Catalogue, 31 August 2011 (2011-08-31), pages 1-21, XP055314475, Retrieved from the Internet: URL:http://www.nexans-power-accessories.com/fileadmin/Kataloge/english/Medium_voltage_symmetrical_Interface_C.pdf [retrieved on 2016-10-27]**

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Description

[0001] The invention refers to a connector according to claim 1.

In the state of the art different types of connectors are known. EP 1624537 B1 describes a connector with a predetermined position of a plug opening that is used for connecting the connector to a correspondent electrical contact. If a cable has a larger cross-sectional area and therefore a higher stiffness, it will be difficult to move the cable according to a predetermined position of the contact.

EP 0 087 267 A1 discloses an electrical high-voltage connector and connection assembly. The electrical connector is suitable for use with voltages of 3.3kv and over and comprises a housing moulded from insulating material and defining a body section and a stem projecting therefrom. A tapered socket opens into the body section from one end thereof and is designed to receive a bushing or plug. A conductive terminal is moulded in situ in the housing and has a part exposed at the inner end of the socket to make electrical contact with the plug. The terminal having an exposed part lying between and separating the inner ends of the socket and of the auxiliary socket.

Nexans: "Medium voltage symmetrical separable connectors - Interface C", Catalogue, August 2011 (2011-08), pages 1 to 21, discloses a connector with a housing with a plug opening for receiving an electrical plug with a cable opening for receiving a terminal of a conductor of a cable, wherein a middle axis of the plug opening and a middle axis of the cable opening are disposed in a predetermined angle, wherein the cable opening leads into a chamber, wherein the plug opening passes over via an opening face in the chamber, wherein the chamber is arranged along a longitudinal axis of the cable opening, wherein the chamber extends opposite to the cable opening in the longitudinal axis of the cable opening or with the opening face providing a space beside the opening face for receiving a front part of the terminal wherein the chamber extends opposite to the cable opening and the longitudinal axis of the cable opening over the opening face.

[0002] The object of the invention is to provide a cable connector with a simple design that simplifies an adjustment of the position of the plug opening relative to the cable for receiving an electrical plug.

[0003] The object of the invention is solved by the connector according to claim 1. The connector according to claim 1 has the advantage that the plug opening can be moved relative to the cable. Therefore, it is possible to adjust the position of the housing to the position of a contact without the need to lift or flex the cable in larger amounts.

[0004] This advantage is attained by a chamber within the housing of the connector that is provided for receiving the terminal of a conductor of the cable, whereby the chamber extends opposite to the cable opening and the longitudinal axis of the cable opening over an opening face between the plug opening and the chamber providing space beside the opening face for receiving a front part of the terminal. The chamber extends at least 5mm opposite to the cable opening over the opening face in the housing. Thus it is possible to move the housing relative to the cable. The terminal is provided for connecting an electrical plug in different positions of the housing. This advantage is attained by a terminal that comprises a hole for fixing an electrical contact, whereby the hole is embodied such that different fixing positions of the electric contact along the terminal are possible. A simple embodiment may be a long hole. However, also a series of holes can be arranged in the terminal. The long hole has the advantage that the position of the housing can be used without depending on the predetermined positions as it is the case using several holes in a terminal plate.

[0005] The proposed connector allows a simple adjustment of the position of the plug opening of the housing relative to the cable to receive an electrical plug or a second connector without the need to move the cable.

[0006] Further embodiments of the invention are disclosed in the dependent claims.

[0007] In one embodiment, a simple terminal is provided that can be used for connecting an electrical plug or a second connector in different positions of the housing. This advantage is attained by a terminal that comprises a hole for fixing an electrical contact, whereby the hole is embodied such that different fixing positions of the electric contact along the terminal are possible. A simple embodiment may be a long hole. However, also a series of holes can be arranged in the terminal. The long hole has the advantage that the position of the housing can be used without depending on the predetermined positions as it is the case using several holes in a terminal plate.

[0008] In a further embodiment, one type of cable can be used for different positions of the housing relative to the cable. This advantage is attained by an adaptor section that is fixed to a cable jacket, whereby the adaptor section is at least partially arranged in the cable opening closing the cable opening. The adaptor section has a length that allows different insertion depths of the cable in the cable opening of the housing providing different positions of the plug opening relative to the cable. The adaptor section and the cable opening are embodied in such a way as to seal the introduction of the cable in the connector housing. Therefore, the housing can be positioned in several positions relative to the cable without worsening the sealing and electrical stress control. Furthermore, the needed minimum of the distance between stress cone of adapter and Faraday Cage of the housing is guaranteed.

[0009] In a further embodiment, the connector provides a large distance within which the housing can be moved relative to the cable, wherein the connector has a small size. This advantage is attained by a chamber that protrudes opposite to the cable opening from a shape of the housing. This means that the connector housing itself has a small size with a projecting part for the cham-

ber. Therefore, the chamber extends a large distance from the opening face providing a large distance for moving the terminal and the cable within the housing. As not the whole shape of the connector is enlarged but only a part of the connector projects from the shape that provides the space for the chamber the relative increase of the size of the connector is small. Therefore, only some more material is necessary. This reduces the increase of the costs and the weight of the connector. In a further embodiment, the chamber is covered by an electrical conductive layer forming a Faraday cage. This provides a protection against electrical flashover and improves electrical stress control.

[0010] In a further embodiment, the electrical contact between the terminal and the electrical contact is improved. This advantage is attained by a contact plate that is arranged in the chamber laying on the terminal at the side of the plug opening being in contact with the electrical contact. Thus it is possible to increase a contact surface between the electrical contact and the terminal.

[0011] In a further embodiment, the contact plate has a rectangular shape according to a shape of the terminal and comprises several bores that are arranged for providing several fixing positions of the electrical contact.

[0012] In a further embodiment, the terminal is embodied as a barrel with a palm, whereby the barrel is connected to the conductor of the cable.

[0013] In a further embodiment the contact plate comprises a bar for aligning the contact plate along a longitudinal axis of the terminal. Thus improves the mounting process.

[0014] In a further embodiment a further bar of the contact plate protrudes from a long hole of the terminal, whereby a front face of the further bar is in contact with a further contact of the further plug, and wherein a side face of the contact plate is in contact with the contact. This increases the contact area to the further contact and to the electrical contact. As a result more power can be guided through the terminal without damaging the palm.

[0015] In a further embodiment a hole of the further plate is arranged in an asymmetrical position referring to a longitudinal extension of the further plate. This embodiment allows the use of a long further plate although the distance between the electrical contact and a wall of the chamber is small.

[0016] In a further embodiment a contact face of the terminal and/or the plate comprises an uneven surface or a coating for improving the electrical conductivity.

[0017] The invention will now be explained in more detail with the reference to the figures, in which:

Figure 1 shows a schematic view of a connector, whereby the housing is in a first position relative to the cable,

Figure 2 shows the connector of figure 1, whereby the housing is in a second position relative to the cable and the cable lug to adjust a second position of a second plug,

Figure 3 shows a top view of the connector of figure 1,

Figure 4 shows a schematic view of the terminal,

Figure 5 shows a top view on a contact plate,

Figure 6 shows a side view of the terminal with the contact plate,

Figures 7 to 9 show different positions for connecting two cables using two connectors that have moveable housings, and

Figures 10 to 12 show different positions of connecting a connector to an electrical contact.

Figure 13 shows a further embodiment of the connector.

Figure 14 shows a further embodiment of the electrical contact.

Figure 15 shows a further embodiment of a palm.

Figures 16 to 19 show further embodiments of a contact plate.

Figures 20 to 24 show another embodiment of a contact plate.

Figures 25 to 27 show a further embodiment of a contact plate.

Figure 28 shows a further embodiment of an electrical contact.

Figure 29 shows a further embodiment of the further plate of Figure 18.

Figure 30 shows a further embodiment of the further plate of Figure 19.

[0018] Figure 1 shows a schematic view of a cable connector 1 that comprises a housing 2 that is connected to a cable 9.

[0019] The housing 2 comprises a cable section 10 for introducing a terminal 5 of the cable 9. The terminal 5 may be embodied as a terminal lug. Furthermore, the housing 2 comprises a contact section 11 for receiving a plug 53 that should be connected with a conductor 26 of the cable 9. A longitudinal axis 17 of the contact section 11 is disposed in a predetermined angle referring to a second longitudinal axis 46 of the cable section 10, in this embodiment 90 degrees, disposing the connector 1 as a t-connector. Depending on the used embodiment, the angle between the longitudinal axis of the cable 9

and the longitudinal axis of the housing 2 may be different, for example between 10 degrees and 170 degrees defining a kind of elbow housing.

[0020] The cable section 10 comprises a cable opening 4 that is arranged along the longitudinal second axis 46 of the cable section 10 protruding from the contact section 11. A cross-section of the cable opening 4 may decrease within the contact section 11 to a smaller cross-section. Especially the shape of the cross-section may change from a circular cross-section in the cable section 10 to a rectangular cross-section in the contact section 11. The changeover between the circular cross-section and the rectangular cross-section is performed within a transforming section 12 that is arranged in the contact section 11 of the housing 2. The cable opening 4 emerges in a chamber 6 that is arranged in contact section 11 of the housing 2. The chamber 6 extends along the longitudinal axis of the cable section 10. The chamber 6 is connected to a plug opening 3 via an opening face 14. The plug opening 3 is provided for receiving a plug 53 with a contact 16 that has to be connected to the conductor 26 of the cable 9.

[0021] Opposite to the plug opening 3 a mounting opening 13 is provided in the contact section 10 that is also connected to the chamber 6. The mounting chamber 13 is closed with a further plug 15, preferably a molded part made from epoxy resin with metal inserts depending on the voltage level and a cap. For voltages up to 10 kV or in some cases up to 20 kV, a specially designed cap is used. An electrical contact 16 in the shape of a threaded pin is arranged in the contact section 11, whereby the electrical contact 16 extends from the mounting chamber 13 via the chamber 6 to the plug opening 3 that is a middle axis of the plug opening 3. The electrical contact 16 is connected to a contact of the plug. The electrical contact 16 may be embodied as a bushing contact. The electrical contact 16 is arranged in the axis 17 of the plug opening 3. The chamber 6 extends from the transforming section 12 to an opposite side in an area that is arranged beside the opening face 14. The chamber 6 extends over the opening face 14 to a side face 18 of the housing 2. Depending on the used embodiment, the chamber 6 ends within the housing 2 and provides space 19 beside the opening face 14 opposite to the cable section 10. Depending on the used embodiment, the space 19 extends along the second axis beside the opening face 14, a length of about 200mm, preferably at least 5mm.

[0022] In the shown embodiment, the chamber 6 extends in a projecting part 20 of the housing 2. The projecting part 20 provides a chamber 6 that extends a larger distance referring to the axis 17 of the plug opening 3 compared to an embodiment that does not provide a projecting part 20. The small shape of the housing 2 which is achieved by using a projecting part 20 has the advantage that the size of the connector is small. In comparison with a larger connector, material is saved and the connector is cheaper.

[0023] The cable 9 comprises an outer jacket 21 that is removed from an end section 22 of the cable 9. The outer jacket 21 covers a shielding layer 23 that is folded back in a contact section 24. An adapter 30 is arranged in the cable section. The adapter 30 comprises for example a conductive electrical stress cone 25 and an outer insulating portion 50 in the shape of a cylindrical cover. In the shown embodiment, only one conductor 26 is arranged that is covered by an insulating layer 52. The conductor 26 with the insulating layer 52 is covered by a conductive cable shielding 51. The cable shielding 51 ends in the stress cone 25. Depending on the used embodiment, several conductors may be arranged in a cable 9. A part of the jacket 21 and the folded back shielding layer 23 and also a part of the insulating layer 52 is enclosed in the adapter 30. The adapter 30 is made of an insulating material and comprises preferably a stress cone 25 for reducing electrical stress. The adapter 30 is introduced in the cable opening 4, whereby the material of the cable section 10 and the material of the adapter 30 are constructed in that way that the cable opening 4 is closed by the adapter section 30. The cable section 10 of the housing 2 is made of an elastic and insulating material, for example silicon rubber. The adapter 30 is for example also made of silicon rubber.

[0024] An end-part of the conductor 26 is free from the insulating layer 52 and connected to a terminal 5. The terminal 5 is for example embodied as a lug with a barrel 28 and a palm 29. Depending on the used embodiment, the terminal 5 can also be embodied in other shapes. The conductor 26 is mechanically fixed to the barrel 28 and electrically connected to the barrel 28 and the palm 29.

[0025] The palm 29 extends in the chamber 6 and lays with a front end 31 at an inner face 47 of the projecting part 20. This means that the position of the contact section 11 is at a nearest position referring to the position of the cable 9. The electrical contact 16 is mechanically fixed i.e. by a nut 32 to the palm 29. A contact plate 33 may be arranged between the palm 29 and the plug opening 3. Therefore, the electrical contact 16 is mechanically and electrically connected to the palm 29. In the shown embodiment, the palm 29 is embodied as a plate and comprises a long hole 34 through that the electrical contact 16 is guided. An inner section 48 of the cable opening 4 and the chamber 6 are covered by a conductive layer 35 providing a Faraday cage.

[0026] A plug 53 is introduced in the plug opening 3. The plug 53 comprises an insulating part 56 with a cone shape that is fit in the plug opening 3. In the insulating part 56 a further electrical contact 54 is arranged. The further electrical contact 54 is constructed as a pin with a sleeve 57 at its end with or without a thread. The sleeve 57 receives the electrical contact 16. The electrical contact 16 is fixed to or at least in contact with the further electrical contact 54. The electrical contact 16 may be constructed as a pin with a thread. In this embodiment, the electrical contact 16 is screwed to the further electrical contact 54. In a simple embodiment the electrical contact

16 is only pushed in the sleeve 57 of the further contact 54 and connected by a press fit connection with the further contact 54. The plug 53 comprises electrical lines that are connected to the further contact 54, but not shown in figure 1.

[0027] Figure 2 shows the connector 1 of figure 1, whereby the contact section 11 is arranged in a furthermost position referring to the cable 9. The difference between the two positions of figure 1 and figure 2 are shown in figure 2 by means of an arrow A. Due to the chamber 6 and due to the terminal 27 with the possibility to fix the electrical contact 16 in several different positions it is possible to change the position of the plug opening 3 referring to the position of the cable 9 and the palm 29. Therefore, it is possible to adjust the position of the plug opening 3 depending on the position of the electrical plug.

[0028] The adapter 30 overlaps in Fig. 1 and 2 with the conductive layer 35 of the inner section 48. Preferably the adapter 30 is constructed to provide the necessary electrical functions for example the stress control and the minimum distance of stress cone to the end of conductive layer 35 of the Faraday cage.

[0029] Figure 3 shows a top view of the connector 1 of figure 2. As can be seen, the housing 2 has a small shape, whereby a projecting part 20 projects the shape of the housing 2.

[0030] Figure 4 depicts the terminal 5 in the shape of the barrel 28 and the palm 29, whereby the palm 29 comprises a long hole 34, which is shown in more detail.

[0031] Figure 5 depicts a preferred embodiment of the contact plate 33 comprising several bores 36. Instead of the embodiment of the contact plate 33 shown in figure 5, the contact plate 33 can also be embodied as a simple ring plate as shown in figures 1 and 2.

[0032] Figure 6 shows the contact plate 33 disposed on the palm 29 and between the palm 29 and the plug 53. In this embodiment, the electrical contact 16 can be connected in three different positions that are determined by the bores 36 of the contact plate 33. Another plate 60 is arranged between the palm 29 and the nut 32.

[0033] Figure 7 shows a connector 1 as described in figures 1 and 2 and a second connector 40 that is embodied in the same structure as the connector 1 but comprises instead of a contact section with a plug opening 3 a second contact section 41 with a plug 42. The second contact section 42 of the second connector 40 is moveable referring to a second cable 43 in the same way as the contact section 11 referring to the cable 9. The plug 42 comprises a hole 44 for receiving the contact 16 of the connector 1. In the situation shown in Figure 7, the cables 9, 43 are fixed and cannot be pulled nearer to the other cable.

[0034] Figure 8 shows a solution for connecting the cables 9, 43. The connector 1 and the second connector 40 are moved relative to their cables 9, 43 as depicted by arrows. Then, as shown in figure 9, the two connectors can be mounted by bending the cables 9, 43. Figure 9 shows further steps for connecting the electrical contacts of the first and the second connector.

[0035] Figures 10 to 12 show different steps for connecting the connector 1 with a fixed contact 44 that is part of a substation 45. Figure 11 shows that the connector 1 is moved up relative to the cable 9. Figure 12 shows that the connector 1 is mounted to the fixed contact by bending the cable 9.

[0036] Figure 13 shows a partial view of a further embodiment of the connector with an electrical contact 16 that comprises a contact plate 33 that is fixed to the electrical contact 16. The contact comprises a thread 55 at a first end. At the first end, the nut 32 is screwed onto the thread 55. The opposite end of the electrical contact 16 is received by the further contact 54 of the plug 53.

[0037] Figure 14 shows the electrical contact 16 that is embodied as a pin with the fixed contact plate 33. The contact plate 33 may be one piece with the electrical contact 16 or in a further fixed by a thread with the pin of the electrical contact.

[0038] Figure 15 shows a third embodiment of a barrel 28 and a palm 29, whereby the palm 29 comprises two long holes 34. This embodiment has the advantage that it is possible to adjust the position of the cable referring to a further contact within the distance of the two long holes 34. Furthermore, a contact area between the palm 29 and a further contact may be larger since a larger contact area is available between the palm 29 and the contact plate 33.

[0039] Figure 16 shows a partial view of a third embodiment, whereby a plug 53 with a further contact 54 that is constructed as a sleeve with a thread on its inner face is arranged within the plug opening of the housing that is not depicted. An electrical contact 16 embodied as a threaded pin is screwed in the further contact 54. Between the palm 29 and a contact face 58 of the further contact 54 a further plate 59 is arranged. Opposite to the further plate 59 the nut 32 is screwed on the electrical contact 16 fixing the electrical contact 16 to the palm 29. Between the nut 32 and the palm 29, another plate 60 is arranged. The another plate 60 may have the shape of a ring plate.

[0040] The further plate 59 comprises two parallel bars 61 that protrude in the long hole 34. The bars 61 are used for aligning the further plate 59 along a longitudinal axis of the palm 29.

[0041] Figure 17 depicts a cross-sectional view A-A of figure 16. In this view it is shown that the bars 61 are arranged in parallel and that the bars 61 have a length that is a bit shorter than the width of the long hole 34. Depending on the used embodiment, only one bar 61 may be sufficient to align the further plate 59 along the longitudinal axis of the long hole 34. The further plate 59 is depicted with a dashed line and has the same width as the palm 29. The further plate 59 has a basically rectangular shape. The contact face 58 has a ring-shape that encircles the circular cross-section of the first contact 16. The further plate 59 increases the contact area between the contact face 58 and the palm 29. As a result

of the long hole 34 the contact area between the contact face 58 and the palm 29 is reduced without using the further plate 59. The further plate increases the contact area so that a high current can be guided via the palm 29 and the contact 16 to the further contact 54.

[0042] Figure 18 shows three different views of the further contact plate 59 with the bars 61 and the hole 62. Figure 19 shows a further embodiment of the further contact plate 59, whereby the bars 61 are arranged at opposite sides of the further plate 59, encompassing in a mounted position opposite long sides of the palm 29. Also these bars 61 can be used for aligning the further plate 59.

[0043] Figure 20 shows another embodiment with a fourth plate 63 that is arranged between the contact face 58 of the further contact 54 and the nut 32 or a further plate 60 that is arranged between the nut 32 and the fourth plate 63. The fourth plate 63 comprises further bars 64 that protrude through the long hole 34 of the palm 29.

[0044] Figure 21 shows a cross-sectional view A-A of figure 20, showing the cross-sectional area of the further bars 64 that protrude the long-hole 34 as a lined area.

[0045] Figure 22 shows a top-view on the fourth plate 63 with the further bars 64.

[0046] Figure 23 shows a side-view of the fourth plate 63.

[0047] Figure 24 shows the perspective view of the fourth plate 64 that comprises a rectangular base plate 65 with two further bars 64 that are arranged on opposite sides of the hole 62. The further bars 64 comprise inner faces 66 that have a part circular shape as the circular shape of the hole 62 for receiving the contact 16.

[0048] Figure 25 shows a top view of a further embodiment of the fourth plate 63 that comprises at opposite sides two guiding bars 61 that encompass in a mounted position long sides of the palm 29, as shown in figure 26. The guiding bars 66 increase the contact face between the fourth plate 63 and the palm 29.

[0049] Figure 27 shows a perspective view of the fourth plate 63 of Figure 25.

[0050] Figure 28 shows a third embodiment, whereby the electrical contact 16 is embodied as a pin with a plate 33 as shown in figure 14. The electrical contact 16 comprises a thread 55 and is guided through the long hole 34 of the palm 29. The contact 16 is fixed to the palm 29 by a nut 32 that comprises studs 67. The studs 67 protrude in the long hole 34 and prevent a rotation of the nut 32. In this embodiment the electrical contact 16 is fixed in the palm 29 by screwing the electrical contact 16 in the nut 32.

[0051] The faces of the palm 29, the contact plate 33, the further plates 59, 63 and the contact face 58 that are used as electrical contact areas for transmitting current from one part to another comprise an unevenness surface that improves the electrical contact between the contact surfaces. The unevenness may be attained by scratches or fractions or heights. The uneven surface provides a larger area for increasing the contact face conductivity. In a further embodiment, additionally or instead of the uneven surface, coatings, for example made of silver, may be used to improve the surface conductivity between the parts.

[0052] Figure 29 shows a further embodiment of the further plate 59 of Figure 18. In this embodiment, the hole 62 is not arranged in the middle between the two bars 61, which is defined by a middle axis 70. Similar to the principle shown in figure 15 there could be more than one hole 62 or a long hole.

[0053] Figure 30 shows a further embodiment of the further plate 59 of Figure 19, whereby the hole 62 is not arranged in the middle which is defined by the middle axis. The asymmetrical position of the hole 62 has the advantage that a relatively long further plate 59 can be used although the distance of the mounted contact 16 referring to a side wall of the chamber 6 is small. Thus, the contact face is increased.

Reference list

[0054]

1	connector
2	housing
3	plug opening
4	cable opening
5	terminal (lug)
6	chamber
9	cable
10	cable section
11	contact section
12	transforming section
13	mounting chamber
14	opening face
15	further plug
16	electrical contact
17	axis
18	side face
19	space
20	projecting part
21	jacket
22	end section
23	shielding layer
24	contact section
25	stress cone
26	conductor
28	barrel
29	palm
30	adapter
31	front end
32	nut
33	contact plate
34	long hole
35	conductive layer
36	bore

40 2nd connector
41 2nd contact section
42 plug
43 2nd cable
44 hole
45 substation
46 second axis
47 inner face
48 inner section
50 insulating portion
51 cable shielding
52 insulating layer
53 plug
54 further contact
55 thread
56 insulating part
58 contact face
59 further plate
60 another plate
61 bar
62 hole
63 4. plate
64 further bar
65 base plate
66 inner face
67 stud
70 middle axis

Claims

1. Connector (1) with a housing (2) with a plug opening (3) for receiving an electrical plug (53), with a cable opening (4) for receiving a terminal (5) of a conductor (26) of a cable (9), whereby a middle axis (17) of the plug opening (3) and a middle axis (46) of the cable opening (4) are disposed in a predetermined angle, whereby the cable opening (4) leads in a chamber (6),
whereby the plug opening (3) passes over via an opening face (14) in the chamber (6), whereby the chamber (6) is arranged along a longitudinal axis of the cable opening (4), whereby the chamber (6) extends opposite to the cable opening (4) in the longitudinal axis (46) of the cable opening (4) over the opening face (14) providing a space (19) beside the opening face (14) for receiving a front part of the terminal (5), whereby the chamber (6) extends opposite to the cable opening (4) in the longitudinal axis (46) of the cable opening (4) over the opening face (14) at least 5mm,
whereby the terminal (5) is arranged in the chamber (6),
whereby the terminal (5) comprises:

at least one hole (34,36) for guiding an electrical contact (16), whereby the at least one hole is embodied as a long hole (34), wherein the long hole (34) allows different fixing positions of the electrical contact (16) along the terminal (5), or at least two holes (36) for guiding an electrical contact (16), whereby the at least two holes (36) are embodied such that different positions of the electrical contact (16) are provided along the terminal (5).

2. Connector according to claim 1, whereby the chamber (6) protrudes opposite to the cable opening (4) from a shape of the housing (2) providing a projection part (20).

3. Connector according to claim 1 or 2, whereby the cable (9) comprises an adapter (30) that encompasses a cable jacket (21), whereby the adapter (30) is at least partially arranged in the cable opening (4) closing the cable opening (4), whereby the adapter (30) has a length that allows different insertion depths of the cable in the cable opening (4) of the housing (2).

4. Connector according to any one of the preceding claims, whereby the chamber (6) is covered by an electrical conductive layer (35) forming a Faraday cage.

5. Connector according to any one of the preceding claims, whereby a contact plate (33) is arranged in the chamber (6) lying on the terminal (5) adjacent to an opening face (14) of the plug opening (3).

6. Connector according to claim 5, wherein the plate (33) has a rectangular shape according to a shape of the terminal and comprises more than one bore (36), or long holes or any other kind of opening that are arranged for providing several positions of the electrical contact (16).

7. Connector according to one of the preceding claims, whereby the terminal (5) is embodied as a barrel (28) with a palm (29), whereby the barrel (28) is connected to the conductor (26) of the cable (9).

8. Connector according to one of the preceding claims, whereby the contact element (16) is a contact pin with a fixed contact plate (33).

9. Connector according to one of claims 5 to 8, whereby the contact plate (59) comprises a bar (61) for aligning the contact plate (59) along a longitudinal axis of the terminal (29).

10. Connector according to one of claims 5 to 9, whereby a further bar (64) of the contact plate (63) protrudes from a long hole (34) of the terminal (5, 29), whereby a front face of the further bar (64) is in contact with a further contact (54) of the further plug (53), and

wherein a side face (66) of the contact plate (63) is in contact with the contact (16).

11. Connector according to one of claims 5 to 10, wherein one or more holes (62) of the further plate (52) are arranged in an asymmetrical position referring to a longitudinal extension of the further plate (59).

12. Connector according to one of the preceding claims, whereby a contact face of the terminal and/or the plate (33, 59, 63) comprise an uneven surface or a coating for improving the electrical conductivity.

Patentansprüche

1. Verbinder (1) mit einem Gehäuse (2) mit einer Steckeröffnung (3) zum Aufnehmen eines elektrischen Steckers (53), mit einer Kabelöffnung (4) zum Aufnehmen eines Anschlusses (5) eines Leiters (26) eines Kabels (9), wobei eine Mittelachse (17) der Steckeröffnung (3) und eine Mittelachse (46) der Kabelöffnung (4) in einem vorgegebenen Winkel angeordnet sind, wobei die Kabelöffnung (4) in eine Kammer (6) führt, wobei die Steckeröffnung (3) über eine Öffnungsfläche (14) in die Kammer (6) übergeht, wobei die Kammer (6) in Richtung einer Längsachse der Kabelöffnung (4) angeordnet ist, wobei sich die Kammer (6) gegenüber der Kabelöffnung (4) in Richtung der Längsachse (46) der Kabelöffnung (4) über die Öffnungsfläche (14) erstreckt, wobei ein Raum (19) neben der Öffnungsfläche (14) zum Aufnehmen eines Vorderteils des Anschlusses (5) vorgesehen ist, wobei sich die Kammer (6) gegenüber der Kabelöffnung (4) in Richtung der Längsachse (46) der Kabelöffnung (4) mindestens 5 mm über die Öffnungsfläche (14) erstreckt, wobei der Anschluss (5) in der Kammer (6) angeordnet ist und wobei der Anschluss (5) Folgendes umfasst:

mindestens eine Öffnung (34, 36) zum Führen eines elektrischen Kontakts (16), wobei die mindestens eine Öffnung als eine lange Öffnung (34) ausgebildet ist, wobei die lange Öffnung (34) verschiedene Befestigungspositionen des elektrischen Kontakts (16) am Anschluss (5) erlaubt, oder
mindestens zwei Öffnungen (36) zum Führen eines elektrischen Kontakts (16), wobei die mindestens zwei Öffnungen (36) so ausgebildet sind, dass verschiedene Positionen des elektrischen Kontakts (16) am Anschluss (5) vorgesehen sind.

2. Verbinder nach Anspruch 1, wobei die Kammer (6) gegenüber der Kabelöffnung (4) aus einer Form des Gehäuses (2) vorsteht und einen vorstehenden Teil (20) bereitstellt.

3. Verbinder nach Anspruch 1 oder 2, wobei das Kabel (9) einen Adapter (30) aufweist, der einen Kabelmantel (21) einschließt, wobei der Adapter (30) mindestens teilweise in der Kabelöffnung (4) angeordnet ist und die Kabelöffnung (4) verschließt, wobei der Adapter (30) eine Länge hat, die verschiedene Eindringtiefen des Kabels in die Kabelöffnung (4) des Gehäuses (2) ermöglicht.

4. Verbinder nach einem der vorhergehenden Ansprüche, wobei die Kammer (6) mit einer elektrisch leitenden Schicht (35) bedeckt ist, die einen Faraday'schen Käfig bildet.

5. Verbinder nach einem der vorhergehenden Ansprüche, wobei eine Kontaktplatte (33) in der Kammer (6) angeordnet ist, die auf dem Anschluss (5) neben einer Öffnungsfläche (14) der Steckeröffnung (3) liegt.

6. Verbinder nach Anspruch 5, wobei die Platte (33) eine rechteckige Form entsprechend einer Form des Anschlusses hat und mehr als eine Bohrung (36) oder lange Öffnungen oder eine andere Art von Öffnung umfasst, die angeordnet sind, um mehrere Positionen des elektrischen Kontakts (16) vorzusehen.

7. Verbinder nach einem der vorhergehenden Ansprüche, wobei der Anschluss (5) als ein Zylinder (28) mit einem Anschluss (29) ausgebildet ist, wobei der Zylinder (28) mit dem Leiter (26) des Kabels (9) verbunden ist.

8. Verbinder nach einem der vorhergehenden Ansprüche, wobei das Kontaktelement (16) ein Kontaktstift mit einer festen Kontaktplatte (33) ist.

9. Verbinder nach einem der Ansprüche 5 bis 8, wobei die Kontaktplatte (59) einen Stab (61) zum Ausrichten der Kontaktplatte (59) auf eine Längsachse des Anschlusses (29) umfasst.

10. Verbinder nach einem der Ansprüche 5 bis 9, wobei ein weiterer Stab (64) der Kontaktplatte (63) aus einer langen Öffnung (34) des Anschlusses (5, 29) vorsteht, wobei eine Vorderseite des weiteren Stabs (64) in Kontakt mit einem weiteren Kontakt (54) des weiteren Steckers (53) ist und wobei eine Seitenfläche (66) der Kontaktplatte (63) in Kontakt mit dem Kontakt (16) ist.

11. Verbinder nach einem der Ansprüche 5 bis 10, wobei eine oder mehrere Öffnungen (62) der weiteren Platte (52) in einer in Bezug auf eine Längsausdehnung der weiteren Platte (59) asymmetrischen Position angeordnet sind.

12. Verbinder nach einem der vorhergehenden Ansprü-

che, wobei eine Kontaktfläche des Anschlusses und/oder die Platte (33, 59, 63) eine unebene Oberfläche oder eine Beschichtung zum Verbessern der spezifischen elektrischen Leitfähigkeit umfassen.

Revendications

1. Connecteur (1) pourvu d'un boîtier (2) pourvu d'une ouverture (3) pour fiche destinée à recevoir une fiche électrique (53), pourvu d'une ouverture (4) pour câble destinée à recevoir une cosse (5) d'un conducteur (26) d'un câble (9), un axe médian (17) de l'ouverture (3) pour fiche et un axe médian (46) de l'ouverture (4) pour câble formant entre eux un angle prédéfini, l'ouverture (4) pour câble menant dans une chambre (6), l'ouverture (3) pour fiche passant par-delà via une face (14) d'ouverture dans la chambre (6), la chambre (6) étant agencée suivant un axe longitudinal de l'ouverture (4) pour câble, la chambre (6) s'étendant à l'opposé de l'ouverture (4) pour câble dans l'axe longitudinal (46) de l'ouverture (4) pour câble par-delà la face (14) d'ouverture pour ménager un espace (19) à proximité de la face (14) d'ouverture destiné à recevoir une partie avant de la cosse (5), la chambre (6) s'étendant à l'opposé de l'ouverture (4) pour câble dans l'axe longitudinal (46) de l'ouverture (4) pour câble par-delà la face (14) d'ouverture d'au moins 5 mm,
la cosse (5) étant agencée dans la chambre (6),
la cosse (5) comprenant :

au moins un trou (34, 36) destiné à guider un contact électrique (16), l'au moins un trou étant réalisé sous la forme d'un long trou (34), le long trou (34) permettant différentes positions de fixation du contact électrique (16) le long de la cosse (5), ou
au moins deux trous (36) destinés à guider un contact électrique (16), les au moins deux trous (36) étant réalisés de manière à procurer différentes positions du contact électrique (16) le long de la cosse (5).

2. Connecteur selon la revendication 1, la chambre (6) faisant saillie, à l'opposé de l'ouverture (4) pour câble, à partir d'une forme du boîtier (2) procurant une partie en saillie (20).

3. Connecteur selon la revendication 1 ou 2, le câble (9) comprenant un adaptateur (30) qui englobe une gaine (21) de câble, l'adaptateur (30) étant agencé au moins en partie dans l'ouverture (4) pour câble pour obturer l'ouverture (4) pour câble, l'adaptateur (30) présentant une longueur permettant différentes profondeurs d'introduction du câble dans l'ouverture (4) pour câble du boîtier (2).

4. Connecteur selon l'une quelconque des revendications précédentes, la chambre (6) étant couverte d'une couche conductrice électrique (35) formant une cage de Faraday.

5. Connecteur selon l'une quelconque des revendications précédentes, une plaque de contact (33) étant agencée dans la chambre (6) pour reposer sur la cosse (5) en position adjacente à une face (14) d'ouverture de l'ouverture (3) pour fiche.

6. Connecteur selon la revendication 5, la plaque (33) présentant une forme rectangulaire conforme à une forme de la cosse et comprenant plus d'un alésage (36), ou de longs trous ou tout autre type d'ouverture agencés pour procurer plusieurs positions du contact électrique (16).

7. Connecteur selon l'une des revendications précédentes, la cosse (5) étant réalisée sous la forme d'un fût (28) pourvu d'une palme (29), le fût (28) étant raccordé au conducteur (26) du câble (9).

8. Connecteur selon l'une des revendications précédentes, l'élément de contact (16) étant une broche de contact pourvue d'une plaque de contact fixe (33).

9. Connecteur selon l'une des revendications 5 à 8, la plaque de contact (59) comprenant une barre (61) destinée à aligner la plaque de contact (59) suivant un axe longitudinal de la cosse (29).

10. Connecteur selon l'une des revendications 5 à 9, une barre supplémentaire (64) de la plaque de contact (63) faisant saillie à partir d'un long trou (34) de la cosse (5, 29), une face avant de la barre supplémentaire (64) étant au contact d'un contact supplémentaire (54) de la fiche supplémentaire (53), et une face latérale (66) de la plaque de contact (63) étant au contact du contact (16).

11. Connecteur selon l'une des revendications 5 à 10, un ou plusieurs trous (62) de la plaque supplémentaire (52) étant agencés en position asymétrique par rapport à un prolongement longitudinal de plaque supplémentaire (59).

12. Connecteur selon l'une des revendications précédentes, une face de contact de la cosse et/ou la plaque (33, 59, 63) comprenant une surface irrégulière ou un revêtement visant à améliorer la conductivité électrique.

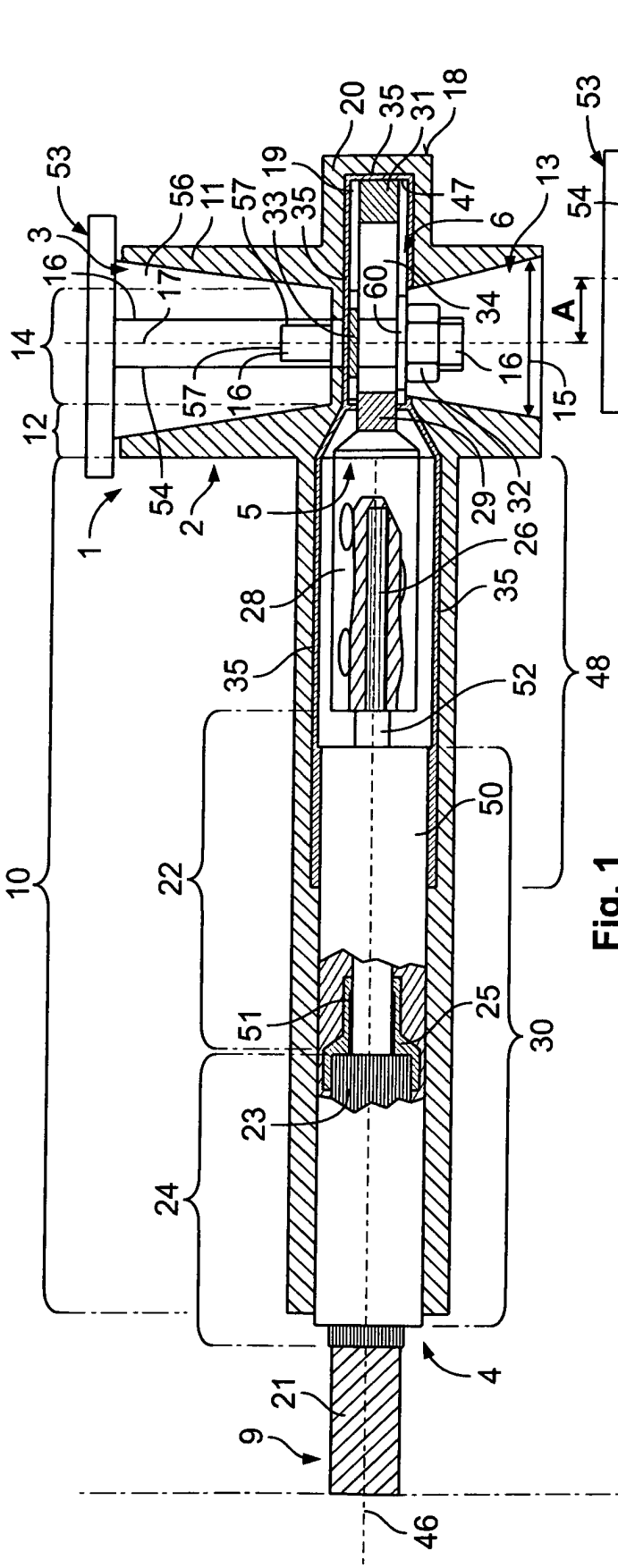

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Fig. 1

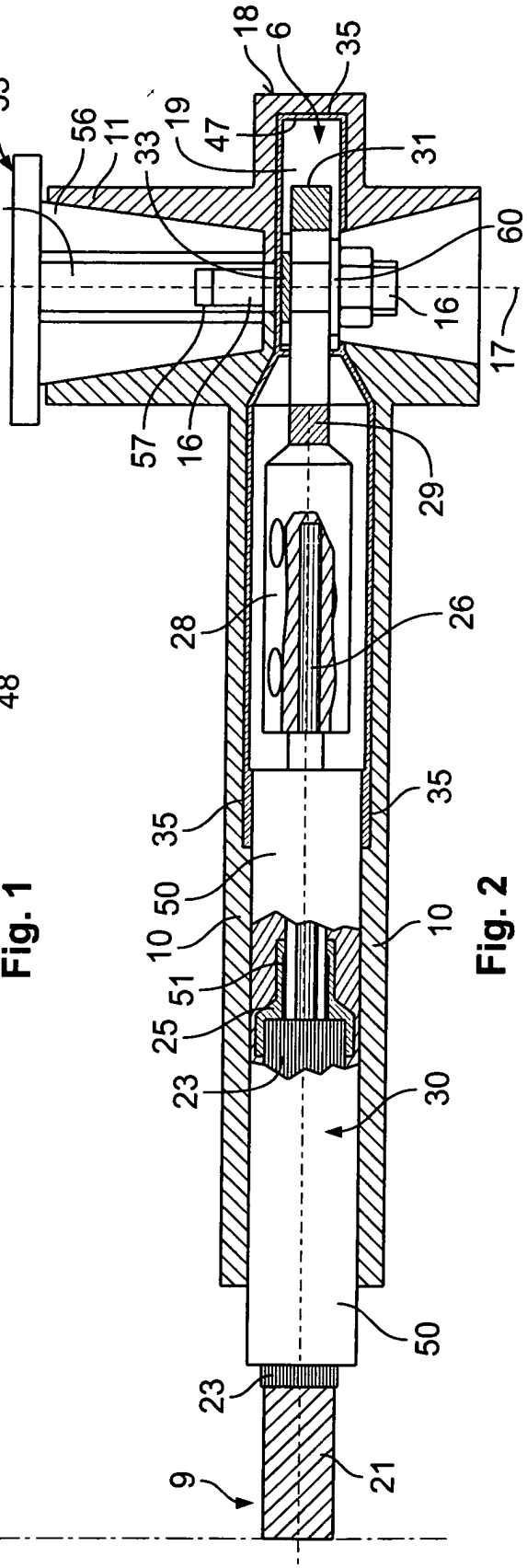

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Fig. 2

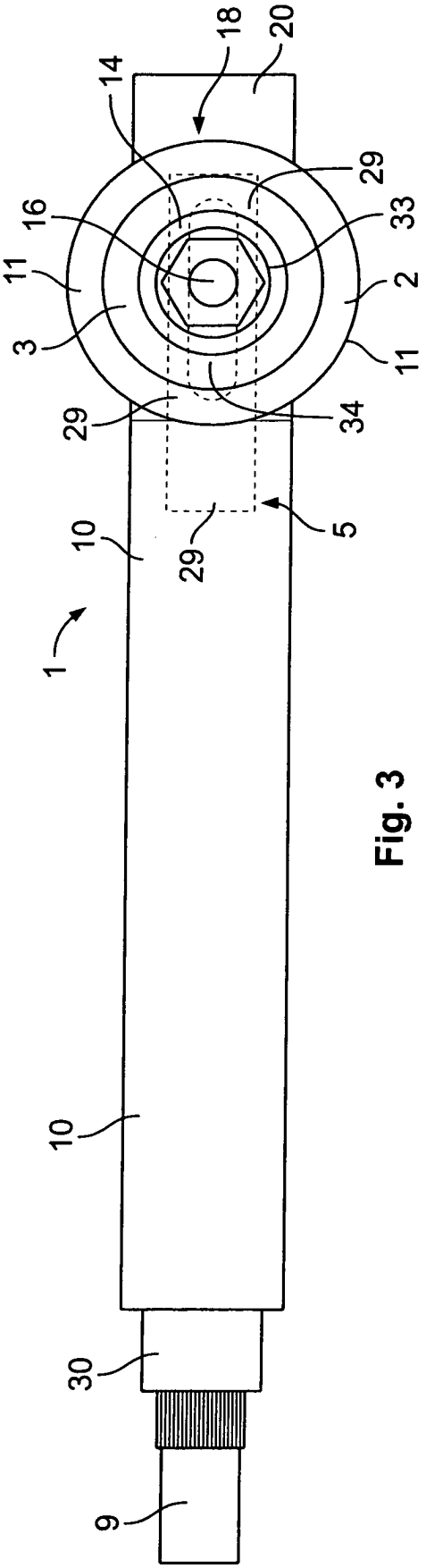


Fig. 3

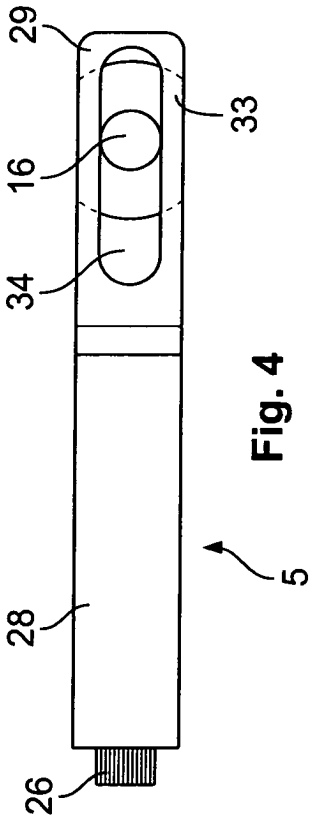


Fig. 4

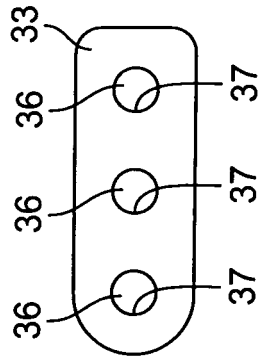


Fig. 5

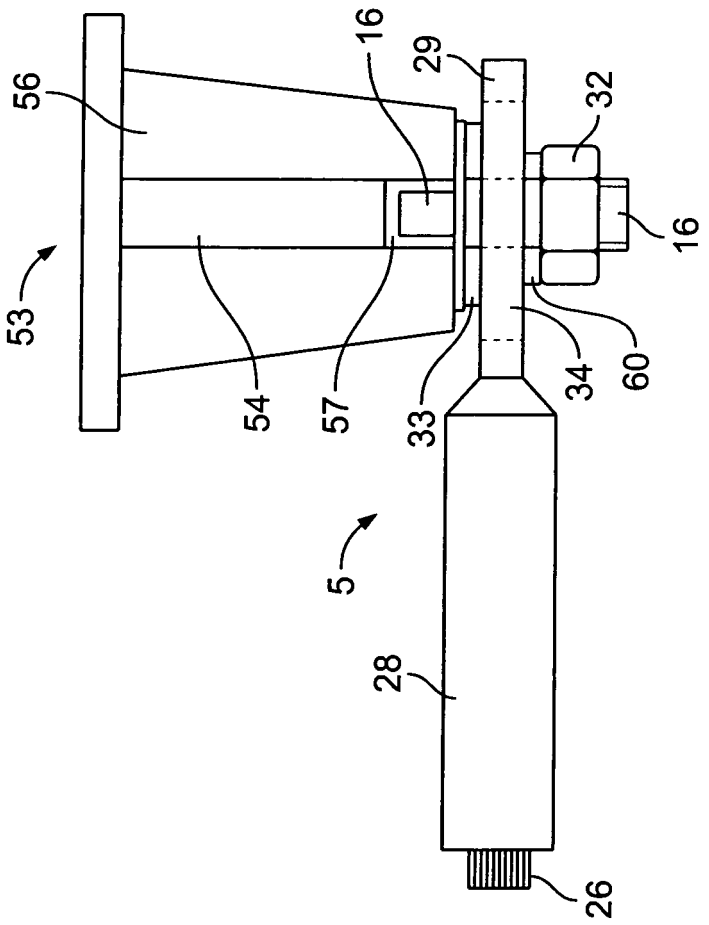


Fig. 6

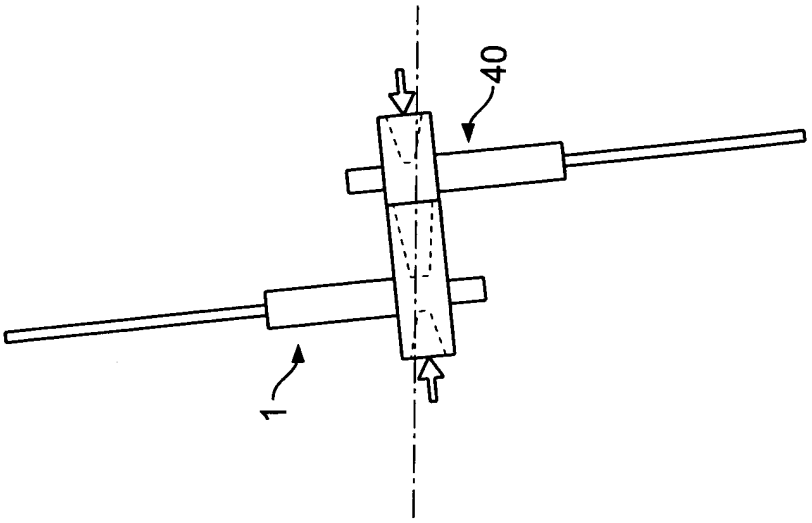


Fig. 9

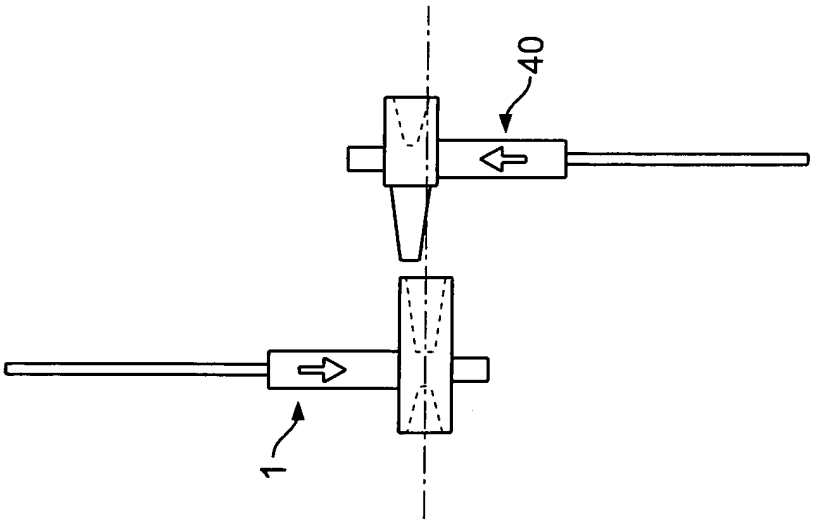


Fig. 8

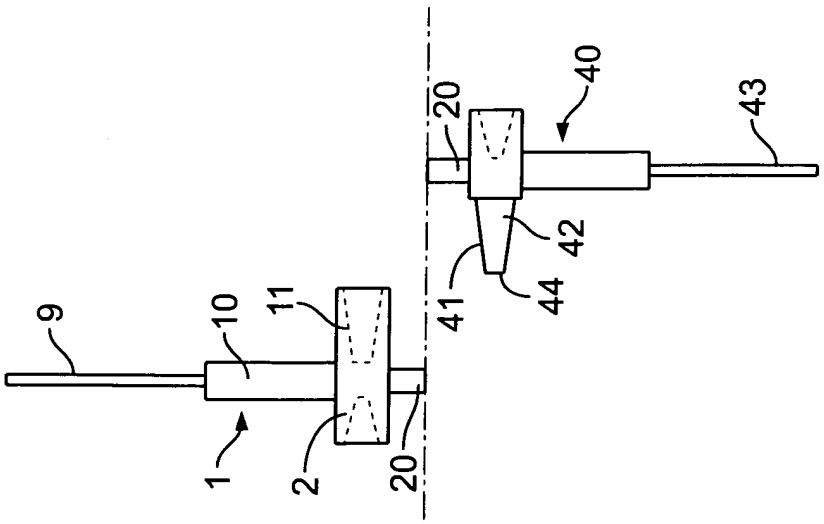


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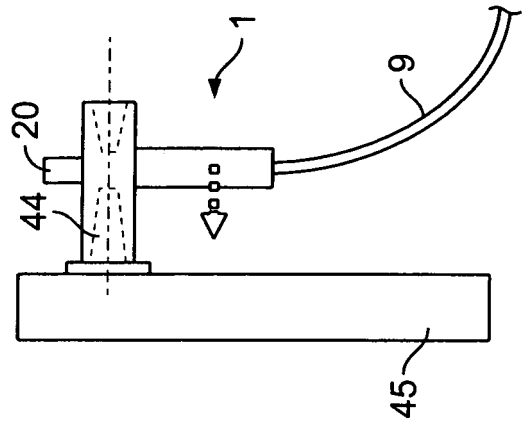


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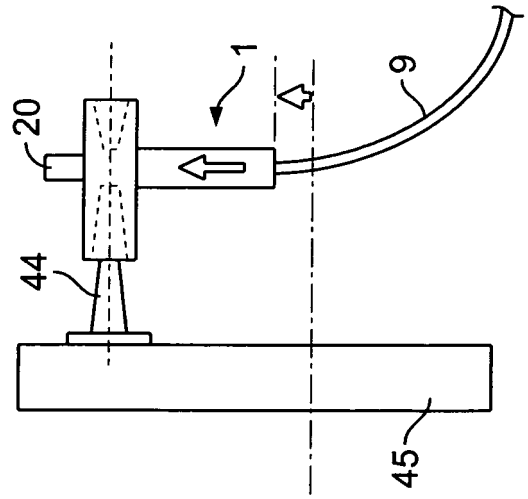


Fig. 11

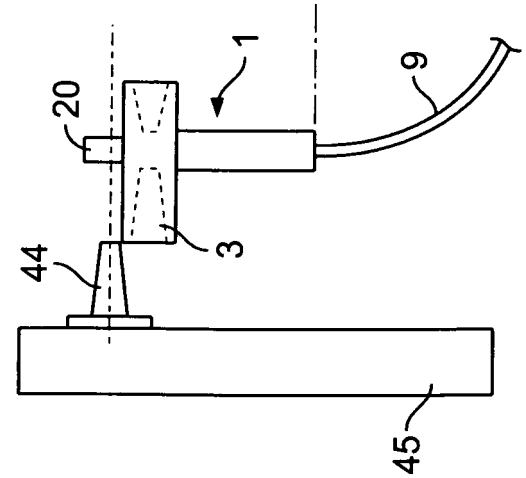


Fig. 10

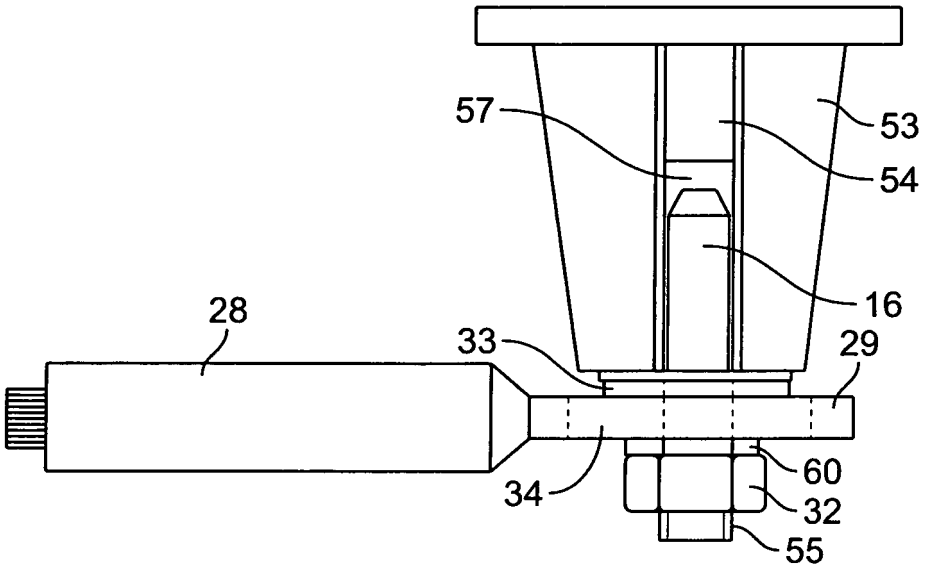


Fig. 13

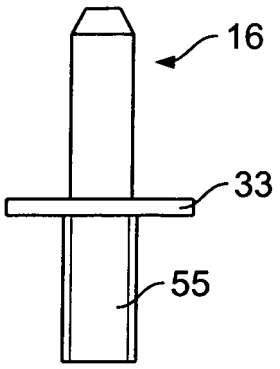


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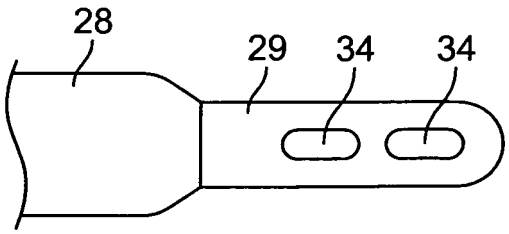


Fig. 15

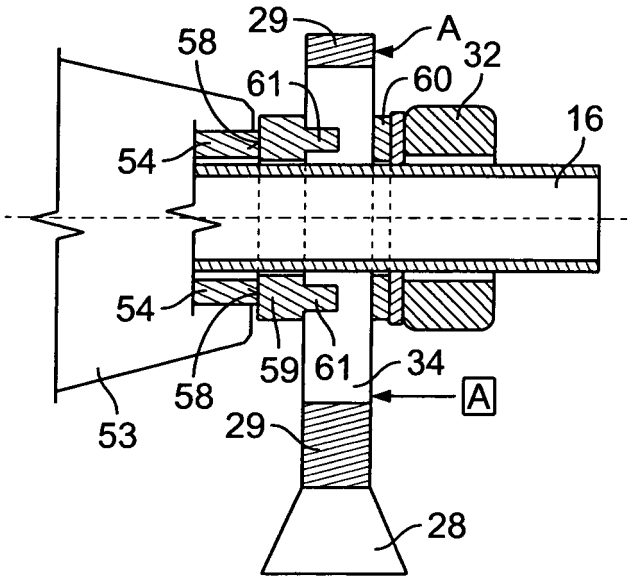


Fig. 16

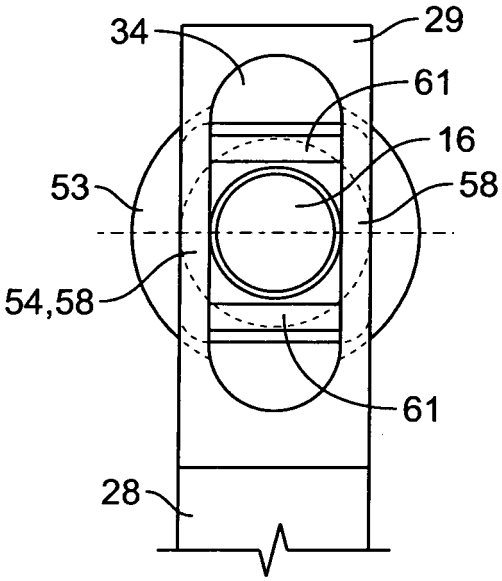


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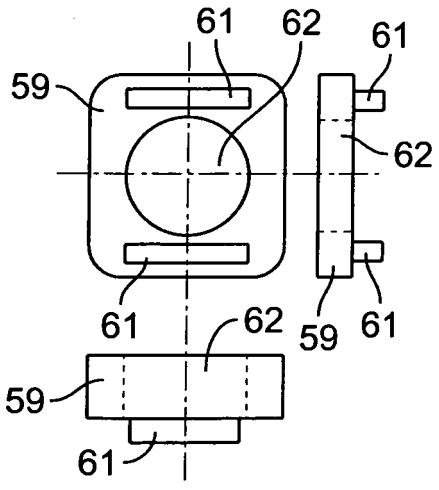


Fig. 18

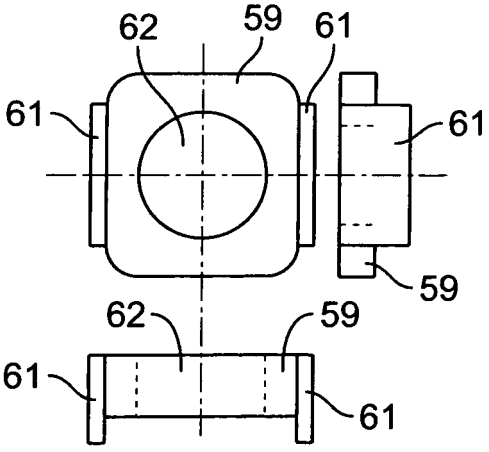


Fig. 19

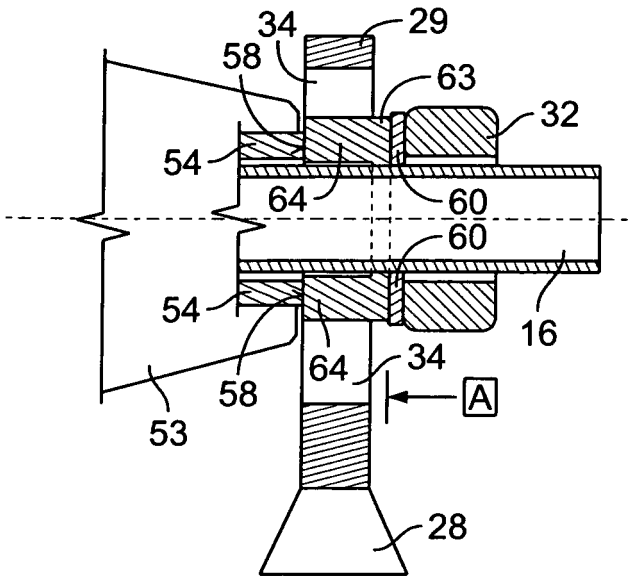


Fig. 20

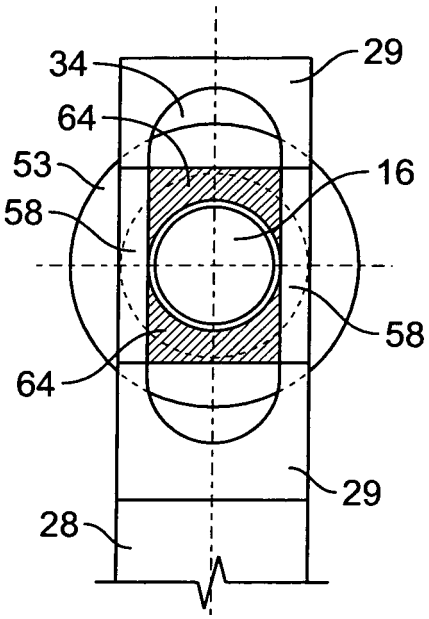


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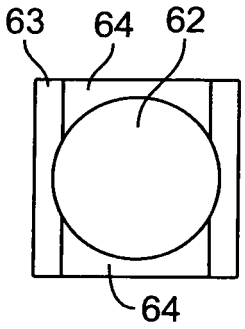


Fig. 22

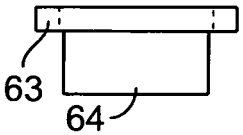


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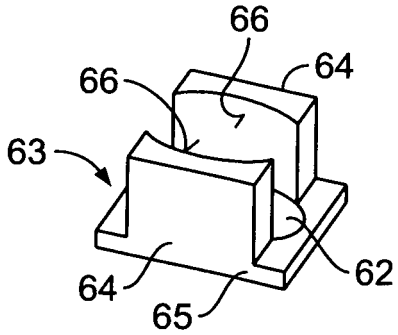


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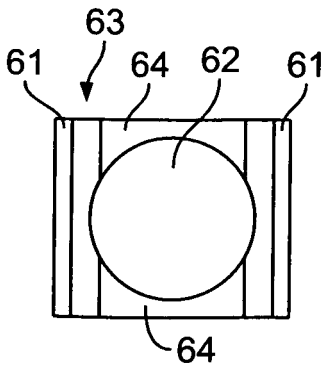


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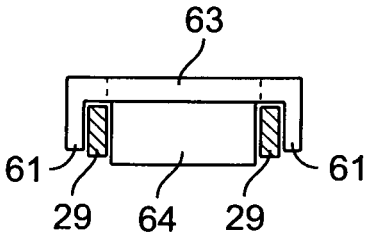


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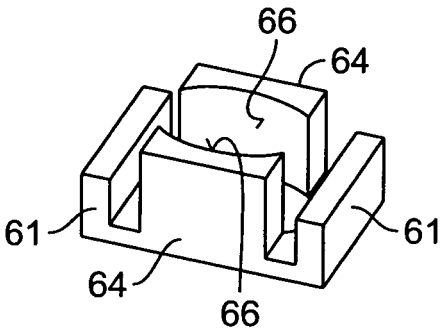


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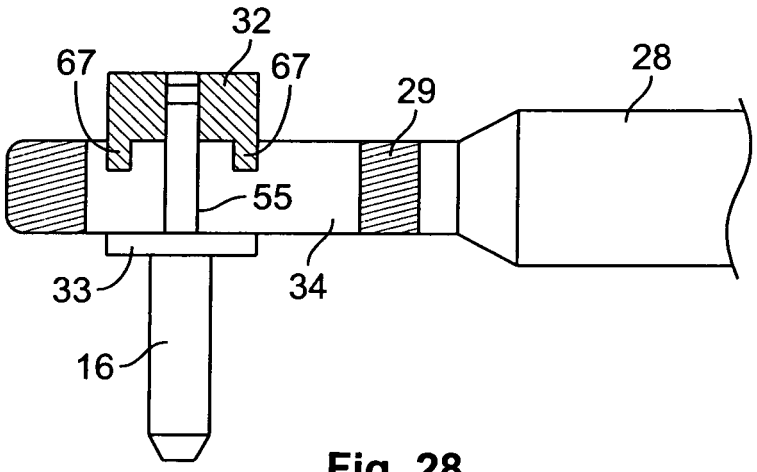


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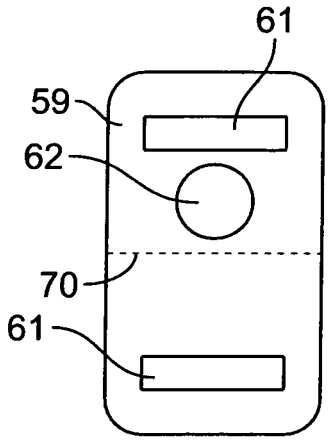


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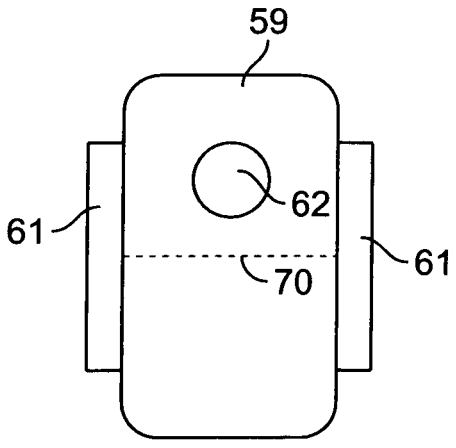


Fig. 30

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 1624537 B1 **[0001]**
- EP 0087267 A1 **[0001]**

Non-patent literature cited in the description

- **NEXANS.** Medium voltage symmetrical separable connectors - Interface C. *Catalogue,* August 2011, 1-21 **[0001]**