



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
29.05.2019 Bulletin 2019/22

(21) Application number: **18206923.7**

(22) Date of filing: **19.11.2018**

(51) Int Cl.:
H01R 4/02 (2006.01) **H01R 4/18** (2006.01)
H01R 11/03 (2006.01) **H01R 4/70** (2006.01)
H01R 11/12 (2006.01) **H01R 43/02** (2006.01)
H01R 4/62 (2006.01)

(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**
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

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(30) Priority: **23.11.2017 IT 201700134205**

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(54) **POWER TERMINAL**

(57) A terminal (10) for intermediate connection to an electric cable (20), comprising a body of conducting metal material having a connection part (11) configured to be connected to a user device, and a support part (13) configured to receive an intermediate portion (21) of the electric cable (20) welded to the support part (13). The terminal comprises, on each of longitudinally opposite ends of the support part (13), a pair of crimping tabs (15a, 15b; 16a, 16b) extending from transversely opposite

sides of the support part (13) and susceptible to be clamped by deformation around an insulating sleeve (23) of the electric cable (20) adjacent to the intermediate portion (21) of the electric cable (20), wherein each pair of tabs (15a, 15b; 16a, 16b) comprises at least one rib (17, 18) adapted to engage the insulating sleeve (23) of the electric cable (20) and extending transversely between the opposite free ends (15a', 15b'; 16a', 16b') of the pair of tabs (15a, 15b; 16a, 16b').

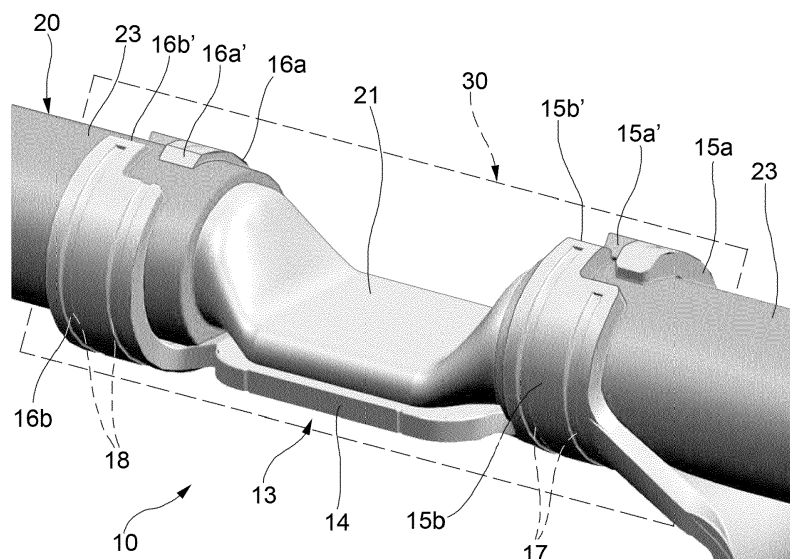


FIG.4

Description

[0001] The present invention concerns in general achieving connections on electric power cables, in particular in the automotive sector.

[0002] Various solutions are known for making intermediate connections in a cable that must serve multiple user devices.

[0003] A first solution, used for copper conductors, provides that the cable is stripped at an intermediate point thereof, and that a terminal is clamped to the cable at such point to make an intermediate connection with a user device.

[0004] A second solution, used for aluminum conductors, provides for the use of two single lengths of cable, each ending with a respective terminal. The terminals are then secured together to form a single connection to interface with an intermediate user device. Such type of connection, although relatively more complex than the previous one, is used for aluminum conductors because it facilitates sealing operations. It is in fact well known that aluminum conductors have a greater need for sealing than copper conductors because, when exposed to external agents, they corrode more easily and degrade in the interface area between the terminal and the cable.

[0005] An object of the present invention is to make available a solution that allows an intermediate connection to be obtained, in particular, on aluminum cables, in a relatively simple way, both for the formation of the connection and for the sealing thereof.

[0006] For this purpose, the object of the invention is a terminal for intermediate connection to an electric cable, comprising a body of conducting metal material having a connection part configured to be connected to a user device, and a support part configured to receive an intermediate portion of the electric cable welded to the support part,

wherein the terminal comprises, at each of the longitudinally opposite ends of the support part, a pair of crimping tabs extending from the transversally opposite sides of the support part and capable of being clamped by deformation around an insulating sleeve of the electric cable adjacent to the intermediate portion of the electric cable, wherein each pair of tabs comprises at least one rib adapted to engage the insulating sleeve of the electric cable and extending transversely between the opposing free ends of the pair of tabs, wherein the opposite free ends of each pair of tabs have complementary profiles that interdigitate when the pair of tabs is tightened around the insulating sleeve of the electric cable.

[0007] It is further object of the invention a method for forming an intermediate connection to an electric cable by means of a terminal, the terminal comprising a body of conducting metal material having a connection part configured to be connected to a user device, and a support part having, on each longitudinally opposite end, a pair of crimping tabs extending from transversely opposite sides of the support part, wherein each pair of tabs

comprises at least one rib extending transversely between the opposite free ends of the pair of tabs, the opposite free ends of each pair of tabs having complementary profiles,

5 wherein the method comprises the steps of:

removing the insulating sleeve from the electric cable at an intermediate portion of the latter,
placing said intermediate portion of the electric cable into contact with the support part of the terminal,
10 welding the intermediate portion of the electric cable to the support part of the terminal, and
clamping each pair of crimping tabs around the insulating sleeve of the electric cable adjacent to the intermediate portion of the electric cable, in such a way that the respective ribs deform the insulating sleeve, and in such a way that the complementary profiles of the opposite free ends of each pair of tabs interdigitate.

[0008] The crimping tabs, in addition to serving as a support for mechanical stresses, have the function of deforming the insulation over substantially the entire transverse perimeter thereof in order to obtain a pre-seal before covering with heat-shrinkable material, co-molding or other sealing systems.

[0009] Due to the ribs obtained on the tabs, with the subsequent covering of the terminal with the sealing material, an effective seal is obtained that makes the area completely watertight. Further features and advantages of the terminal according to the invention will become more apparent in the following detailed description of an embodiment of the invention, made with reference to the accompanying drawings, provided purely to be illustrative and non-limiting, wherein

figures 1 and 2 are perspective views of a terminal according to the invention;

figures 3 and 4 are perspective views of the terminal of figures 1 and 2, to which an electric cable has been welded; and

figure 5 is a perspective view of the terminal of figures 3 and 4, on which a sealing coating has been applied.

[0010] With reference to figures 1 and 2, an intermediate connection terminal to an electric cable is shown, indicated collectively at 10.

[0011] The term "intermediate connection" means that the terminal is applied at an intermediate point along the extension of the electric cable, and not at the ends of the latter. In other words, the terminal here described makes a connection with an electric cable at a point wherein the cable is continuous.

[0012] The terminal 10 comprises a body made of conducting metal material having a connection part 11 configured to be connected to a user device, and a support part 13 configured to receive an intermediate portion of the electric cable welded to the support part 13. In the

example shown, the connection part 11 has, for example, a hole, which is positioned on a threaded pin arranged on the user device, and on which a nut is screwed to secure the terminal 10 to the user device. However, the invention is not limited to such mode of connection. In the example shown, the support part 13 extends on one end of the connection part 11, forming an angle therewith, for example an angle of about 90°.

[0013] The support part 13 comprises a central support plate 14 and, on each of the longitudinally opposite ends of the support part 13, a pair of crimping tabs 15a, 15b; 16a, 16b extending from the transversally opposite sides of the support part 13. In particular, a first pair of tabs, indicated at 15a and 15b, is placed between the connection part 11 of the terminal 10 and the central support plate 14, while a second pair of tabs, indicated at 16a and 16b, is located on the opposite end of the support part 13, far from the connection part 11.

[0014] The opposite free ends 15a' and 15b', as well as 16a' and 16b' of each pair of tabs 15a, 15b and 16a, 16b have shaped profiles, for example, toothed, complementary to each other.

[0015] Each pair of tabs comprises at least one rib 17, 18 (in the example shown, two ribs) obtained on an inner surface of the tabs 15a, 15b and 16a, 16b and a portion of the support part 13 which interconnects between the tabs 15a, 15b and 16a, 16b of each pair.

[0016] Each rib 17 and 18 protrudes towards the "inside" of the terminal 10, i.e. on the side of the support part 13 intended to receive the electric cable. Each rib 17 and 18 extends transversely between the opposite free ends 15a', 15b' and 16a', 16b' of each pair of tabs 15a, 15b and 16a, 16b, so as to cover the entire transversal extension of the tabs, or at least the major part thereof.

[0017] With reference to figures 3 and 4, the terminal 10 is coupled to an electric cable 20, in particular, a cable comprising a conductor 21, in particular, made of aluminum, and an insulating sleeve 23 arranged around the conductor 21. For this purpose, at an intermediate portion of the electric cable 20, the insulating sleeve 23 is first removed so as to leave the conductor 21 exposed.

[0018] The electric cable 20 thus prepared is coupled to the terminal 10 so as to place the sleeveless intermediate portion of the cable 20 in contact with the support part 13 of the terminal 10, and each of the longitudinally opposite parts of the insulating sleeve 23 adjacent to such intermediate part arranged within a respective pair of tabs 15a, 15b and 16a, 16b.

[0019] The intermediate part of the electric cable 10 is then welded to the support plate 14, in particular, by means of friction or ultrasonic welding.

[0020] The crimping of the tabs 15a, 15b and 16a, 16b around the insulating sleeve 23 is moreover envisaged. Each pair of tabs 15a, 15b and 16a, 16b thus encircles the entire perimeter of the insulated sleeve 23, tightening and deforming the latter due to the ribs 17 and 18. In addition, with the closure of the tabs, the complementary

profiles of the opposite free ends 15a', 15b' and 16a', 16b' interdigitate with each other.

[0021] The welding and crimping of the tabs may be carried out by the same tool or by different tools, at the same time or successively in time.

[0022] Once the cable 20 has been welded to the terminal 10 and the tabs 15a, 15b and 16a, 16b have been clamped, a sealing coating 30 is applied to the terminal 10 with the cable 20 to cover the entire support part 13 of the terminal 10 with the intermediate portion of the electric cable 20, as well as each pair of crimping tabs 15a, 15b and 16a, 16b clamped on the insulating sleeve 23 of the cable 20.

[0023] In this way, an optimal sealing that makes the area completely watertight is obtained, due to the deformation of the insulation 23 obtained by means of the tabs 15a, 15b and 16a, 16b. The sealing may be obtained by conventional methods, for example, the application of a sleeve of heat-shrinkable material, or the co-molding of a plastic material.

Claims

1. A terminal (10) for intermediate connection to an electric cable (20), comprising a body of conducting metal material having a connection part (11) configured to be connected to a user device, and a support part (13) configured to receive an intermediate portion (21) of the electric cable (20) welded to the support part (13), wherein said terminal comprises, on each of longitudinally opposite ends of the support part (13), a pair of crimping tabs (15a, 15b; 16a, 16b) extending from transversely opposite sides of the support part (13) and susceptible to be clamped by deformation around an insulating sleeve (23) of the electric cable (20) adjacent to the intermediate portion (21) of the electric cable (20), wherein each pair of tabs (15a, 15b; 16a, 16b) comprises at least one rib (17, 18) adapted to engage the insulating sleeve (23) of the electric cable (20) and extending transversely between the opposite free ends (15a', 15b'; 16a', 16b') of the pair of tabs (15a, 15b; 16a, 16b'), wherein the opposite free ends (15a', 15b'; 16a', 16b') of each pair of tabs (15a, 15b; 16a, 16b) have complementary profiles that interdigitate when the pair of tabs (15a, 15b; 16a, 16b) is clamped around the insulating sleeve (23) of the electric cable (20).
2. A method for forming an intermediate connection to an electric cable (20) by means of a terminal (10), the terminal comprising a body of conducting metal material having a connection part (11) configured to be connected to a user device, and a support part (13) having, on each of longitudinally opposite ends, a pair of crimping tabs (15a, 15b; 16a, 16b) extending from transversely opposite sides of the support part

(13), wherein each pair of tabs (15a, 15b; 16a, 16b) comprises at least one rib (17, 18) extending transversely between the opposite free ends (15a', 15b'; 16a', 16b') of the pair of tabs (15a, 15b; 16a, 16b) the opposite free ends (15a', 15b'; 16a', 16b') of each pair of tabs (15a, 15b; 16a, 16b) having complementary profiles, 5

wherein the method comprises the steps of:

removing the insulating sleeve (23) from the electric cable (20) at an intermediate portion (21) of the latter, 10

placing said intermediate portion (21) of the electric cable (20) into contact with the support part (13) of the terminal (10), 15

welding the intermediate portion (21) of the electric cable (20) to the support part (13) of the terminal (10), and

clamping each pair of crimping tabs (15a, 15b; 16a, 16b) around the insulating sleeve (23) of the electric cable (20) close to the intermediate portion (21) of the electric cable (20), in such a way that the respective ribs (17, 18) deform the insulating sleeve (23), and in such a way that the complementary profiles of the opposite free ends (15a', 15b'; 16a', 16b') of each pair of tabs (15a, 15b; 16a, 16b) interdigitate. 20 25

3. Method according to claim 2, further comprising applying a sealing covering (30) around the terminal (10) in order to cover the support part (13) of the terminal (10) along with the intermediate portion (21) of the electric cable (20) and each pair of crimping tabs (15a, 15b; 16a, 16b). 30 35
4. A method according to claim 2 or 3, wherein the electric cable (20) is an aluminum conductor cable.
5. A method according to any of claims 2 to 4, wherein the intermediate portion (21) of the electric cable (20) is ultrasonically welded to the support part (13) of the terminal (10). 40 45 50 55

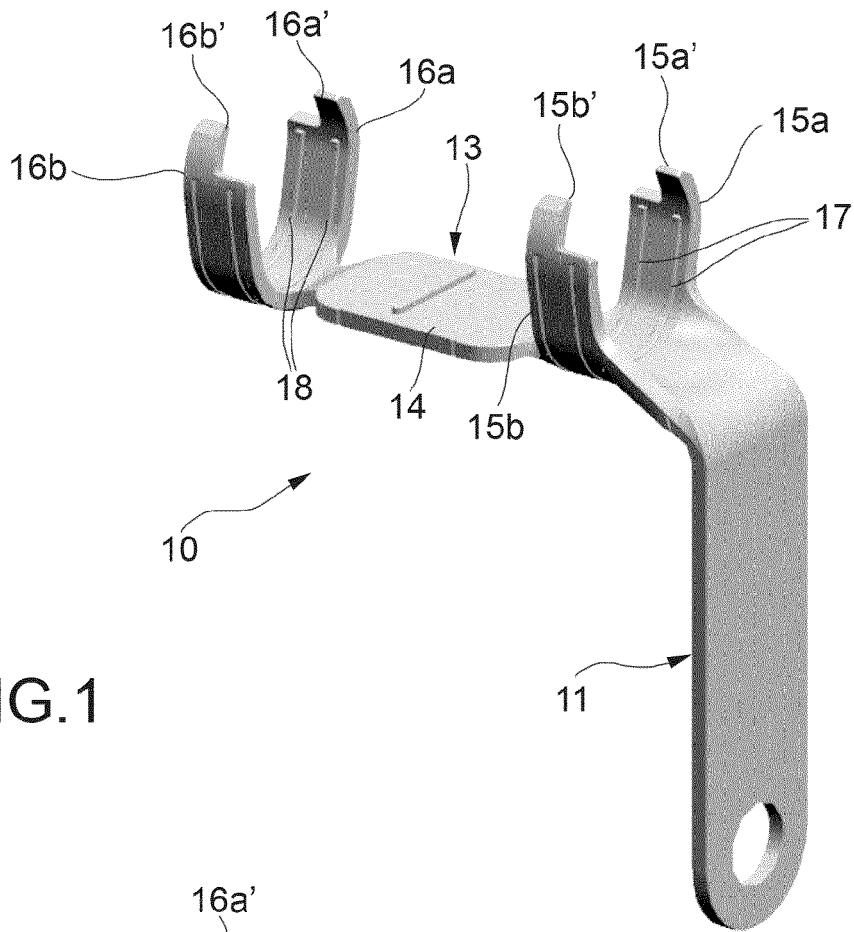


FIG.1

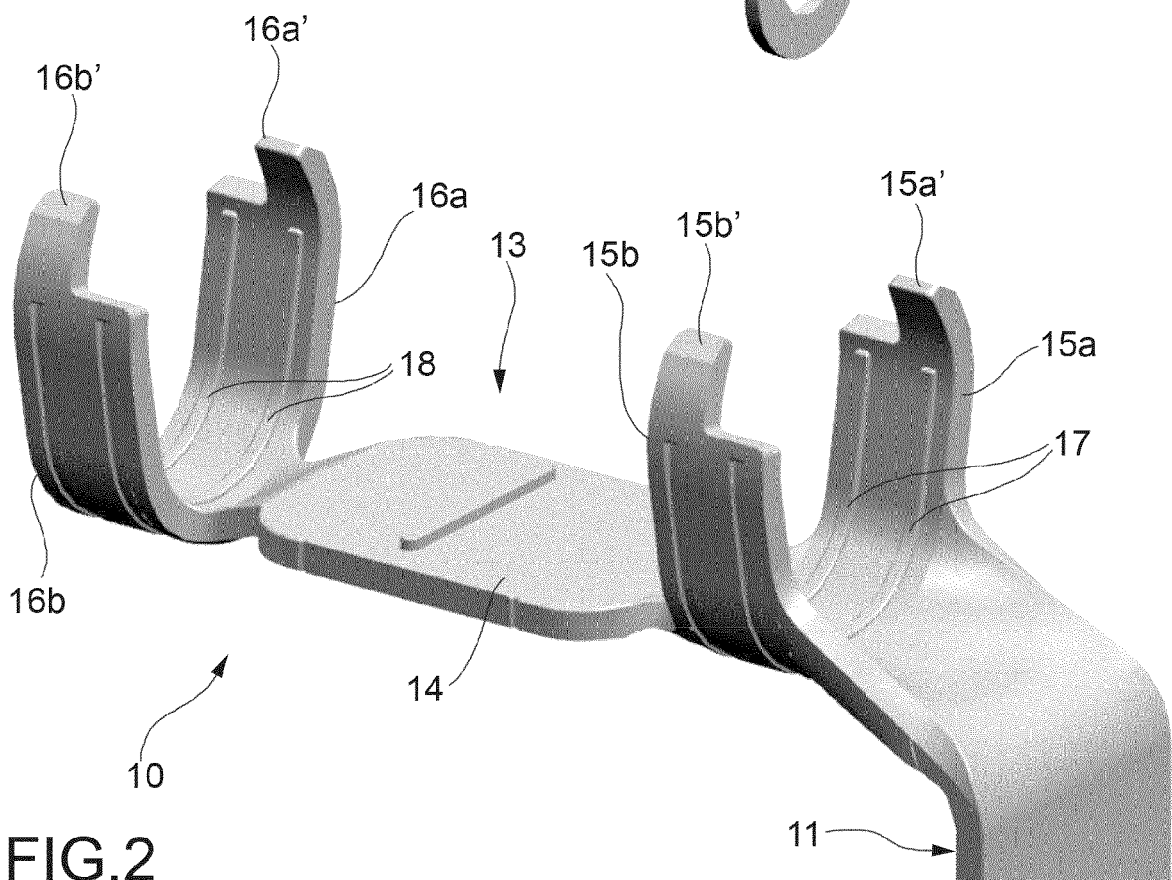


FIG.2

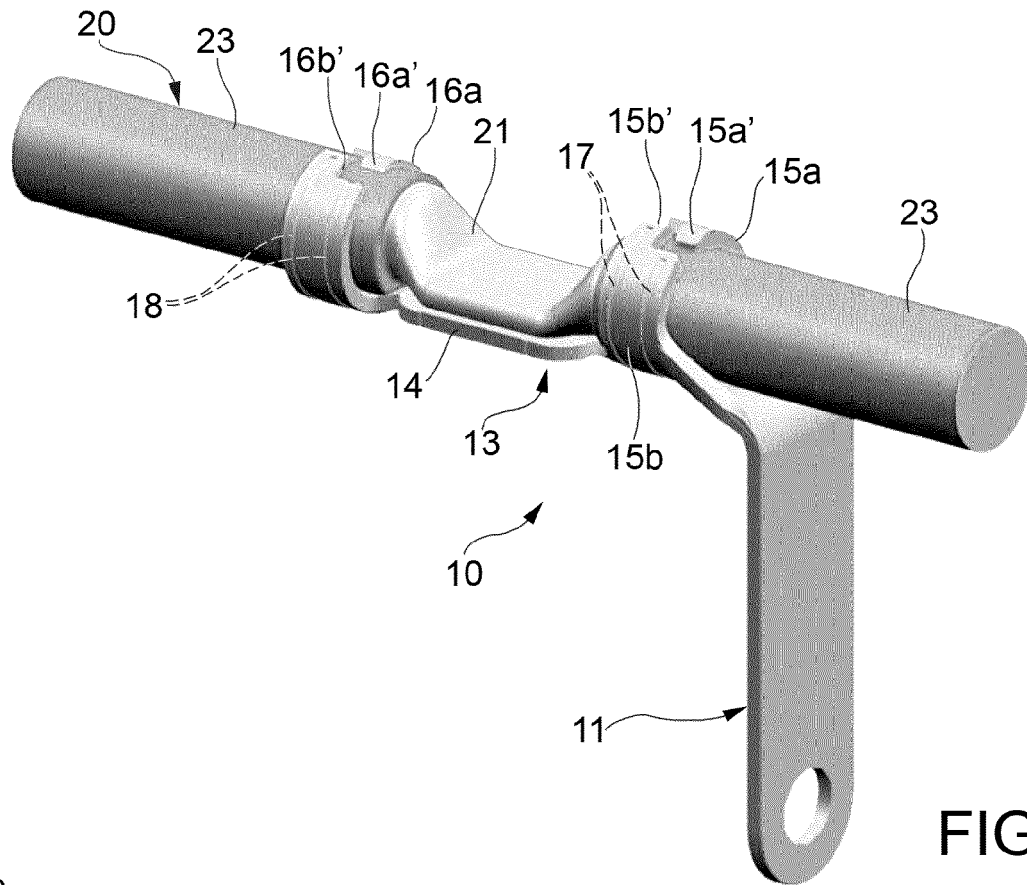


FIG.3

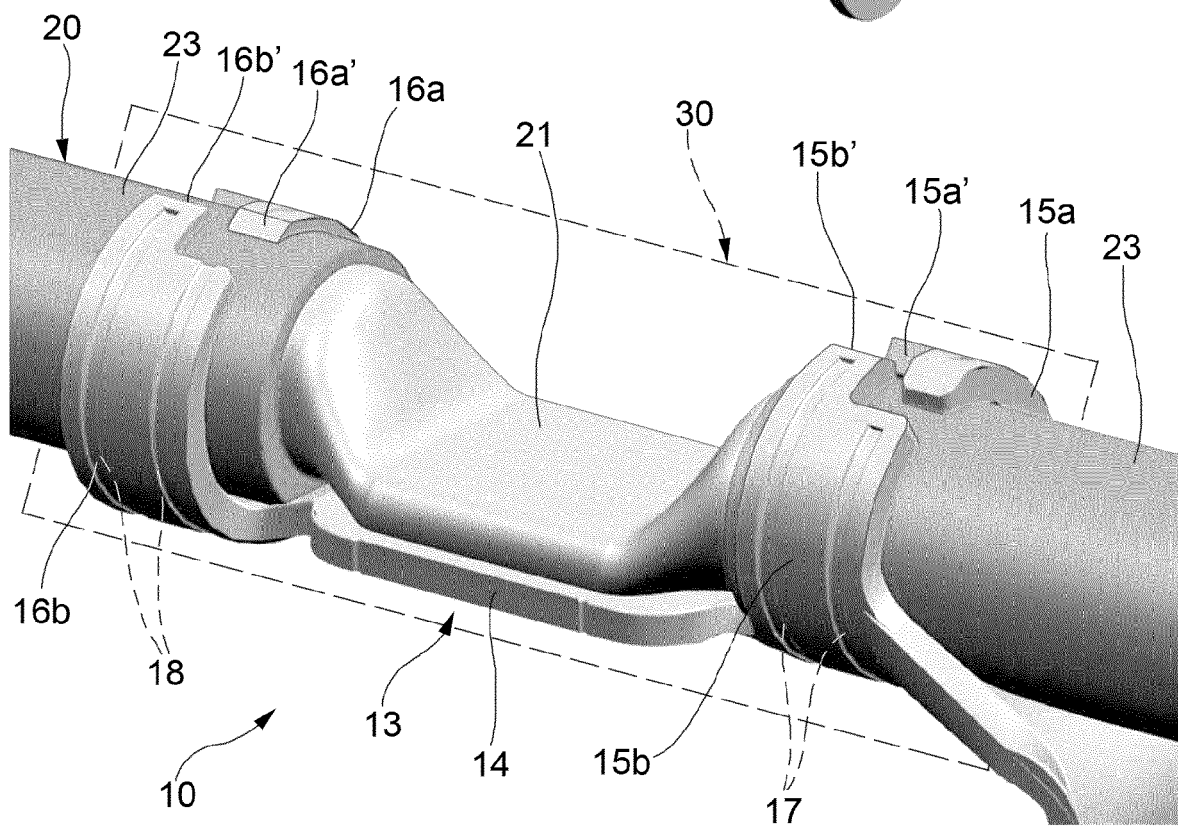


FIG.4

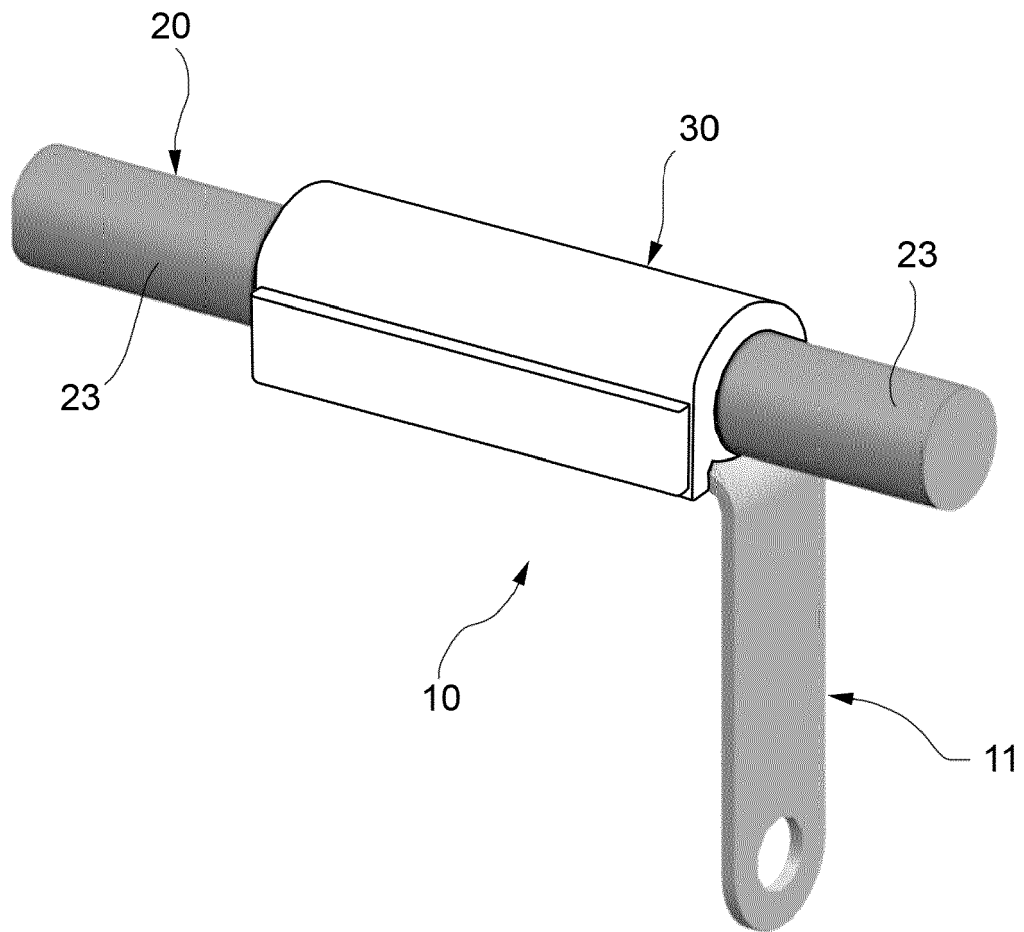


FIG.5



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Application Number
EP 18 20 6923

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Place of search The Hague		Date of completion of the search 29 November 2018	Examiner Mier Abascal, Ana
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EPO FORM 1503 03/02 (P04C01)

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