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(71) Applicant: **Rosi, Renato**
29010 Castelnuovo Fogliani (PC) (IT)

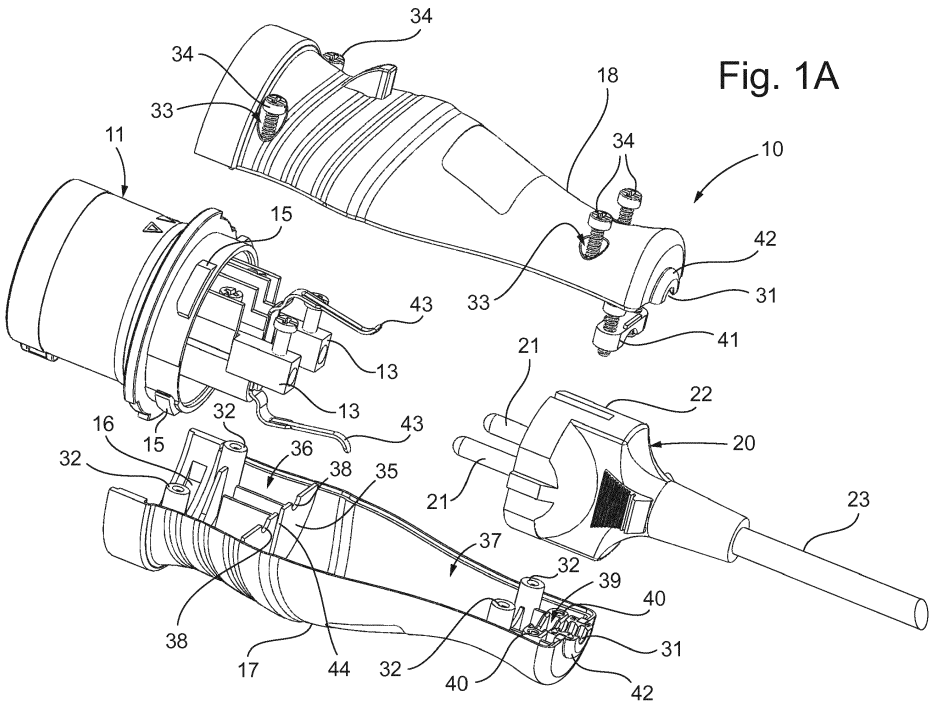
(72) Inventors:
- **Rosi, Renato**
29010 Castelnuovo Fogliani (PC) (IT)
- **Rosi, Romano**
29010 Castelnuovo Fogliani (PC) (IT)

(74) Representative: **Biallo, Dario et al**
Barzanò & Zanardo Milano S.p.A.
Via Borgonuovo, 10
20121 Milano (IT)

(54) **Adapter device for industrial electrical sockets**

(57) The present invention refers to an adapter device for industrial electrical sockets, particularly but not exclusively useful in the field of industrial electrical engineering, comprising a plug body (11) provided at the front with a plurality of pins suitable for being engaged in an industrial electrical socket and at the back with a plurality of connectors (13) suitable for receiving corresponding pins (21) of a civil electrical plug (20), the connectors (13) being designed to adapt the industrial electrical socket for the civil electrical plug (20); a protective shell (14) of the connectors (13) coupled with the back of the plug body (11); and characterised in that the protective shell (14) extends in a longitudinal direction behind the plug body (11) for a length portion such as to completely cover the connectors (13) and the civil electrical plug (20) when it is engaged in the connectors (13).

Fig. 1A



EP 2 852 010 A1

Description

[0001] The present invention refers to an adapter device for industrial electrical sockets particularly but not exclusively useful in the field of industrial electrical engineering.

[0002] Currently, numerous electrical sockets/plugs are known that differ not only due to the different use for which they are intended, but also for the different electrical standards to be respected in the countries where they are intended to be installed.

[0003] In any case, there are known so-called civil electrical plugs/sockets that are usually associated with the electrical power supply of commonly-used or domestic tools like, for example, drills, hammers, angle grinders and so on. A very common type of civil plug/socket is, for example, a "schuko" type plug/socket complying with European standard CEE 7/7. So-called industrial electrical plugs/sockets are also known that can be monophase or triphase and are able to support the greater electrical currents that are usually used in industry to supply machinery, furnaces and so on. Industrial electrical plugs/sockets are also made to operate safely in difficult environmental conditions (outdoors, exposed to water, ice, sand and various chemical agents), to have greater mechanical strength and to prevent accidental disconnections. A very common type of industrial plug/socket is, for example, a plug/socket complying with European standard IEC 309.

[0004] In common use, however, it may be necessary to use tools supplied through civil electrical plugs where only industrial electrical sockets are installed, like for example on building sites or in industrial settings.

[0005] In these cases, it is known to cut the power supply cable of the aforementioned tools upstream of the civil electrical plug and connect the relative conductors of the cable to an industrial electrical plug. In this way, however, the guarantee against failure and/or manufacturing defects associated with the tools that have been tampered with is lost.

[0006] For this reason, it is usual to use adapter devices capable of adapting a civil electrical socket to an industrial one. These known adapter devices are arranged at the front to be engaged in industrial electrical sockets and at the rear to couple with civil electrical plugs.

[0007] In particular, the adapter devices currently known comprise a plug body that at the front carries a plurality of pins suitable for being engaged in an industrial electrical socket and on the back carries a plurality of connectors suitable for coupling with a civil electrical plug. These connectors are in turn enclosed in a protective shell applied onto the back of the plug body so as to make an actual civil electrical socket.

[0008] This shell, however, offers a degree of protection against the penetration of dangerous external agents like water, which may not be considered sufficient by the safety control authorities on worksites, in factories and so on.

[0009] Indeed, the protective shell generally mounted on the known adapter devices is able to externally cover the connection interface between the connectors and the civil electrical plug and only partially the plug itself.

[0010] It is therefore possible that in critical conditions, like for example in the case of outdoor installations, water can penetrate into the adapter device through the rear civil electrical socket with a consequent risk of electrical dispersions, electrocution and damages to the apparatus connected.

[0011] The purpose of the present invention is to avoid the aforementioned drawbacks and, in particular, to devise an adapter device for industrial sockets that allows a civil electrical plug to be supplied with power with an industrial electrical socket ensuring a greater degree of mechanical protection and protection against external agents with respect to known adapter devices. These and other purposes according to the present invention are accomplished by making an adapter device for industrial sockets as outlined in claim 1.

[0012] Further characteristics of the adapter device for industrial sockets are the object of the dependent claims.

[0013] The characteristics and advantages of an adapter device for industrial sockets according to the present invention will become clearer from the following description, given as a non-limiting example, referring to the attached schematic drawings, in which:

- figures 1a, 1b and 1c are three schematic perspective views relative to a mounting sequence of a civil electrical plug in an adapter device according to the present invention;
- figure 2 is a first schematic perspective view of an adapter device according to the present invention in operative configuration;
- figure 3 is a schematic perspective view partially in section of the adapter device of figure 2;
- figure 4 is a schematic plan view partially in section of the adapter device of figure 2; and
- figure 5 is a second schematic perspective view of an adapter device according to the present invention in operative configuration.

[0014] With reference to the figures, an adapter device for industrial electrical sockets is shown, wholly indicated with 10.

[0015] Such an adapter device 10 comprises a plug body 11 provided at the front with a plurality of pins 12 suitable for being engaged in an industrial electrical socket (not illustrated) and at the back with a plurality of connectors 13 suitable for receiving corresponding pins 21 of a civil electrical plug 20.

[0016] In the present description, the expression "civil electrical plug" 20 refers to the assembly comprising both the pins 21 and the insulating casing 22 that carries such pins 21 and that is connected to an end of an electrical cable 23. In particular, such an expression refers to any

civil electrical plug, conforming to any national standard.

[0017] The connectors 13 are designed to adapt the industrial electrical socket for the aforementioned civil electrical plug 20; such connectors 13 are therefore connected to the front pins.

[0018] The adapter device 10 also comprises a protective shell 14 of the connectors 13 coupled with the back of the plug body 11.

[0019] Such a coupling can for example be obtained through interlocking and/or using fixing means like, for example, screws.

[0020] According to the present invention, the protective shell 14 extends behind the plug body 11 in the longitudinal direction for a length portion such as to completely cover the connectors 13 and the civil electrical plug 20 when it is engaged in the connectors 13.

[0021] In the present description, by longitudinal direction we mean the direction of extension in length of the civil electrical plug 20 when it is engaged in the connectors 13. Therefore, in the case in which the connectors 13 are oriented so that the civil electrical plug 20 engaged extends in length in a direction perpendicular to the pins 12, such a direction will correspond to the direction of longitudinal extension of the protective shell 14.

[0022] In the particular illustrated embodiment of the present invention, the protective shell 14 comprises a base half-shell 17 and a covering half-shell 18 suitable for being reversibly constrained one on the other in a constraint position to define the protective shell 14; such half-shells 17, 18 are, moreover, shaped so that the protective shell 14, at the opposite end to that for coupling with the plug body 11, has an opening 19 for the passage of the electrical cable 23 that carries the civil electrical plug 20.

[0023] Preferably, the two half-shells have two semicircular half-openings 31 that, when the half-shells are in constraint position, form a circular opening 19 of diameter such that the cable of the civil electrical plug is flush with the edge of the opening 19 when the plug itself is engaged in the adapter device 10. More generally, the opening 19 and the half-openings 31 can be of any shape and size.

[0024] In an embodiment that is not illustrated of the present invention, the half-shells 17 and 18 are coupled at one of the two longitudinal sides so as to be able to pass reversibly from an opening position in which the half-shells 17 and 18 are arranged side by side to each other and a closing position in which the covering half-shell 18 is arranged on the base half-shell 17. Preferably, the plug body 11 is equipped at the back with fastening portions 15 that project outwards and the protective shell 14 is internally provided with corresponding coupling recesses 16 in which the aforementioned coupling portions 15 joint engage in a firm manner making the coupling between the protective shell 14 and the plug body 11.

[0025] In addition, one of the two half-shells 17, 18, comprises a plurality of fixing seats 32; in a corresponding position, the other half-shell comprises through holes 33 through which it is possible to insert fixing means 34, like for example screws, which engage in the fixing seats 32 in order to make the constraint between the two half-shells 17, 18 stable. In the illustrated embodiment, the base half-shell 17 comprises the fixing seats 32 whereas the covering half-shell 18 comprises the corresponding through holes 33.

[0026] In a first embodiment of the present invention, each of the half-shells 17, 18 comprises a half-wall 35 that extends transversally to the direction of extension of the protective shell 14 so that, when the two half-shells 17, 18 are in constraint position, the half-walls 35 are opposite one on the other to form a transversal separating wall.

[0027] Each half-wall 35 defines a first half-chamber 36 and a second half-chamber 37 inside each half-shell. Thus, when the two half-shells 17, 18 are in constraint position, the transversal wall resulting from the juxtaposition of the two half-walls 35 defines a first and a second chamber for at least partially housing, respectively, the connectors 13 and the civil electrical plug 20, where such housing chambers are defined by the joining of the half-chambers 36, 37 of each half-shell.

[0028] The half-walls 35, moreover, are shaped so as to define, on the resulting transversal wall, a plurality of openings (not illustrated) at the connectors 13 to allow the engagement of the pins 21 of the civil electrical plug 20 in the connectors 21. In particular, as can be seen for example in figure 1a, the half-wall 35 of the base half-shell 17 comprises two recesses 38 on top; in a corresponding position the half-wall (not illustrated) of the covering half-shell 18 also comprises two recesses (not illustrated) that, when the half-shells are in constraint position, form - with the recesses 38 of the base half-shell 17 - the through openings for the pins 21 of the civil electrical plug 20.

[0029] In a second embodiment of the present invention, one of the half-shells 17, 18 internally comprises a transversal separating wall (not illustrated) with respect to the direction of longitudinal extension of the protective shell; such a separating wall, when the half-shells are in constraint position, defines a first and a second chamber (not illustrated) for at least partially housing, respectively, the connectors 13 and the civil electrical plug 20, and comprises a plurality of openings, preferably through holes, at the connectors 13 to allow the engagement of the pins 21 of the civil electrical plug 20 in the connectors 13.

[0030] In any case, the base half-shell 17 preferably internally comprises, at the opposite end to that for coupling with the plug body 11, a receiving and guiding seat 39 for the cable 23 of the civil electrical plug 20 laterally provided with engagement seats 40 for fixing means. In this case, the adapter device 10 also comprises a locking plate 41 suitable for being constrained to the receiving and guiding seat 39 through fixing means so as to hold the cable 23 of the civil electrical plug 20 in such a receiving and guiding seat 39.

[0031] Preferably, the protective shell 14 comprises a seal gasket 42 at the through opening 19 for the cable 23 of the civil electrical plug 20.

[0032] Preferably, the plurality of connectors 13 comprises a corresponding plurality of clamps 13 configured to clamp the pins 21 of the civil electrical plug 20 through respective fixing screws.

[0033] In the case in which the civil electrical plug 20 is of the type complying with European standard CEE 7/7, the plug body 11 is also provided at the back with two flexible metallic tabs 43 intended to come into contact with the protective conductor provided on such plugs 20.

[0034] In this case, the half-walls 35 have, in a position corresponding to the flexible tabs 43 some slits 44. Indeed, in particular, such flexible tabs 43 extend in the longitudinal direction so as to pass, when the half-shells 17 and 18 are in constraint position, from the first to the second housing chamber, passing through the transversal separating wall at the slits 44.

[0035] From the description that has been made the characteristics of the adapter device for industrial electrical sockets object of the present invention are clear, just as the relative advantages are clear. Indeed, the protective shell is able to shield the civil electrical plug from water and other foreign bodies when it is engaged in the adapter device, ensuring the high degree of protection that needs to be maintained when connecting to an industrial electrical socket. In particular, the aforementioned protective shell ensures a degree of protection at least equal to the IP44 rating defined by standard UNI EN60529 or CEI 70-1.

[0036] The risk of penetration of water is further reduced thanks to the presence of the rear opening of the protective shell sized so as to allow the cable of the civil electrical plug that is to be engaged to pass flush. The presence of a seal gasket at the aforementioned opening further increases the degree of safety and impermeability of the volume enclosed by the protective shell.

[0037] Finally, it is clear that the adapter device for industrial electrical sockets thus conceived can undergo numerous modifications and variants, all of which are covered by the invention; moreover, all of the details can be replaced by technically equivalent elements. In practice, the materials used, as well as the sizes, can be whatever according to the technical requirements.

Claims

1. Adapter device (10) for industrial electrical sockets comprising:

   - a plug body (11) provided at the front with a plurality of pins suitable for being engaged in an industrial electrical socket and at the back with a plurality of connectors (13) suitable for receiving corresponding pins (21) of a civil electrical plug (20), said connectors (13) being designed to adapt said industrial electrical socket for said civil electrical plug (20);
   - a protective shell (14) of said connectors (13) coupled with the back of said plug body (11); **characterised in that** said protective shell (14) extends behind said plug body (11) in the longitudinal direction for a length portion such as to completely cover said connectors (13) and said civil electrical plug (20) when it is engaged in said connectors (13).

2. Adapter device (10) for industrial electrical sockets according to claim 1 **characterised in that** said protective shell (14) comprises a base half-shell (17) and a covering half-shell (18) suitable for being reversibly constrained one on the other in a constraint position to define said protective shell (14), said half-shells (17, 18) being shaped so that said protective shell (14), at the opposite end to that for coupling with said plug body (11), has an opening (19) for the passage of an electrical cable (23) that carries said civil electrical plug (20).

3. Adapter device (10) for industrial electrical sockets according to claim 1 or 2 **characterised in that** said plug body (11) is equipped at the rear with coupling portions (15) that project outwards and said protective shell (14) is internally provided with corresponding coupling recesses (16) into which said coupling portions (15) joint engage in a firm manner making the coupling between said protective shell (14) and said plug body (11).

4. Adapter device (10) for industrial electrical sockets according to claim 2 or 3 **characterised in that** one of said half-shells (17, 18) internally comprises a separating wall that is transversal with respect to said direction of longitudinal extension of said protective shell (14), said separating wall defining, when the half-shells (17, 18) are in constraint position, a first and a second chamber for at least partially housing said connectors (13) and said civil electrical plug (20), respectively, and comprising a plurality of openings at said connectors (13) to allow the engagement of said pins (21) of said civil electrical plug (20) in said connectors (13).

5. Adapter device (10) for industrial electrical sockets according to claim 2 or 3 **characterised in that** each of said half-shells (17, 18) comprises a half-wall (35) that extends transversally to the direction of extension of said protective shell (14) so that, when the two half-shells (17, 18) are in constraint position, said half-walls (35) are opposite one another to form a transversal separating wall that defines a first and a second chamber for at least partially housing said connectors (13) and said civil electrical plug (20), respectively, said half-walls (35) being shaped so as

to define a plurality of openings on said transversal wall at said connectors (13) to allow the engagement of said pins (21) of said civil electrical plug (20) in said connectors (13).

6. Adapter device (10) for industrial electrical sockets according to one of claims 3 to 5 **characterised in that** said base half-shell (17) internally comprises, at the opposite end to that for coupling with said plug body (11), a receiving and guiding seat (39) for the cable (23) of said civil electrical plug (20) laterally provided with engagement seats (40) for fastening means, said device (10) also comprising a locking plate (41) suitable for being constrained to said receiving and guiding seat (39) through fastening means so as to hold the cable (23) of said civil electrical plug (20) in its seat.

7. Adapter device (10) for industrial electrical sockets according to one of claims 3 to 6 **characterised in that** said protective shell (14) comprises a seal gasket (42) at the through opening (19) for said cable (23) of said civil electrical plug (20).

8. Adapter device (10) for industrial electrical sockets according to one of the previous claims **characterised in that** said plurality of connectors (13) comprises a corresponding plurality of clamps (13) configured to clamp said pins (21) of said civil electrical plug (20) through respective fastening screws.

9. Adapter device (10) for industrial electrical sockets according to one of claims 3 to 8 **characterised in that**, in the case in which said civil electrical plug (20) is of the type complying with European standard CEE 7/7, said plug body 11 is also provided at the back with two flexible metal tabs (43) intended to come into contact with the protective conductor provided on said civil electrical plug (20).

10. Adapter device (10) for industrial electrical sockets according to one of claims 3 to 9 **characterised in that** said half-shells (17, 18) are coupled at one of the two longitudinal sides so as to be able to pass reversibly from an opening position in which said half-shells (17, 18) are arranged side by side to each other and a closing position in which said covering half-shell (18) is arranged on said base half-shell (17).

Fig. 1A

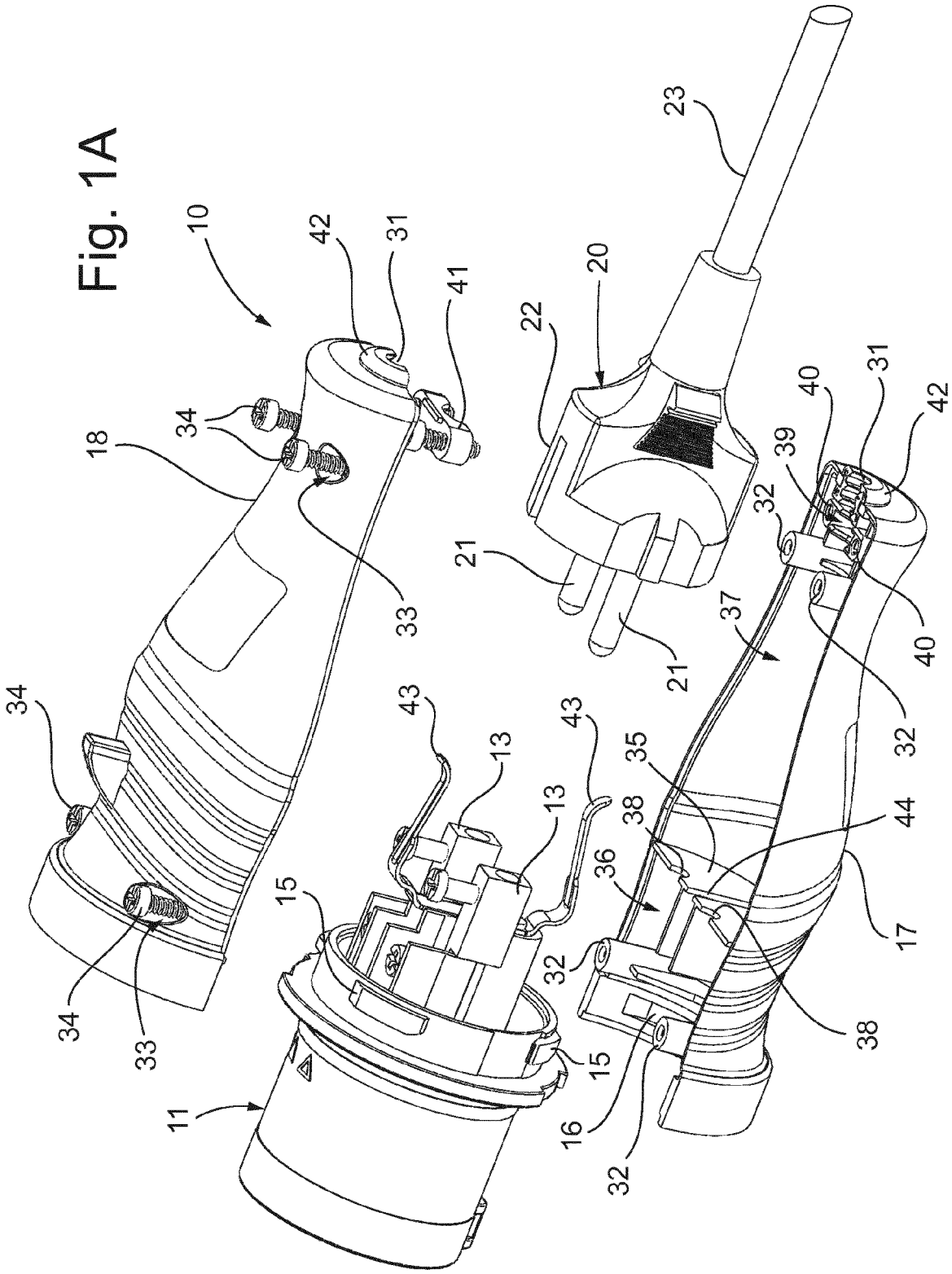

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Fig. 1B

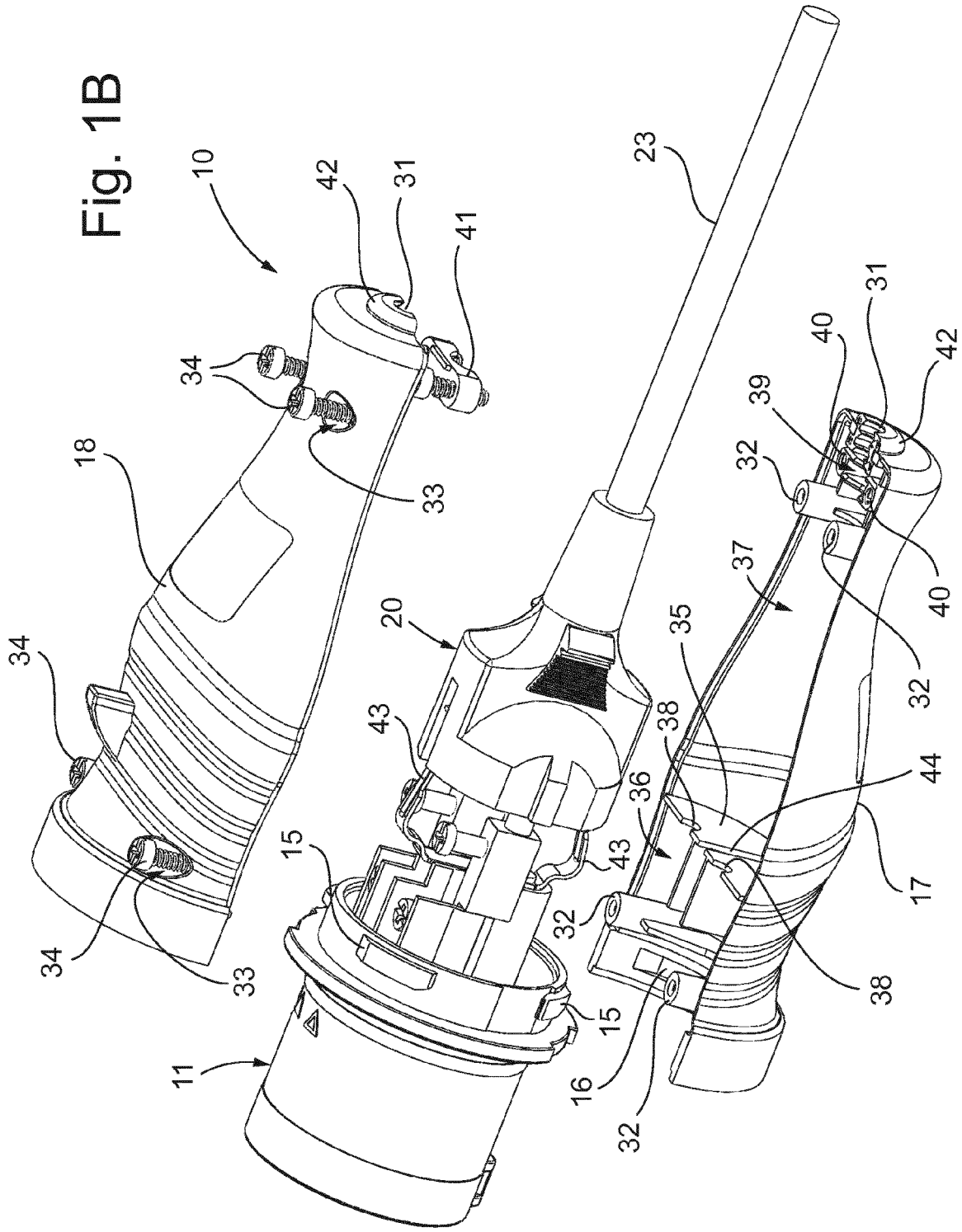


Fig. 1C

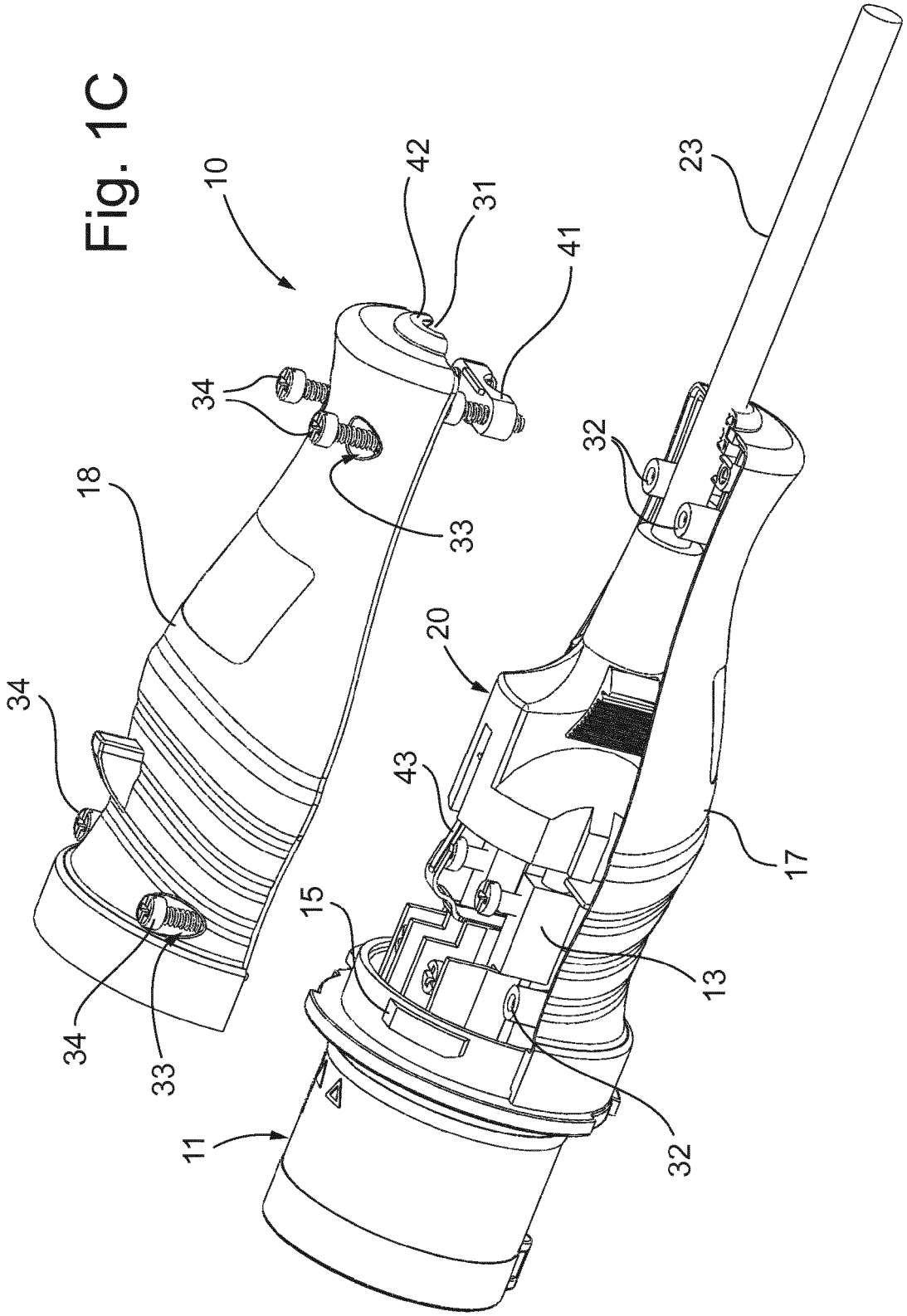


Fig. 2

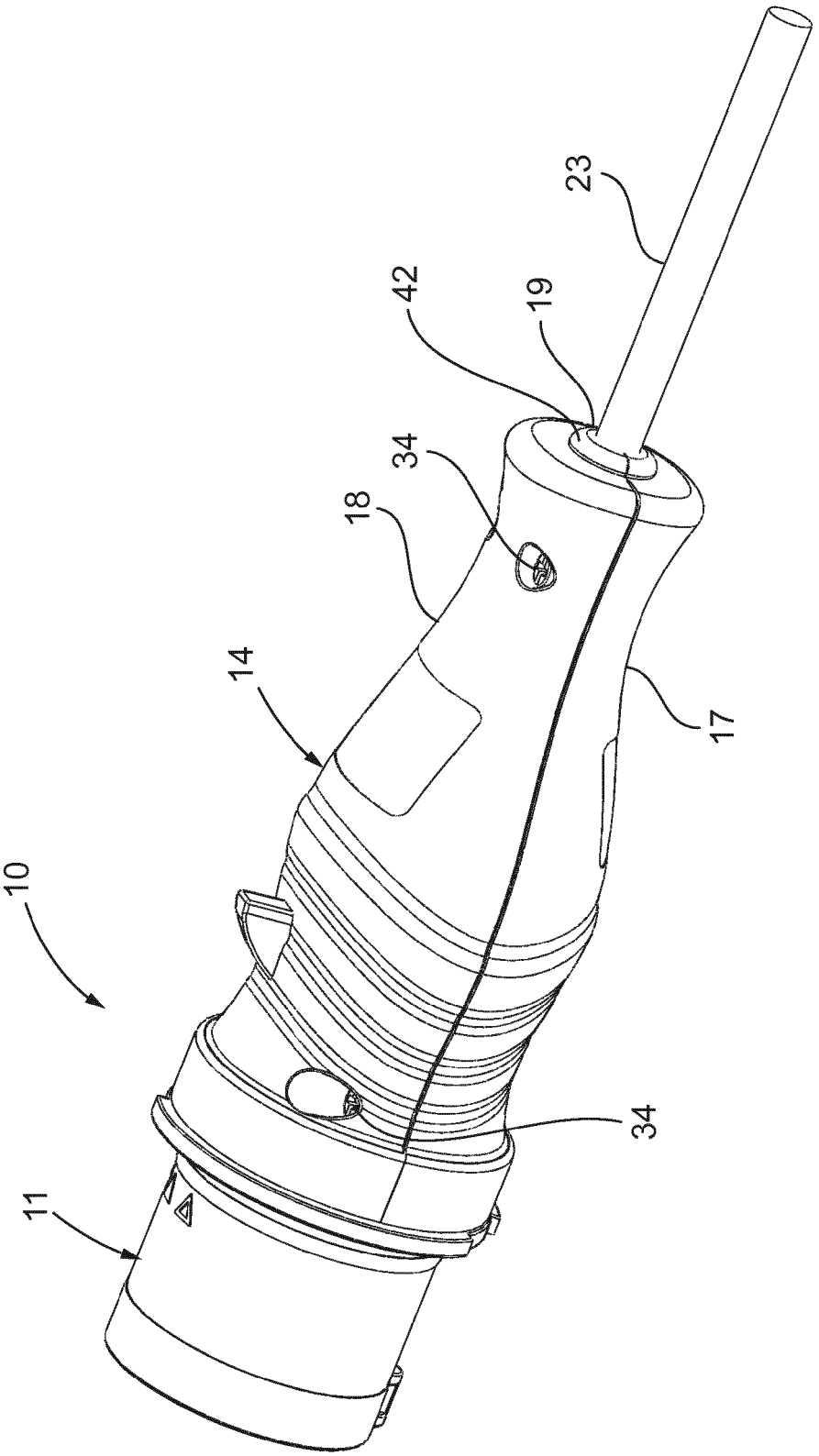


Fig. 3

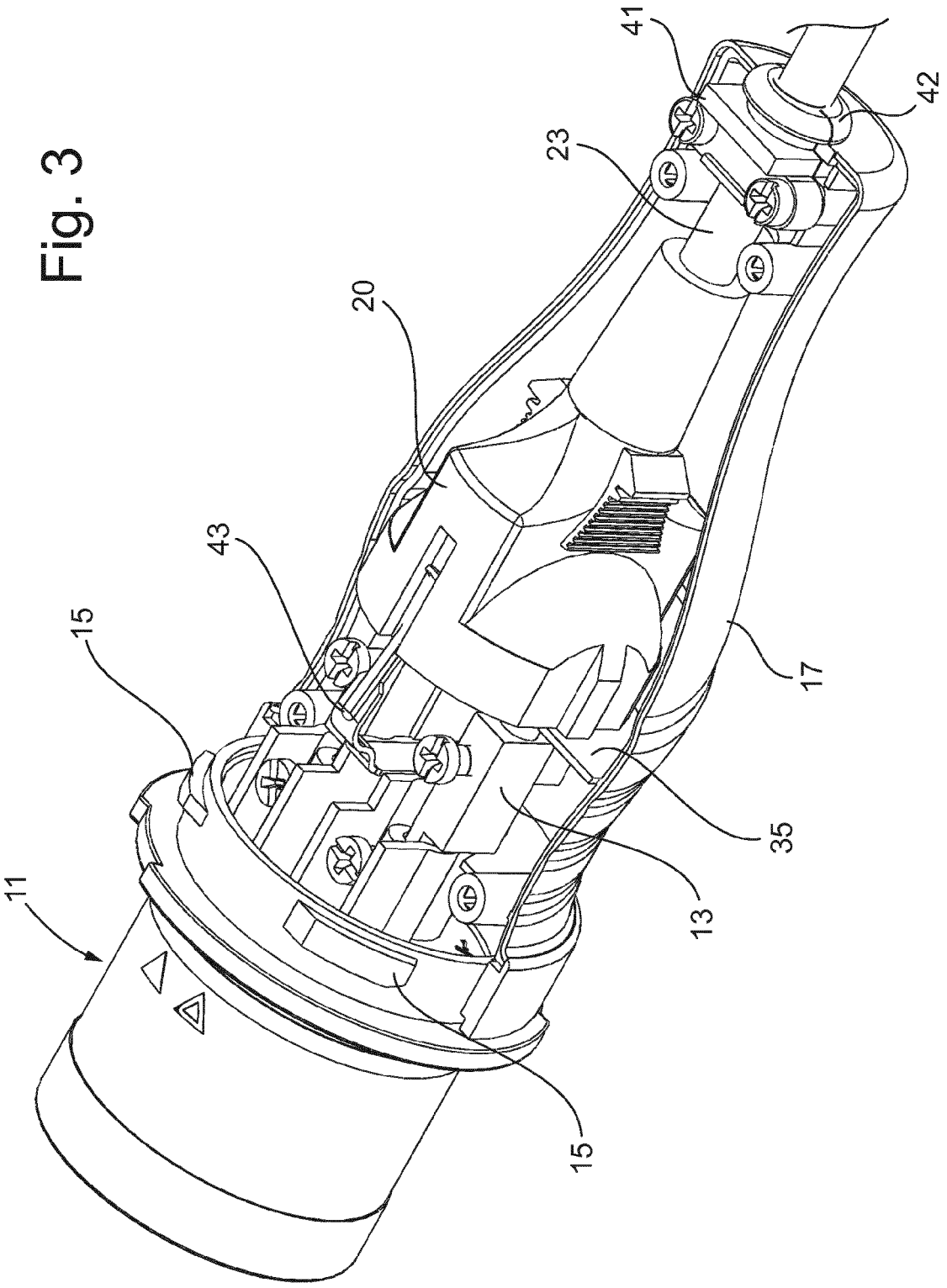
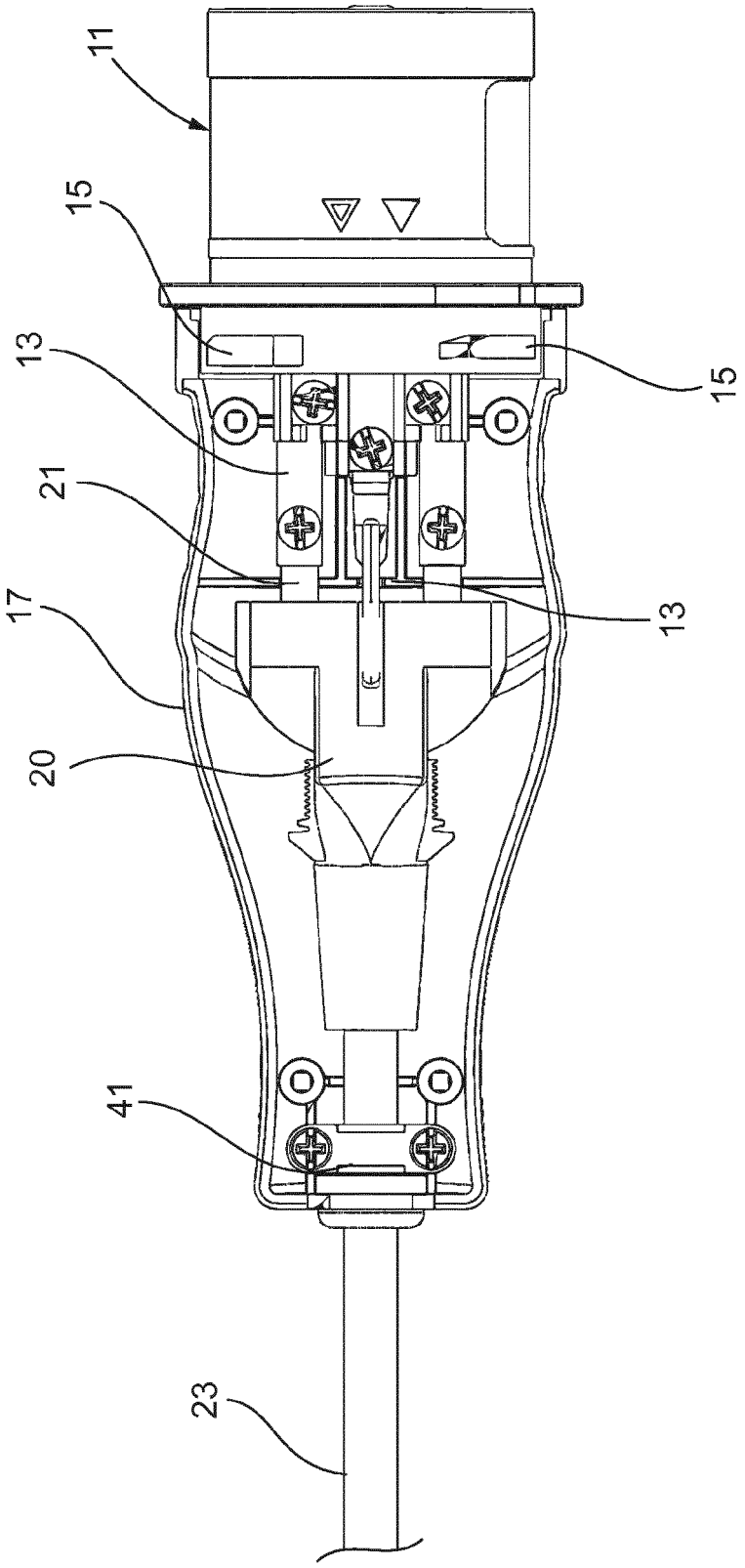


Fig. 4



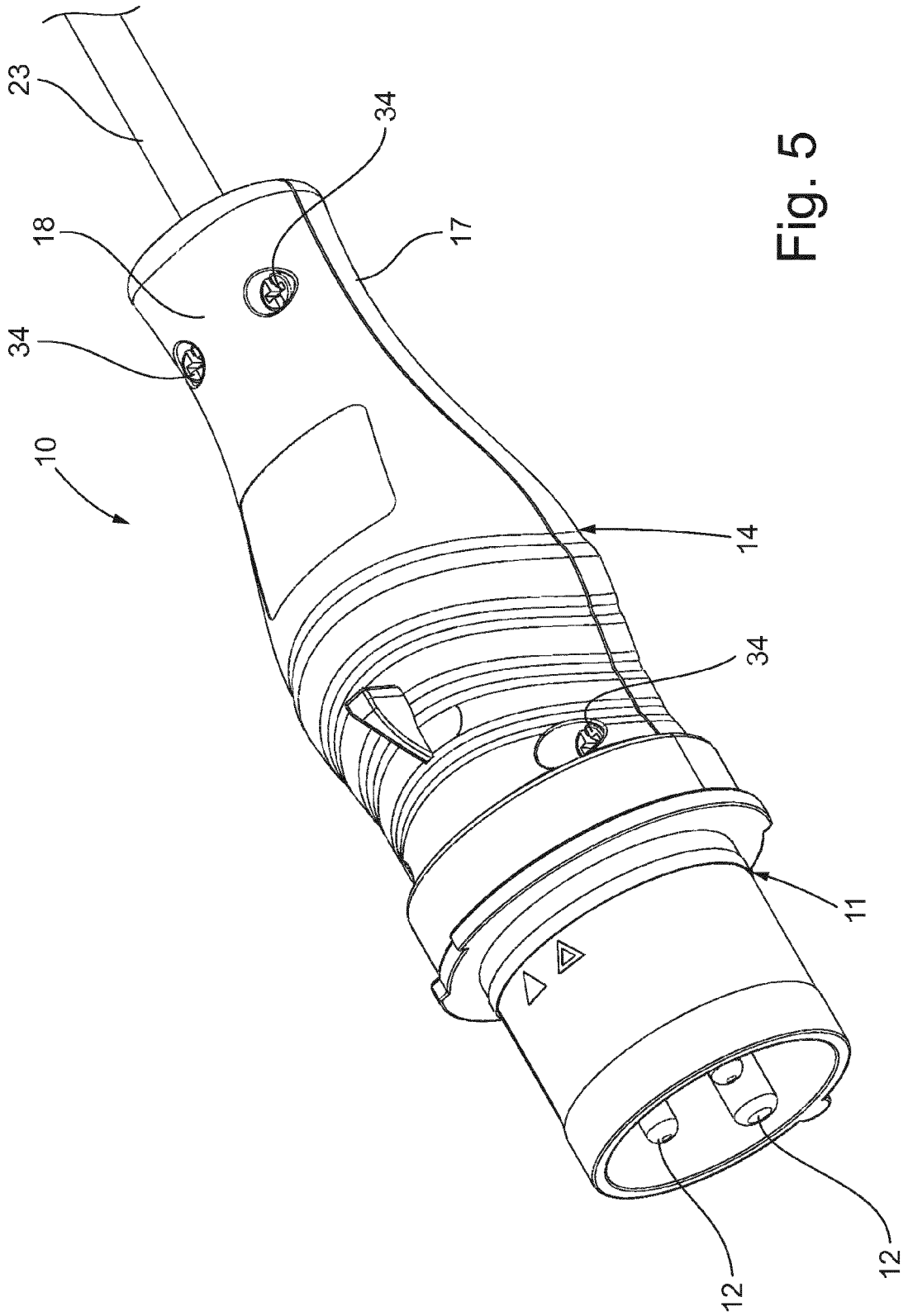


Fig. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 14 18 5499

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 6 454 576 B1 (HEDRICK PAUL [US] ET AL) 24 September 2002 (2002-09-24)	1-6,9,10	INV. H01R31/06
Y	* figures 1,2,11,13 *	7,8	H01R24/30

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Y	* figure 1 *	7,8	H01R13/58

A	DE 203 13 455 U1 (DEWERT ANTRIEBS SYSTEMTECH [DE]) 13 November 2003 (2003-11-13) * figure 2 *	1-10	

TECHNICAL FIELDS SEARCHED (IPC)

H01R

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	22 January 2015	Ferreira, João

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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22-01-2015

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