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(54) **ELECTRIC CONNECTION DEVICE**

(57) An electric connection device is described, comprising: a first electric connection element (10, 10a) connectable to a second electric connection element (12, 12a); a bayonet-type locking and unlocking mechanism configured for coupling and uncoupling the first connection element (10, 10a) and the second connection element (12, 12a) through a mutual rotation; a secondary safety locking mechanism, configured for preventing the rotation of the first connection element (10, 10a) and of the second connection element (12, 12a) one with respect to another and the consequent separation of the two elements (10, 10a, 12, 12a) comprising retractable locking means (22, 24) configured to be unlocked by a removable unlocking tool (32), the removable unlocking tool (32) being connectable to the electric connection device through removable connecting means (40) configured to be removably fastened to the electric connection device.

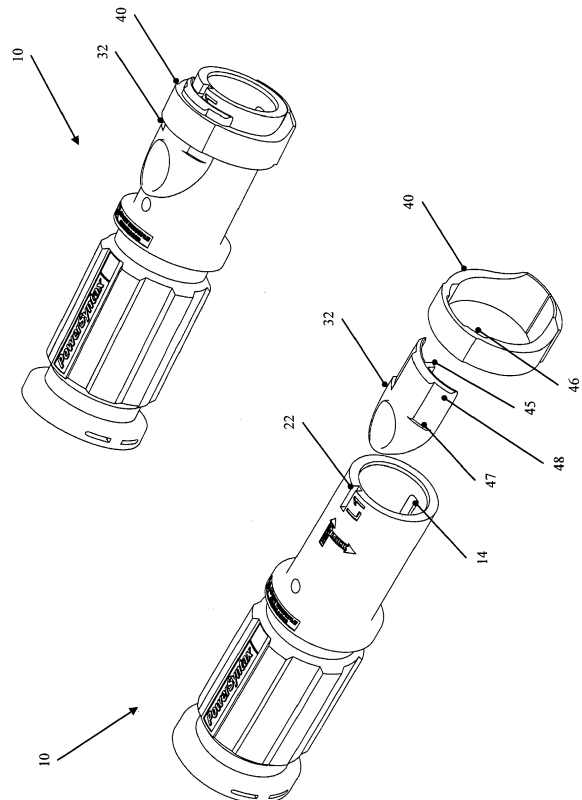


FIG. 1

Description

[0001] The present invention refers to an electric connection device.

[0002] In particular, the invention refers to an electric connection device, comprising two connection elements capable of being mutually coupled through a bayonet-type locking mechanism and through a secondary locking mechanism configured for preventing an accidental disconnection of the two connection elements, further comprising a removable unlocking mechanism.

[0003] Electric connection devices are known, for example from US5685730, comprising two connection elements, configured to be blocked through a bayonet-type locking mechanism which provides that the two elements are pressed one towards the other and blocked following the rotation of one related to the other, further comprising a secondary locking mechanism of said connection elements, having a spring-loaded safety pin which prevents the mutual rotation of the two elements, said secondary locking mechanism requiring a suitable unlocking tool.

[0004] These known electric connection devices have the advantage that they prevent, through the secondary locking mechanism, both the accidental unlocking of the two connection elements and the unlocking by people not equipped with a suitable unlocking tool, since not authorized, operation which can be dangerous, especially if the connector is of the high-voltage type.

[0005] However, these known electric connection devices have the problem that the authorized technician could forget or lose his suitable unlocking tool, which would make this unlocking less easy.

[0006] Electric connection devices are known which solve this problem by integrating with the electric connection device the unlocking system of the secondary locking mechanism, so that the skilled technician is not required to bring a suitable unlocking tool with him.

[0007] These latter electric connection devices however have the problem that they are not able of preventing the unlocking by non-authorized people.

[0008] Object of the present invention is providing an electric connection device comprising two connection elements capable of being mutually coupled through a bayonet-type locking mechanism and through a secondary locking mechanism, a pin configured for preventing the accidental disconnection of the two connection elements, further comprising a removable unlocking tool, configured both to be connected to the device by a skilled technician, who therefore will not be compelled any more to bring with him any suitable unlocking tool, with the risk of losing it or forgetting it, and to be separated and extracted by the skilled technician, thereby preventing the unlocking of the electric connection device by unauthorized people.

[0009] The above and other objects and advantages of the invention, as will result from the following description, are obtained with an electric connection device as claimed in the independent claim. Preferred embodiments

and non-trivial variations of the present invention are the subject matter of the dependent claims.

[0010] It is intended that the enclosed claims are an integral part of the present description.

[0011] It will be immediately obvious that numerous variations and modifications (for example related to shape, sizes, arrangements and parts with equivalent functionality) can be made to what is described, without departing from the scope of the invention as appears from the enclosed claims.

[0012] The present invention will be better described by some preferred embodiments thereof, provided as a non-limiting example, with reference to the enclosed drawings, in which:

- Figure 1 is an exploded perspective view and a perspective view of a first element of an electric connection device according to the present invention;
- Figure 2 is an exploded perspective view and a perspective view of a first element of an electric connection device according to the present invention; and
- Figure 3 are two perspective views of a second element of an electric connection device according to the present invention.

[0013] With reference to the Figures, a preferred embodiment of the electric connection device according to the present invention is shown and described.

[0014] The electric connection device of the invention comprises a first electric connection element 10, 10a, for example of the female type, preferably a front capsule 10 of the female type or a flange 10a of the female type for a fastening on a panel, connectable to a second electric connection element 12, 12a, for example of the male type, in particular a front capsule 12 of the male type or a flange 12a of the male type for a fastening on a panel, said first electric connection element 10, 10a and second electric connection element 12, 12a being mutually electrically connectable by means of respective electric contacts; a bayonet-type locking and unlocking mechanism configured for coupling the first connection element 10, 10a and the second connection element 12, 12a following a rotation of one with respect to the other along a first direction and for uncoupling said first connection element 10, 10a and said second connection element 12, 12a following a rotation of one with respect to the other along a second direction, opposite to the first; a secondary safety locking mechanism, configured for preventing the rotation of the first connection element 10, 10a and of the second connection element 12, 12a one with respect to the other along said second direction and the consequent separation of the two elements 10, 10a and 12, 12a, comprising retractable locking means 22, 24 configured to be unlocked by a removable unlocking tool 32.

[0015] The retractable locking means 22, 24 preferably comprise a seat 22, in a preferred way obtained on the external surface of the first connection element 10, 10a,

a pin 24, in a preferred way inserted in a housing 25 obtained in the second connection element 12, 12a, and an elastic element, for example a spring, contiguous to the pin 24, also inserted in the housing 25; said secondary locking mechanism requires to be unlocked by the insertion of the suitable removable unlocking tool 32 in the seat 22 which determines the retraction of the pin 24 in the housing 25 in order to allow the rotation of said first and second connection elements 10, 10a, 12, 12a one with respect to the other along the second direction which implies its separation.

[0016] The electric connection device of the invention comprises the removable unlocking tool 32, slidably connectable to the first connection element 10, 10a, through removable connecting means 40 configured to be removably fastened to the electric connection device.

[0017] For example, the connecting means comprise a ring nut 40 fastened to the first connection element 10, 10a, so that the removable unlocking tool 32 is sliding along first guiding means 48 made thereon both with respect to the first connection element 10, 10a, and with respect to the connecting means 40; in particular, said connecting means 40 are configured to be removably fastened to the first connection element 10, 10a, through removable fastening means of the known type, for example a screw, to connect the removable unlocking tool 32 to or to be removed from the first connection element 10, 10a, removing the removable fastening means, to separate the strumento of unlocking 32 dal electric connection device.

[0018] In a preferred way the connecting means 40 comprise second guiding means 46 configured to cooperate with the first guiding means 48 of the removable unlocking tool 32, in order to slide said removable unlocking tool 32, once connected to the first connection element 10, 10a, both with respect to the connecting means 40 and with respect to the electric connection device, comprising said removable unlocking tool 32, stop means 47, for example steps 47 obtained next to the ends of the guiding means 46, 48, configured to stop their sliding along the guiding means 46, 48 at the end of their stroke.

[0019] In a known way, the bayonet-type locking mechanism is configured so that, when the first connection element 10, 10a and the second connection element 12, 12a are pushed one towards the other to be coupled, at least one projecting element 14, obtained on the internal surface of the first connection element 10, 10a and placed next to at least one "L"-shaped groove 18, obtained on the external surface of the second connection element 12, 12a, vertically slides inside a first section 23 of the groove 18, till it reaches a second section 21 of said groove 18, after that, when the first and the second connection elements 10, 10a, 12, 12a, are rotated along the first direction to be coupled, the projecting element 14, horizontally slides inside said second section 21 of the groove 18; preferably, the connection elements 10, 10a, 12, 12a comprise two projecting elements 14, and two

"L"-shaped grooves 18. When the first 10, 10a and the second 12, 12a connection elements are rotated along the first direction and the projecting element 14 of the first connection element 10 horizontally slides inside the second section 21 of the groove 18, in the second connection element 12, 12a the pin 24 gets in contact with the first connection element 10, 10a which pushes it inside the housing 25 obtained in the second connection element 12, 12a compressing the spring, after that the pin 24 retracted in the housing 25 slides, following the rotation of the connection elements 10, 10a, 12, 12a, till it meets the seat 22 of the first connection element 10, 10a which implies that the pin 24, not in contact any more with the first element 10, 10a, is pushed by the decompression of the spring inside the seat 22 blocking the first and second connection elements 10, 10a, 12, 12a in such a manner that it prevents their mutual rotation.

[0020] In a preferred way, the removable unlocking tool 32, configured to be inserted in the seat 22 of the first connection element 10, 10a in contact with the pin 24 and pressed against said pin 24 in order to push it inside the housing 25 obtained in the second connection element 12 and unlock the secondary locking mechanism allowing a user to rotate the first and the second connection elements 10, 10a, 12, 12a in order to uncouple them, comprises a projection 45 whose sizes coincide with those of the seat 22 in which the projection 45 is inserted in order to unlock it.

[0021] Advantageously, the electric connection device allows the skilled technician to choose whether removing the unlocking tool, for preventing the unlocking of the electric connection device by unauthorized people, or keeping the unlocking tool connected to the connection device.

Claims

1. Electric connection device comprising: a first electric connection element (10, 10a) connectable to a second electric connection element (12, 12a) by means of respective electric contacts; a bayonet-type locking and unlocking mechanism configured for coupling and uncoupling the first connection element (10, 10a) and the second connection element (12, 12a) following a rotation of one with respect to another; a secondary safety locking mechanism, configured for preventing a rotation of the first connection element (10, 10a) and of the second connection element (12, 12a) one with respect to another and a consequent separation of the two elements (10, 10a, 12, 12a) comprising retractable locking means (22, 24) configured to be unlocked by a removable unlocking tool (32), **characterized in that** the removable unlocking tool (32) is connectable to the electric connection device through removable connecting means (40) configured to be removably fastened to the electric connection device.

2. Electric connection device according to claim 1,
characterized in that the removable connecting means (40) comprise a ring nut (40) fastened to the first connection element (10, 10a) so that the removable unlocking tool (32) is sliding along first guiding means (48) made thereon, both with respect to the first connection element (10, 10a) and with respect to the connecting means (40). 5
3. Electric connection device according to claim 2,
characterized in that the removable connecting means (40) comprise second guiding means (46) configured to cooperate with the first guiding means (48) of the removable unlocking tool (32), in order to slide said removable unlocking tool (32), once connected to the first connection element (10, 10a) both with respect to the connecting means (40) and with respect to the electric connection device. 10
4. Electric connection device according to any one of the previous claims, **characterized in that** the removable unlocking tool (32) comprises stop means (47) obtained next to ends of the guiding means (46, 48), configured to stop their sliding along the guiding means (46, 48) at the end of their stroke. 15 20 25
5. Electric connection device according to any one of the previous claims, **characterized in that** the retractable locking means (22, 24) comprise a seat (22), a retractable pin (24), and an elastic element contiguous to the pin (24), and **in that** said secondary locking mechanism requires to be unlocked by an insertion of the removable unlocking tool (32) in the seat (22), which determines a retraction of the pin (24) in order to allow the rotation of said first and second connection elements (10, 10a, 12, 12a) one with respect to another to separate them. 30 35
6. Electric connection device according to claim 5,
characterized in that the seat (22) is obtained on the external surface of the first connection element (10, 10a), the pin (24) is inserted in an housing (25) obtained in the second connection element (12, 12a), and the elastic element is inserted in the housing (25), and **in that** said secondary locking mechanism requires to be unlocked by an insertion of the removable unlocking tool (32) in the seat (22), which determines the retraction of the pin (24) in the housing (25) in order to allow the rotation of said first and second connection elements (10, 10a, 12, 12a) one with respect to another to separate them. 40 45 50
7. Electric connection device according to claim 6,
characterized in that the removable unlocking tool (32) comprises a projection (45) configured to be inserted in the seat (22) in order to unlock it. 55
8. Electric connection device according to any one of

the previous claims, **characterized in that** it comprises at least one projecting element (14), obtained on the internal surface of the first connection element (10, 10a), and **in that** the bayonet-type locking mechanism is configured so that, when the first connection element (10, 10a) and the second connection element (12, 12a) are pushed one towards another to be coupled, said projecting element (14), placed next to at least one "L"-shaped groove (18) obtained on the external surface of the second connection element (12, 12a), vertically slides inside a first section (23) of the groove (18), till it reaches a second section (21) of said groove (18), after that, when the first and the second connection elements (10, 10a, 12, 12a) are rotated to be coupled, the projecting element (14) horizontally slides inside said second section (21) of the groove (18) for coupling the first electric connection element (10, 10a) and the second electric connection element (12, 12a).

9. Electric connection device according to claim 8,
characterized in that the connection elements (10, 10a, 12, 12a) comprise two projecting elements (14) and two "L"-shaped grooves (18).

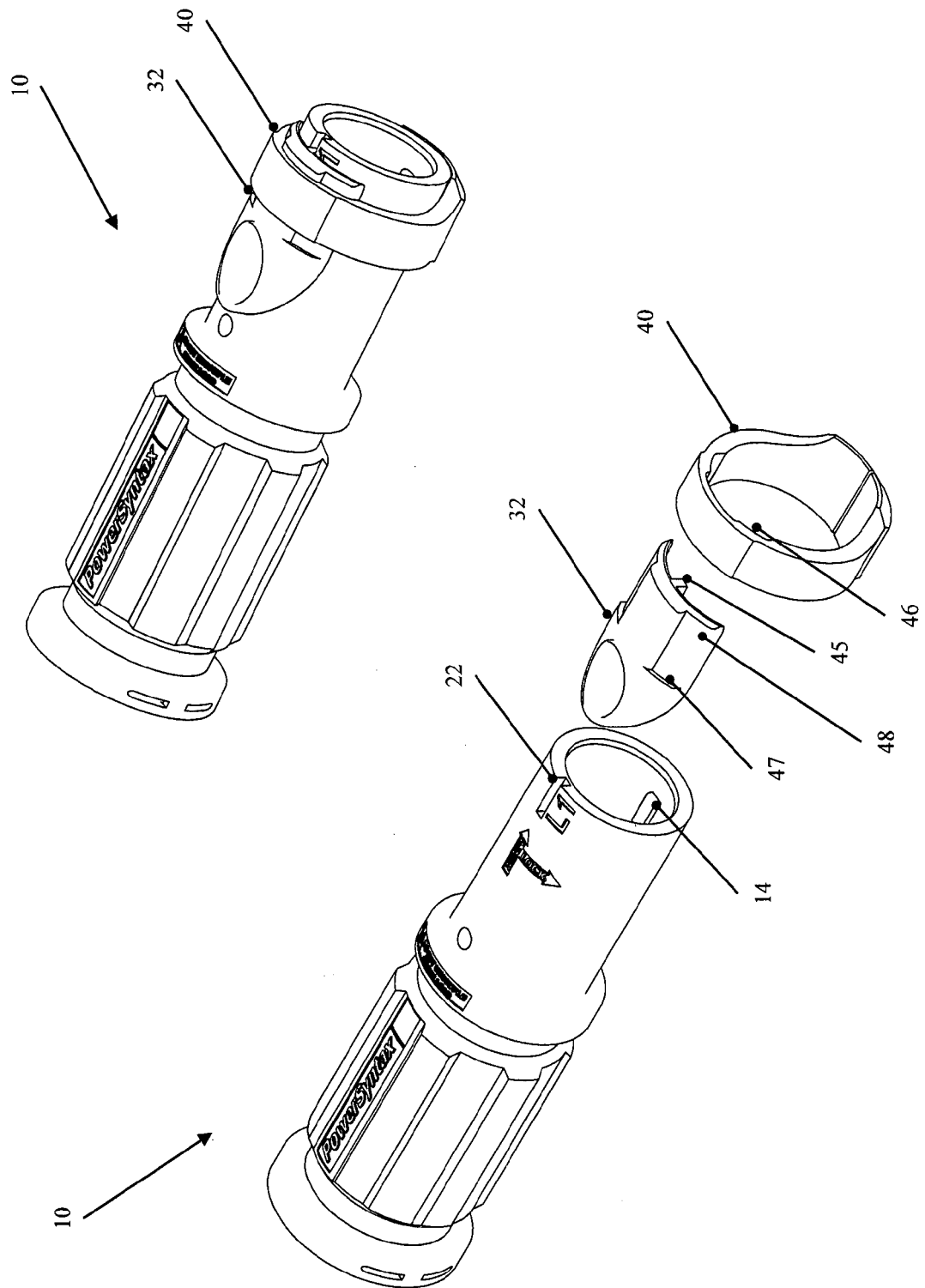


FIG. 1

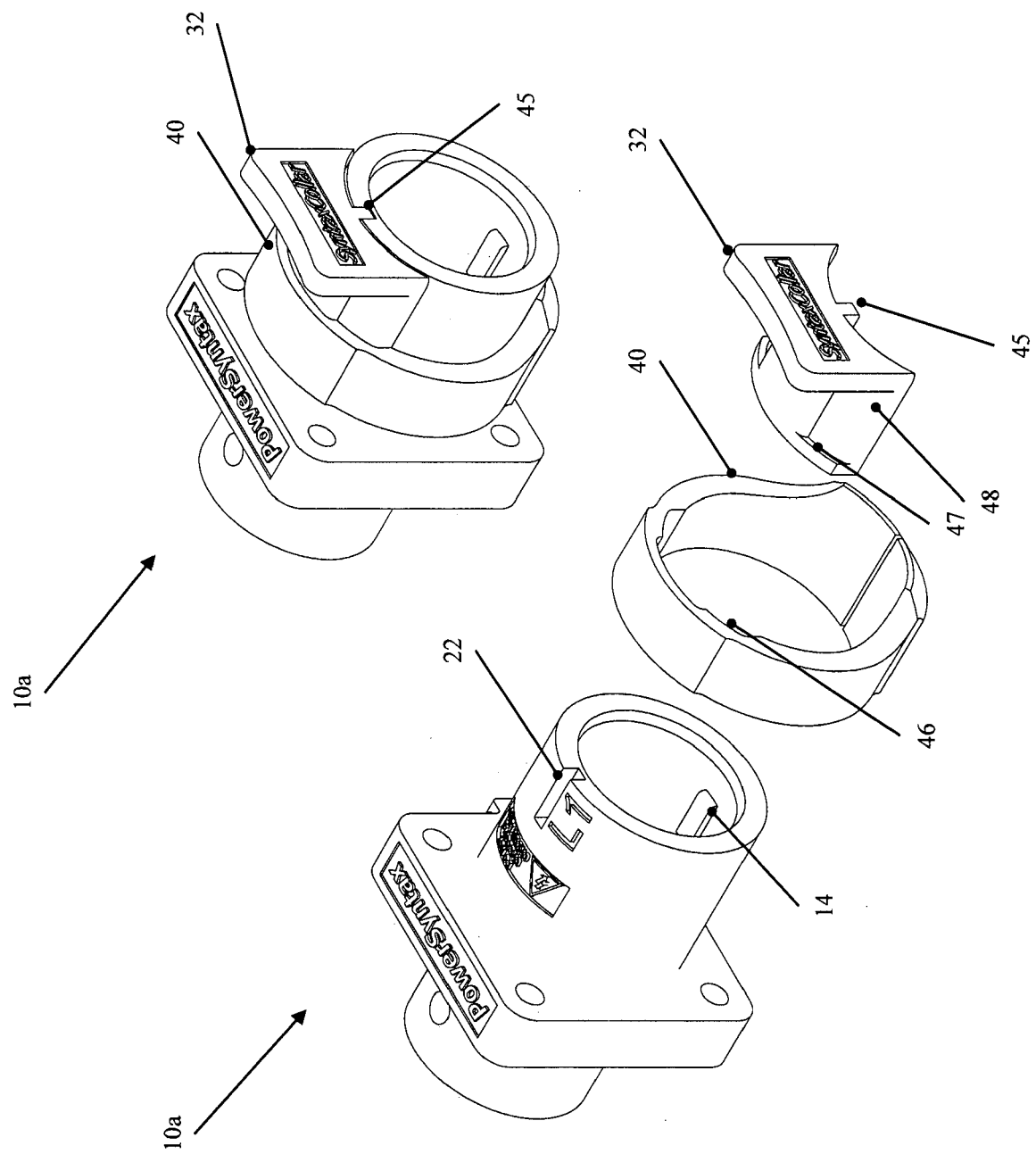


FIG. 2

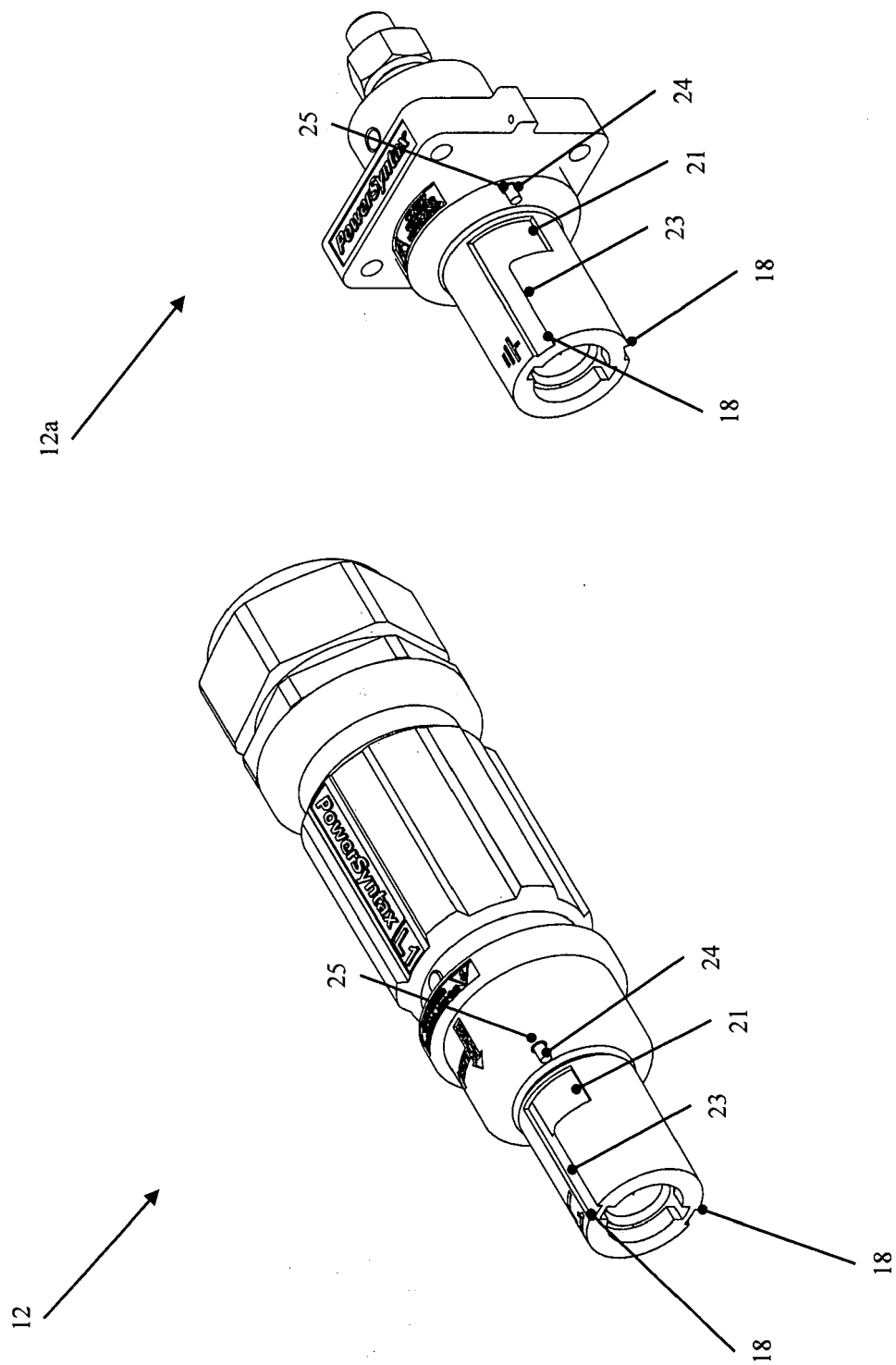


FIG. 3



EUROPEAN SEARCH REPORT

Application Number
EP 19 00 0442

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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 28 January 2020	Examiner Bouhana, Emmanuel
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 19 00 0442

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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