

(19)



(11)

EP 4 819 405 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:

07.10.2026 Bulletin 2026/41

(21) Application number: **25168355.3**

(22) Date of filing: **03.04.2025**

(51) International Patent Classification (IPC):

H01R 13/53 ^(2006.01) **H01R 13/627** ^(2006.01)

H01R 13/707 ^(2006.01) **H01R 24/00** ^(2011.01)

H01R 13/52 ^(2006.01) **H01R 13/71** ^(2006.01)

(52) Cooperative Patent Classification (CPC):

H01R 13/6278; B60R 16/00; H01R 13/53;

H01R 13/707; H01R 24/005; H01R 13/5202;

H01R 13/71; H01R 2201/20; H01R 2201/26

(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 ME MK MT NL
NO PL PT RO RS SE SI SK SM TR**

Designated Extension States:

BA

Designated Validation States:

GE KH LA MA MD TN

(71) Applicant: **Volvo Truck Corporation**

405 08 Göteborg (SE)

(72) Inventors:

• **Bernatavicius, Pijus**
437 31 Lindome (SE)

• **Arnold, Sascha**
415 05 Göteborg (SE)

• **Serra Dalmau, Albert**
417 21 Göteborg (SE)

(74) Representative: **AWA Sweden AB**

Box 5117

200 71 Malmö (SE)

(54) **HIGH VOLTAGE CONNECTOR ASSEMBLY**

(57) The present disclosure relates to a connector assembly for a high-voltage, HV, cable, the assembly comprising: an inner header configured to enclose the HV cable; an outer shell configured to enclose the inner header; and a high-voltage interlock loop, HVIL; wherein the outer shell is movable relative the inner header between a first position in which an inspection hole of the outer shell is configured to misalign with an inspection hole of the inner header, and a second position in which the inspection hole of the outer shell is configured to align with the inspection hole of the inner header so as to provide an open path to the HV cable from outside the connector assembly, and wherein the HVIL is configured such that it is interrupted when the outer shell is arranged in the second position; and wherein one of the inner header or the outer shell comprises a locking pin configured to engage with a groove arranged in the other one of the inner header or the outer shell so as to guide the movement of the outer shell between the first position and the second position.

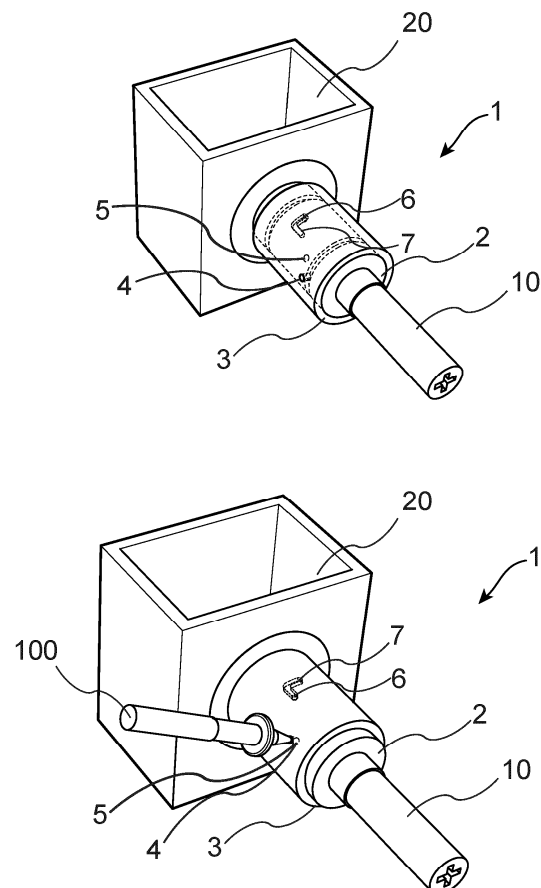


Fig. 4

Description

TECHNICAL FIELD

[0001] The disclosure relates generally to connector assemblies for high voltage, HV, cables. In particular aspects, the disclosure relates to connector assemblies allowing for safe inspection of electrical properties, such as voltage, of HV cables. The disclosure can be applied to heavy-duty vehicles, such as trucks, buses, and construction equipment, among other vehicle types. Although the disclosure may be described with respect to a particular vehicle, the disclosure is not restricted to any particular vehicle.

BACKGROUND

[0002] High voltage power distribution boxes are often equipped with a slowdown lid to obstruct the access to high voltage parts. The slowdown lid blocks the access to the high voltage (HV) parts once the main lid is removed. Often, the main lid has a magnet, which interrupts the high voltage interlock loop (HVIL) as soon as the lid is lifted. Interrupted HVIL shuts down the system and makes it safe to access. Further, due to the time it takes to discharge the system, a slowdown lid prevents the access. Furthermore, two holes in the slowdown lid are present to allow measurement of electrical properties, such as the voltage, and to make sure that the system is safe to access in order to, e.g., perform mechanical maintenance. After ensuring 0 voltage in the system, the slowdown lid may be removed.

[0003] However, whenever a technician needs to decommission a system according to above, it is common that many operations need to be performed. For example, a plurality of fasteners often needs to be removed just to check the voltage of the system. Hereby, current market solutions are often time consuming.

[0004] Thus, there is a need for an improved solution providing a more time-efficient solution which simultaneously ensures the safety of an operator.

SUMMARY

[0005] According to a first aspect of the disclosure, connector assembly for a high-voltage (HV) cable, the assembly comprising: an inner header configured to enclose the HV cable; an outer shell configured to enclose the inner header; and a high-voltage interlock loop (HVIL); wherein the outer shell is movable relative the inner header between a first position in which an inspection hole of the outer shell is configured to misalign with an inspection hole of the inner header, and a second position in which the inspection hole of the outer shell is configured to align with the inspection hole of the inner header so as to provide an open path to the HV cable from outside the connector assembly, and wherein the HVIL is configured such that it is interrupted when the outer

shell is arranged in the second position; and wherein one of the inner header or the outer shell comprises a locking pin configured to engage with a groove arranged in the other one of the inner header or the outer shell so as to guide the movement of the outer shell between the first position and the second position. The first aspect of the disclosure may seek to improve time-efficiency, robustness and safety while accessing an HV cable, for example when probing properties thereof. A technical benefit may include a more easy-to use connector assembly providing a more time-efficient and more robust way of accessing an HV cable, also ensuring the safety of an operator.

[0006] It is to be understood that a connector assembly according to the present disclosure may be used with HV cables in any kind of application. However, the connector assembly is preferably used with HV cables in road vehicles, in particular trucks. For example, a connector assembly may be used with an HV cable which is connected to a high voltage distribution grid of the road vehicle.

[0007] Optionally in some examples, including in at least one preferred example, the groove may be a closed groove comprising a first end point and a second end point, wherein the locking pin may be arranged at the first end point when the outer shell is in the first position and at the second end point when the outer shell is in the second position. Within the context of the present disclosure, that the groove provided in the inner header or the outer shell is a "closed groove" is to be understood as it defining end points beyond which the locking pin is restricted from moving. That is, the movement of the locking pin, and consequently inner header or the outer shell, is limited by the groove in such a way so that the outer shell may not easily be removed from the inner header. A technical benefit may include providing a further safer solution. A closed groove may comprise at least two end points.

[0008] Optionally in some examples, including in at least one preferred example, a sealing may be arranged between the inspection hole of the outer shell and the inspection hole in the inner header when the outer shell is in the first position. A technical benefit may include providing improved resistance to soiling and/or penetration of moisture. A sealing may, e.g., be achieved by a set of, for example at least two, O-rings establishing a sealed area of the inner header. The inspection hole of the outer shell may be arranged outside the sealed area when the outer shell is in the first position.

[0009] Optionally in some examples, including in at least one preferred example, the groove may be zigzag shaped. Optionally, the groove may be substantially L-shaped.

[0010] Optionally in some examples, including in at least one preferred example, the inner header and the outer shell may be cylindrical such that the outer shell is rotatably movable relative the inner header. A technical benefit may include providing a solution which is further user friendly, since moving the outer shell in relation to the

inner header between the first position and the second position may include a rotating motion.

[0011] Optionally in some examples, including in at least one preferred example, the inner header and the outer shell may be made of electrically insulating material. A technical benefit may include providing a further safer solution.

[0012] Optionally in some examples, including in at least one preferred example, the inner header may comprises the locking pin and the groove may be arranged in the outer shell. A technical benefit may include that the connector assembly is easier to assemble, since the inner header is often rigidly attached to a housing to which the connector assembly is connected.

[0013] Optionally in some examples, including in at least one preferred example, wherein in the first position of the outer shell, the locking pin may be actuatable between a first state in which movement of the outer shell relative the inner header is restricted and a second state in which movement of the outer shell relative the inner header is permitted. A technical benefit may include that the risk of the HVIL being involuntarily broken is reduced. For example, if the connector assembly is used for an HV cable in a road vehicle, such as a truck, the risk of the outer shell moving to the second position, in which position the HVIL is broken, due to vibrations caused by driving is reduced.

[0014] The locking pin may be actuatable in a variety of ways. Therefore, the locking pin may be biased in the first state in a variety. To this end, in some examples, including in at least one preferred example, the locking pin may spring loaded.

[0015] Optionally in some examples, including in at least one preferred example, bringing of the outer shell out of the first position may interrupt the HVIL. That is, the HVIL is not only interrupted when the outer shell is in the second position, but as long as the outer shell is not in the first position. A technical benefit may include that the time available for discharging, i.e. reaching 0, or close to 0, voltage, the HV cable and the system in which it forms a part, such as a HV power distribution box, is increased. Hereby, an even safer solution is provided.

[0016] Optionally in some examples, including in at least one preferred example, the locking pin may be configured such that actuation thereof to the second state interrupts the HVIL.

[0017] Optionally in some examples, including in at least one preferred example, the locking pin may form part of the HVIL.

[0018] Optionally in some examples, including in at least one preferred example, the locking pin may be configured to interrupt the HVIL when the outer shell is in the second position. That is, when the outer shell is arranged in the second position, the locking pin may interrupt the HVIL.

[0019] The above may be achieved in a variety of ways. In some examples, including in at least one preferred example, the locking pin may be configured to mechani-

cally and/or magnetically interact with the HVIL in order to interrupt the HVIL.

[0020] The disclosed aspects, examples (including any preferred examples), and/or accompanying claims may be suitably combined with each other as would be apparent to anyone of ordinary skill in the art. Additional features and advantages are disclosed in the following description, claims, and drawings, and in part will be readily apparent therefrom to those skilled in the art or recognized by practicing the disclosure as described herein.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] Examples are described in more detail below with reference to the appended drawings.

FIG. 1 is an exemplary schematic exploded view of a connector assembly, and an HV cable and a housing which are connected to each other via the connector assembly according to an example.

FIG. 2A is an exemplary schematic perspective view a connector assembly wherein the outer shell is arranged relative the inner header in the first position according to an example.

FIG. 2B is an exemplary schematic cross-sectional view of the connector assembly of FIG. 2A.

FIG. 3A is an exemplary schematic perspective view a connector assembly wherein the outer shell is arranged relative the inner header in the second position according to an example.

FIG. 3B is an exemplary schematic cross-sectional view of the connector assembly of FIG. 3A.

FIG. 4 is an exemplary schematic perspective view a connector assembly wherein (left) the outer shell is arranged relative the inner header in the first position, and (right) the outer shell is arranged relative the inner header in the second position and wherein a multimeter probe is arranged through the aligning inspection holes according to an example.

DETAILED DESCRIPTION

[0022] The detailed description set forth below provides information and examples of the disclosed technology with sufficient detail to enable those skilled in the art to practice the disclosure.

[0023] A problem to be solved by any one aspect of the disclosure is providing a more time-efficiency and user friendly, robust and safe solution for accessing an HV cable, for example when probing properties thereof.

[0024] **FIG. 1** is an exemplary schematic exploded view of a connector assembly 1 according to the present disclosure. The connector assembly 1 comprises an inner header 2 configured to enclose a high-voltage (HV) cable 10. That is, the inner header 2 comprises an inner surface 2A which is configured to face and/or be arranged against the HV cable 10. The connector as-

sembly 1 is further configured to be connected to a housing 20. The housing may for example be a part of or in electrical and/or electronic connection with a power distribution box. The connector assembly 1 further comprises an outer shell 3 configured to enclose the inner header 2. That is, the outer shell 3 comprises an inner surface 3A which is configured to face and/or be arranged against the inner header 2, specifically an outer surface 2B of the inner header 2. Here, the inner header 2 and the outer shell 3 are cylindrical. However, they may have any shape, as long as they are substantially complementary such that the outer shell 3 is enclosing the inner header 2 in an assembled state of the connector assembly 1. For example, the inner header 2 and the outer shell 3 may have square or rectangular cross-sections. However, it is to be understood that in such a case, the outer shell 3 is only arranged for rectilinear motion in relation to the inner header 2. For example, in an assembled state of the connector assembly, the outer shell 3 may be arranged to move in relation to the inner header 2 in a direction along the HV cable and in a direction lateral to the HV cable.

[0025] Further, the inner header 2 and the outer shell 3 may be made of any suitable material. Preferably, the inner header 2 and the outer shell 3 comprise or are made of electrically insulating material. An electrically insulating material is to be understood as a material which exhibits zero to very low electrical conductivity. Exemplary materials include: polymeric material, such as plastic material, and ceramic material.

[0026] When in an assembled state of the connector assembly 1, i.e. when the outer shell 3 is enclosing the inner header 2, the outer shell 3 is movable relative the inner header 2 between a first position and a second position.

[0027] The first position is a position in which an inspection hole 4 of the outer shell 3 is configured to misalign with an inspection hole 5 of the inner header 2. In other words, the inspection hole 4 of the outer shell 3 is configured to not overlap with the inspection hole 5 of the inner header 2 as seen in a radial direction. That is, the HV cable is not accessible from outside of the connector assembly 1.

[0028] The second position is a position in which the inspection hole 4 of the outer shell 3 is configured to align with the inspection hole 5 of the inner header 2 so as to provide an open path to the HV cable 10 from outside the connector assembly 1.

[0029] Furthermore, according to the present disclosure, one of the inner header 2 or the outer shell 3 comprises a locking pin 6 configured to engage with a groove 7 arranged in the other one of the inner header 2 or the outer shell 3 so as to guide the movement of the outer shell 3 between the first position and the second position. In Fig. 1, the locking pin 6 is provided in the inner header 2, whereas the groove 7 is provided in the outer shell 3. Specifically, the groove 7 is provided in the inner surface 3A of the outer shell 3. Further, in Fig. 1, the

groove 7 is a closed groove comprising a first end point 7A and a second end point 7B. Moreover, the locking pin 6 is arranged at the first end point 7A when the outer shell 3 is in the first position and at the second end point 7B when the outer shell 3 is in the second position. It is to be understood that the locking pin 6, when being arranged at either end point 7A, 7B, is restricted from moving in any other direction but one.

[0030] Fig. 2A is an exemplary schematic perspective view of the connector assembly 1 in an assembled state. Further, the outer shell 3 is arranged relative the inner header 2 in the first position. Here, the groove 7 is a closed groove. The groove 7 is provided with a first end point 5A and a second end point 5B. Here, the locking pin 6 is arranged at the first end point 5A of the groove. That is, when the locking pin 6 is arranged at the first end point 5A of the groove, the outer shell 3 is arranged relative the inner header 2 in the first position.

[0031] As is shown in Fig. 2B, the connector assembly 1 further comprises a high-voltage interlock loop, HVIL 8. The HVIL 8 may, preferably, form part of an HVIL 8 of a vehicle. In Fig. 2B, the HVIL 8 is uninterrupted, or unbroken, or complete. Consequently, the cable 10 is under high voltage, that is, current is flowing through the cable 10. Hence, the HV cable 10 is not accessible from the outside. For example, the HV cable 10 is not accessible by a multimeter probe 100.

[0032] The groove 7 is further substantially L-shaped. However, it is to be understood that the groove 7 may have any suitable shape. For example, the groove 7 may have a zigzag shape. The groove 7 is configured to guide the movement of the outer shell 3 between the first position and the second position. Since the inner header 2 and the outer shell 3 are cylindrical, the outer shell 3 is rotatably movable relative the inner header 2. In Fig. 2A, the outer shell 3 may therefore be guided by the groove 7 in an angular direction, i.e. by rotation around a rotational axis of the outer shell 3, and in a translative direction, i.e. along the rotational axis of the outer shell 3.

[0033] The locking pin 6 is here arranged at the first end point 7A of the groove 7. The locking pin 6 may be actuatable between a first state in which movement of the outer shell 3 relative the inner header 2 is restricted and a second state in which movement of the outer shell 3 relative the inner header 2 is permitted. The locking pin 6 may be actuatable in a variety of ways. The locking pin 6 may, e.g., be biased in the first state. To this end, the locking pin 6 may spring loaded. The locking pin 6 may be reachable by an operator in a variety of ways. For example, the locking pin 6 may, in the first position, be arranged such that actuation thereof brings a top part thereof into the groove 7. That is, in such examples, the top part of the locking pin 6 may be arranged outside of the outer shell 3 as seen in a radial direction. Hereby, the locking pin 6 may be actuatable in a radially inwards direction. Additionally or alternatively, the outer shell 3 may be provided with a soft patch arranged above the locking pin 6, specifically a top part of the locking pin 6, in

the first position, wherein the soft patch is configured to be displaceable upon pressing thereof by an operator. Hereby, the locking pin 6 may be actuatable through the soft patch. To this end, the soft patch may be made of any suitable flexible material, such as rubber, or polymeric material.

[0034] Moreover, in order to avoid water creepage through the inspection hole 5 of the outer shell 3, the inspection hole 5 is positioned outside a sealed area of the inner header 2 when the outer shell 3 is in the first position. The sealing of the inner header 2 is in **Fig. 2B** achieved by two O-rings 9.

[0035] In **Fig. 3A**, the outer shell 3 has been moved to the second position. Hereby, the inspection hole 4 of the outer shell 3 is aligned with the inspection hole 5 of the inner header 2.

[0036] As may be seen in **Fig. 3B**, when the outer shell 3 is in the second position, the HVIL 8 is interrupted, or broken. Here, the outer shell 3 has been moved in relation to the inner header 2, guided by the locking pin 6, such that the locking pin 6 has been moved to a second end point 7B of the groove 7. Here, the locking pin 6 mechanically interacts with the HVIL 8 in order to interrupt the HVIL 8. However, the locking pin 6 may additionally or alternatively magnetically interact with the HVIL 8 in order to interrupt the HVIL 8. It is to be understood that, in some example, bringing of the outer shell 3 out of the first position may interrupt the HVIL 8. That is, the HVIL 8 is not only interrupted when the outer shell 3 is in the second position, but as long as the outer shell 3 is not in the first position. Additionally or alternatively, the locking pin 6 may form part of the HVIL 8. Hereby, by actuating the locking pin 6, i.e. displacing the locking pin 6, e.g. radially inwards or radially outwards, the HVIL 8 may be broken. For example, the locking pin 6 may in a first state close the HVIL 8 by conducting the low-voltage HVIL signal and in a second state be misplaced due to the spring force and break the HVIL 8 by not being in a position in which it may electrically conduct the low-voltage HVIL signal.

[0037] The HV cable 10 is here accessible from the outside. Hereby, as may be seen in **Fig. 3B**, a multimeter probe 100 is arranged through the inspection holes 4, 5, such that electrical properties of the HV cable 10 may be measured.

[0038] In **Fig. 4**, a general overview of the first aspect of the present disclosure is provided. In the top view of **Fig. 4**, a connector assembly 1 in an assembled state for a high-voltage, HV, cable 10 is provided. The assembly 1 comprises an inner header 2 enclosing the HV cable 10, an outer shell 3 enclosing the inner header 2, and a high-voltage interlock loop, HVIL 8. The outer shell 3 is movable relative the inner header 2 between a first position in which an inspection hole 5 of the outer shell 3 is configured to misalign with an inspection hole 4 of the inner header 2, and a second position. One of the inner header 2 or the outer shell 3 comprises a locking pin 6 configured to engage with a groove 7 arranged in the other one of the inner header 2 or the outer shell 3 so as to

guide the movement of the outer shell 3 between the first position and the second position. Here, the inner header 2 comprises the locking pin 6 and the groove 7 is arranged in the outer shell 3.

[0039] In the bottom view of **Fig. 4**, the outer shell 3 is in the second position relative the inner header 2. The second position is a position in which the inspection hole 5 of the outer shell 3 is configured to align with the inspection hole 4 of the inner header 2 so as to provide an open path to the HV cable 10 from outside the connector assembly 1. Further, the HVIL 8 is configured such that it is interrupted when the outer shell 3 is arranged in the second position. The HV cable 10 is consequently accessed by a multimeter probe 100.

[0040] Examples of the disclosure follows.

Example 1: A connector assembly 1 for a high-voltage, HV, cable 10, the assembly 1 comprising: an inner header 2 configured to enclose the HV cable 10; an outer shell 3 configured to enclose the inner header 2; and a high-voltage interlock loop, HVIL 8; wherein the outer shell 3 is movable relative the inner header 2 between a first position in which an inspection hole 5 of the outer shell 3 is configured to misalign with an inspection hole 4 of the inner header 2, and a second position in which the inspection hole 5 of the outer shell 3 is configured to align with the inspection hole 4 of the inner header 2 so as to provide an open path to the HV cable 10 from outside the connector assembly 1, and wherein the HVIL 8 is configured such that it is interrupted when the outer shell 3 is arranged in the second position; and wherein one of the inner header 2 or the outer shell 3 comprises a locking pin 6 configured to engage with a groove 7 arranged in the other one of the inner header 2 or the outer shell 3 so as to guide the movement of the outer shell 3 between the first position and the second position.

Example 2: The connector assembly 1 according to example 1, wherein the groove 7 is a closed groove comprising a first end point 7A and a second end point 7B, wherein the locking pin 6 is arranged at the first end point 7A when the outer shell 3 is in the first position and at the second end point 7B when the outer shell 3 is in the second position.

Example 3: The connector assembly 1 according to example 1 or 2, wherein a sealing is arranged between the inspection hole 5 of the outer shell 3 and the inspection hole 4 in the inner header 2 when the outer shell 3 is in the first position.

Example 4: The connector assembly 1 according to any one of the preceding examples, wherein the groove 7 is zigzag shaped.

Example 5: The connector assembly 1 according to any one of examples 1-3, wherein the groove 7 is substantially L-shaped.

Example 6: The connector assembly 1 according to any one of the preceding examples, wherein the

inner header 2 and the outer shell 3 are cylindrical such that the outer shell 3 is rotatably movable relative the inner header 2.

Example 7: The connector assembly 1 according to any one of the preceding examples, wherein the inner header 2 and the outer shell 3 are made of electrically insulating material.

Example 8: The connector assembly 1 according to any one of the preceding examples, wherein the inner header 2 comprises the locking pin 6 and the groove 7 is arranged in the outer shell 3.

Example 9: The connector assembly 1 according to any one of the preceding examples, wherein in the first position of the outer shell 3, the locking pin 6 is actuatable between a first state in which movement of the outer shell 3 relative the inner header 2 is restricted and a second state in which movement of the outer shell 3 relative the inner header 2 is permitted.

Example 10: The connector assembly 1 according to example 9, wherein the locking pin 6 is spring loaded.

Example 11: The connector assembly 1 according to any one of the preceding examples, wherein bringing of the outer shell 3 out of the first position interrupts the HVIL 8.

Example 12: The connector assembly 1 according to example 11 when dependent on example 10 or 9, wherein the locking pin 6 is configured such that actuation thereof to the second state interrupts the HVIL 8.

Example 13: The connector assembly 1 according to claim 12, wherein the locking pin 6 forms part of the HVIL 8.

Example 14: The connector assembly 1 according to any one of example 1-10, wherein the locking pin 6 is configured to interrupt the HVIL 8 when the outer shell 3 is in the second position.

Example 15: The connector assembly 1 according to example 14, wherein the locking pin 6 is configured to mechanically and/or magnetically interact with the HVIL 8 in order to interrupt the HVIL 8.

[0041] The terminology used herein is for the purpose of describing particular aspects only and is not intended to be limiting of the disclosure. As used herein, the singular forms "a," "an," and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. As used herein, the term "and/or" includes any and all combinations of one or more of the associated listed items. It will be further understood that the terms "comprises," "comprising," "includes," and/or "including" when used herein specify the presence of stated features, integers, actions, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, actions, steps, operations, elements, components, and/or groups thereof.

[0042] It will be understood that, although the terms first, second, etc., may be used herein to describe various elements, these elements should not be limited by these terms. These terms are only used to distinguish one element from another. For example, a first element could be termed a second element, and, similarly, a second element could be termed a first element without departing from the scope of the present disclosure.

[0043] Relative terms such as "below" or "above" or "upper" or "lower" or "horizontal" or "vertical" may be used herein to describe a relationship of one element to another element as illustrated in the Figures. It will be understood that these terms and those discussed above are intended to encompass different orientations of the device in addition to the orientation depicted in the Figures. It will be understood that when an element is referred to as being "connected" or "coupled" to another element, it can be directly connected or coupled to the other element, or intervening elements may be present. In contrast, when an element is referred to as being "directly connected" or "directly coupled" to another element, there are no intervening elements present.

[0044] Unless otherwise defined, all terms (including technical and scientific terms) used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this disclosure belongs. It will be further understood that terms used herein should be interpreted as having a meaning consistent with their meaning in the context of this specification and the relevant art and will not be interpreted in an idealized or overly formal sense unless expressly so defined herein.

[0045] It is to be understood that the present disclosure is not limited to the aspects described above and illustrated in the drawings; rather, the skilled person will recognize that many changes and modifications may be made within the scope of the present disclosure and appended claims. In the drawings and specification, there have been disclosed aspects for purposes of illustration only and not for purposes of limitation, the scope of the disclosure being set forth in the following claims.

Claims

1. A connector assembly for a high-voltage, HV, cable, the assembly comprising:

an inner header configured to enclose the HV cable;
an outer shell configured to enclose the inner header; and
a high-voltage interlock loop, HVIL;
wherein the outer shell is movable relative the inner header between a first position in which an inspection hole of the outer shell is configured to misalign with an inspection hole of the inner header, and a second position in which the inspection hole of the outer shell is configured to

- align with the inspection hole of the inner header so as to provide an open path to the HV cable from outside the connector assembly, and wherein the HVIL is configured such that it is interrupted when the outer shell is arranged in the second position; and wherein one of the inner header or the outer shell comprises a locking pin configured to engage with a groove arranged in the other one of the inner header or the outer shell so as to guide the movement of the outer shell between the first position and the second position.
2. The connector assembly according to claim 1, wherein the groove is a closed groove comprising a first end point and a second end point, wherein the locking pin is arranged at the first end point when the outer shell is in the first position and at the second end point when the outer shell is in the second position.
 3. The connector assembly according to claim 1 or 2, wherein a sealing is arranged between the inspection hole of the outer shell and the inspection hole in the inner header when the outer shell is in the first position.
 4. The connector assembly according to any one of the preceding claims, wherein the groove is zigzag shaped.
 5. The connector assembly according to any one of claims 1-3, wherein the groove is substantially L-shaped.
 6. The connector assembly according to any one of the preceding claims, wherein the inner header and the outer shell are cylindrical such that the outer shell is rotatably movable relative the inner header.
 7. The connector assembly according to any one of the preceding claims, wherein the inner header and the outer shell are made of electrically insulating material.
 8. The connector assembly according to any one of the preceding claims, wherein the inner header comprises the locking pin and the groove is arranged in the outer shell.
 9. The connector assembly according to any one of the preceding claims, wherein in the first position of the outer shell, the locking pin is actuatable between a first state in which movement of the outer shell relative the inner header is restricted and a second state in which movement of the outer shell relative the inner header is permitted.
 10. The connector assembly according to claim 9, wherein the locking pin is spring loaded.
 11. The connector assembly according to any one of the preceding claims, wherein bringing of the outer shell out of the first position interrupts the HVIL.
 12. The connector assembly according to claim 11 when dependent on claim 10 or 9, wherein the locking pin is configured such that actuation thereof to the second state interrupts the HVIL.
 13. The connector assembly according to claim 12, wherein the locking pin forms part of the HVIL.
 14. The connector assembly according to any one of claim 1-10, wherein the locking pin is configured to interrupt the HVIL when the outer shell is in the second position.
 15. The connector assembly according to claim 14, wherein the locking pin is configured to mechanically and/or magnetically interact with the HVIL in order to interrupt the HVIL.

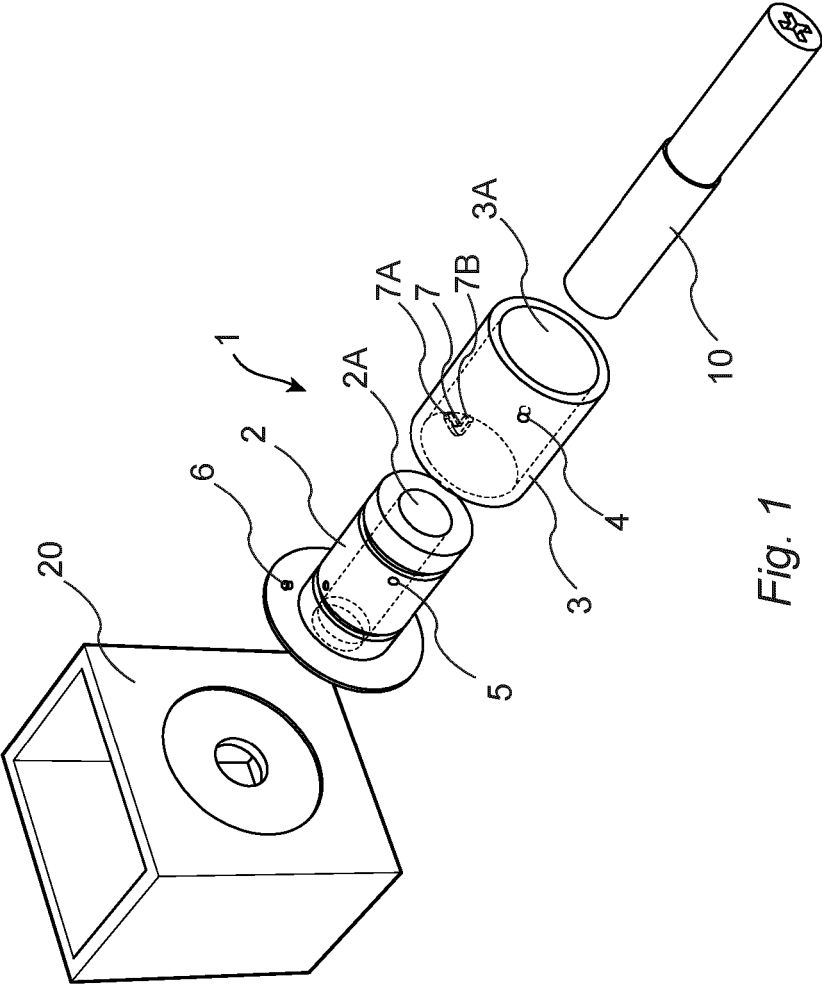


Fig. 1

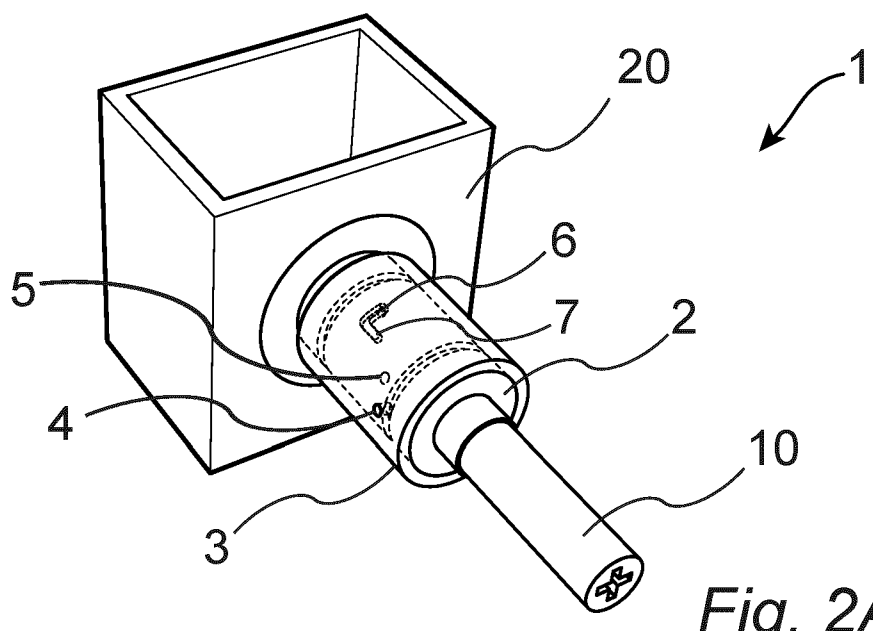


Fig. 2A

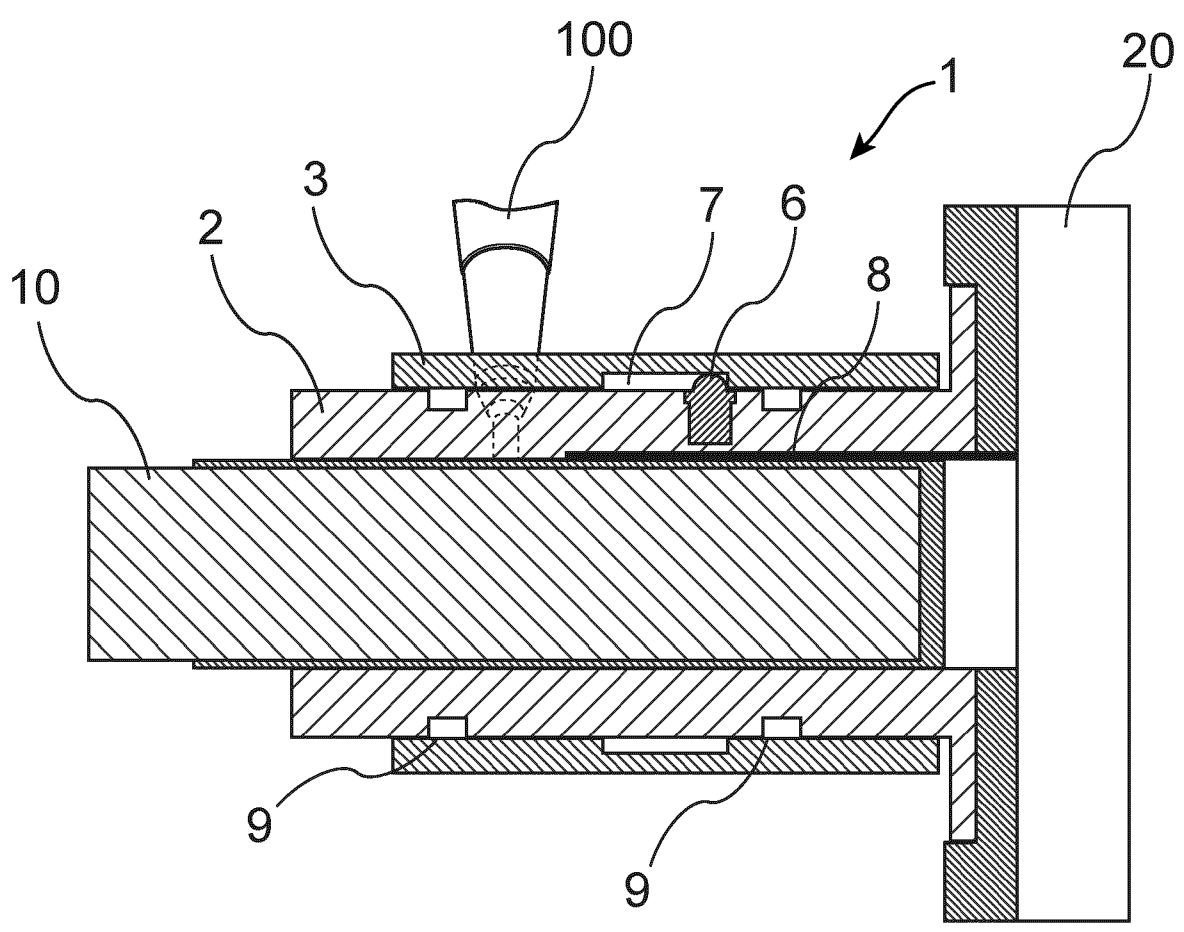


Fig. 2B

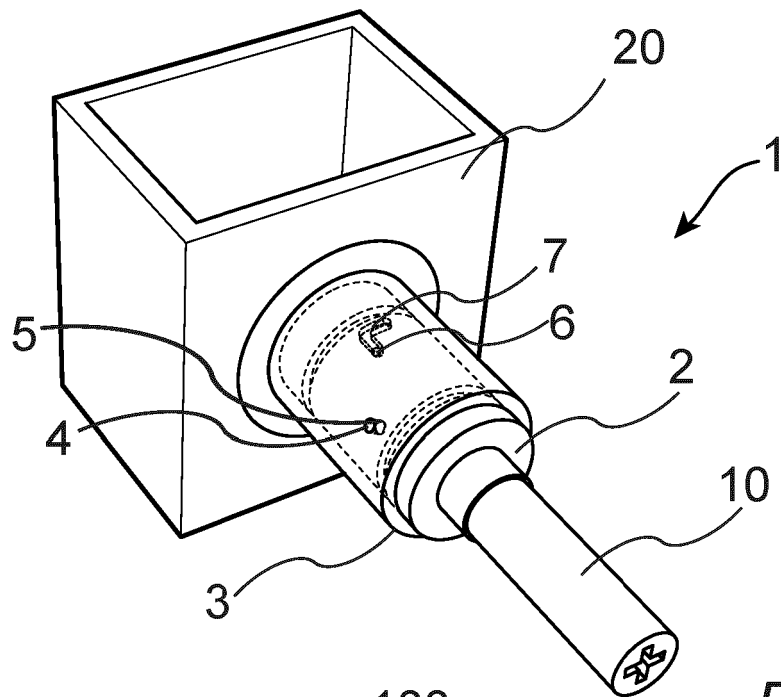


Fig. 3A

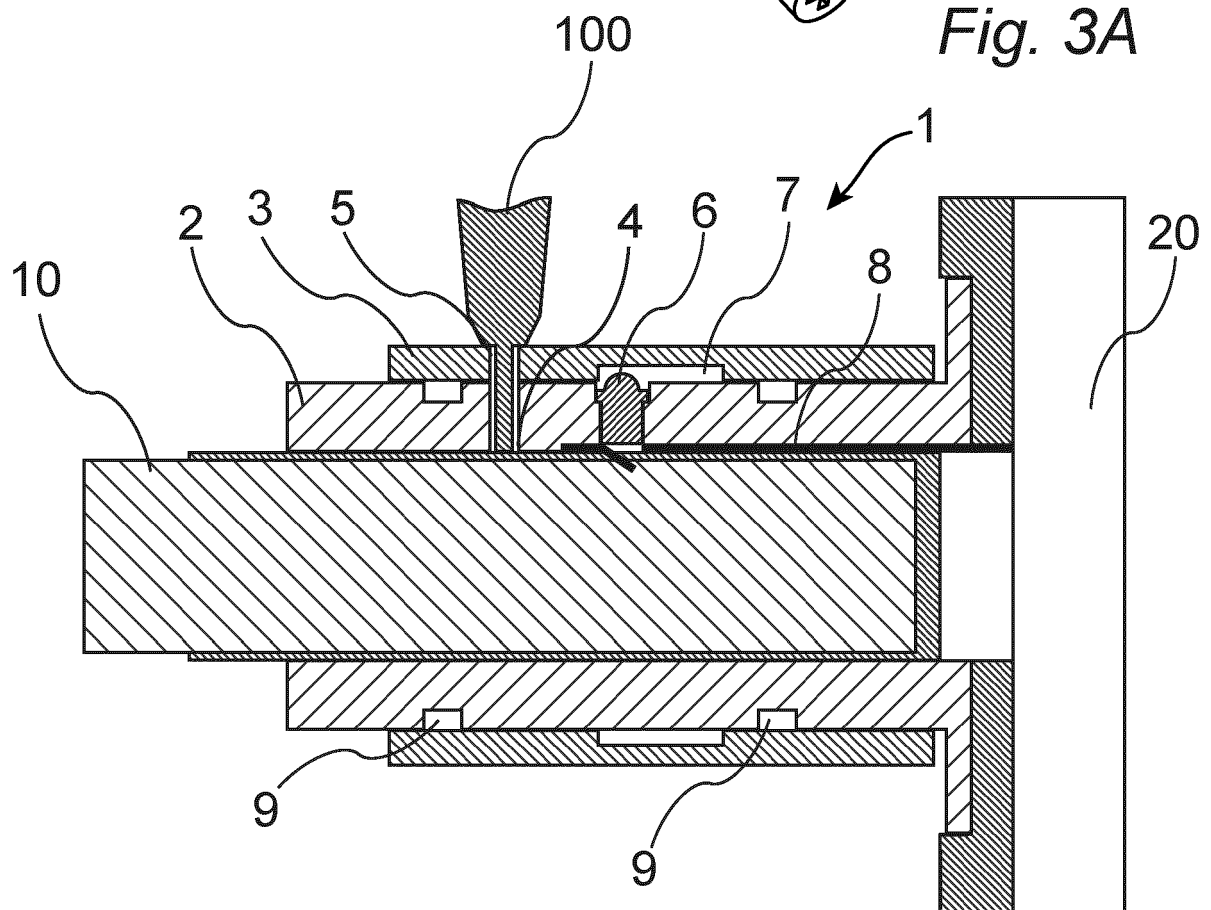


Fig. 3B

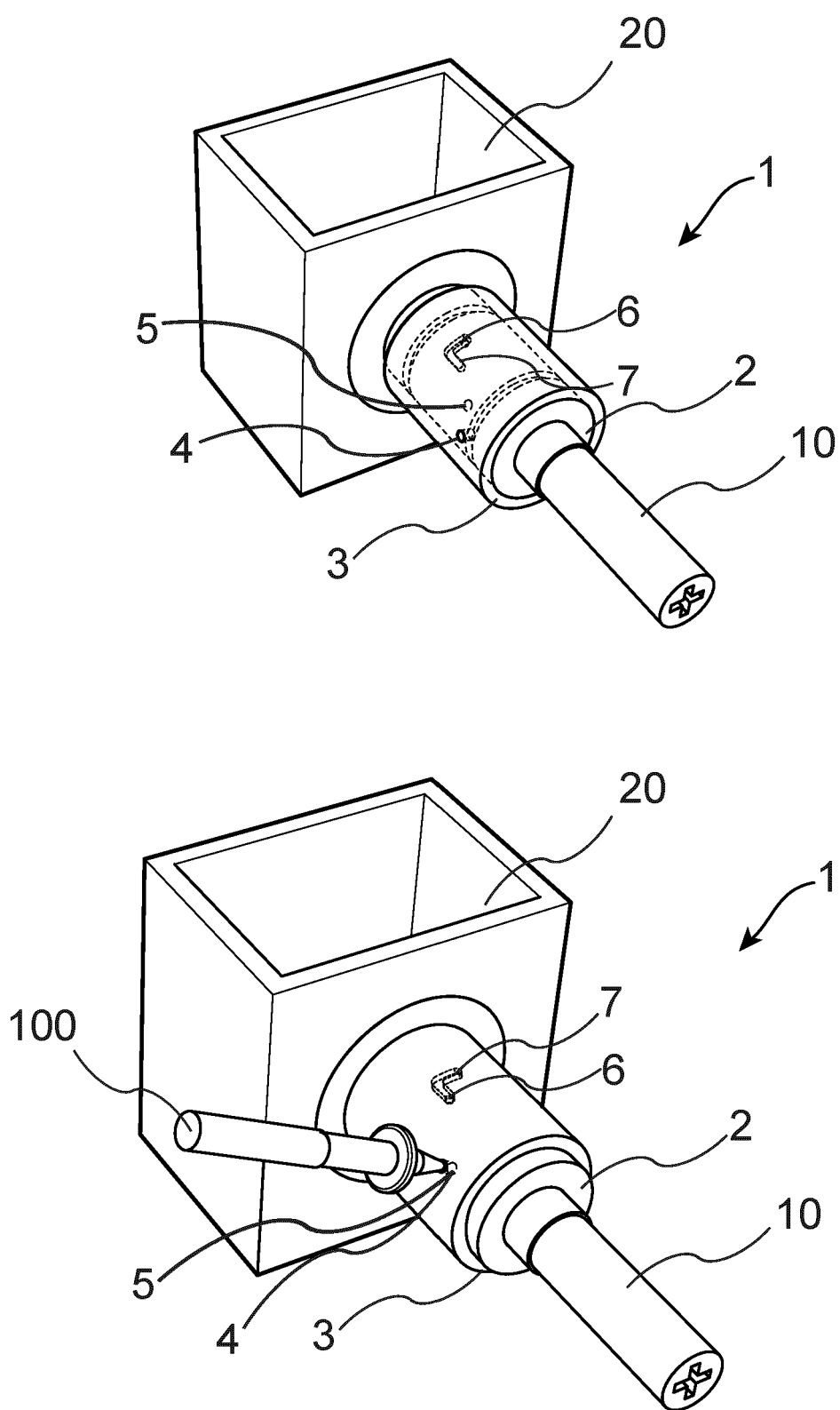


Fig. 4



EUROPEAN SEARCH REPORT

Application Number

EP 25 16 8355

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 7 906 957 B2 (GM GLOBAL TECH OPERATIONS INC [US]) 15 March 2011 (2011-03-15) * paragraph [0001]; figures 1,2A, 2B,4 * -----	1-15	INV. H01R13/53 H01R13/627 H01R13/707 H01R24/00
A	CN 215 218 913 U (GAC AION NEW ENERGY AUTOMOBILE CO LTD) 17 December 2021 (2021-12-17) * the whole document * -----	1-15	ADD. H01R13/52 H01R13/71
A	DE 10 2013 014178 A1 (DAIMLER AG [DE]) 26 February 2015 (2015-02-26) * the whole document * -----	1-15	
			TECHNICAL FIELDS SEARCHED (IPC)
			H01R G01R
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		9 September 2025	Bidet, Sébastien
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			

EPO FORM 1503 03.82 (P24C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

EP 25 16 8355

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

09-09-2025

10

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 7906957 B2	15-03-2011	CN 101740964 A	16-06-2010
		DE 102009053605 A1	10-06-2010
		US 2010123455 A1	20-05-2010

CN 215218913 U	17-12-2021	NONE	

DE 102013014178 A1	26-02-2015	NONE	

15

20

25

30

35

40

45

50

55

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82