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(54) **ELECTRICAL CONNECTOR ASSEMBLY COMPRISING A COVER LOCKING DEVICE**

(57) The present invention relates to an electrical connector assembly i and a method to assemble the same, wherein the electrical connector assembly, comprises a connector housing 10, comprising a locking means 16, 17 and having at least one opening 12. The electrical connector assembly further comprises a cover 30, being hinged to the connector housing 10 to allow a repeated covering and uncovering of the opening 12 of

the connector housing 10, and a cover locking device 50 that is adapted to be mounted onto the cover 30 to be movable relative to the cover 30, wherein the cover locking device 50 comprises a corresponding locking means 56, 57 for engaging with the locking means 16, 17 of the connector housing 10, thereby fixing the cover 30 to the connector housing 10, so that the cover 30 covers the opening 12 of the connector housing 10.

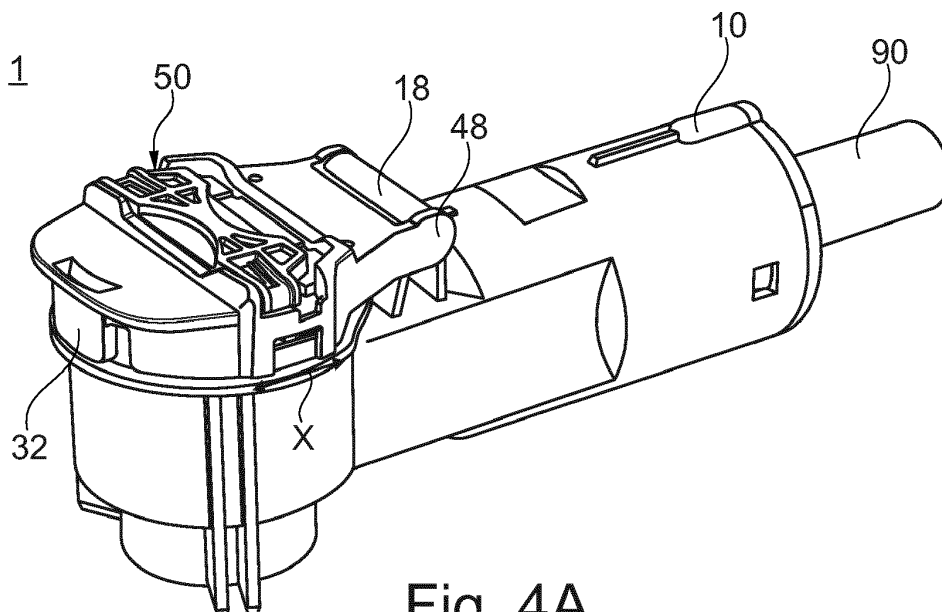


Fig. 4A

Description

Field of the invention

[0001] The present invention relates to an electrical connector assembly and a method to assemble the same, wherein the electrical connector assembly comprises a connector housing, a cover and a cover-locking device.

Background of the invention

[0002] Electrical connectors are used to electrically connect signal or power traces. For example, in automotive applications, electrical connectors play an important role in the vehicle electrical system. Typically, the single electrical components of a vehicle are installed and connected via a cable harness. The electrical connection between the cable harness and the single electronic components is achieved by electrical connectors.

[0003] Conventionally the vehicle electric systems are powered with 12 V. However, due to the increased energy consumption of modern vehicles, e.g. due to increased automation, the use of sensors and further on-board electronics as well as electro motors has led to an increased power consumption. This increased power consumption can hardly be achieved by a 12 V vehicle electrical system. Further, in the field of electrically driven vehicles and hybrid vehicles, high amounts of energy have to be transferred.

[0004] Therefore, the operating voltage of the vehicle electric system is increased to 48 V or even higher. This allows to transfer higher amounts of energy, while the current can be held reasonable low. However, with higher amounts of energy, the requirements for electrical connectors increase. Still further, electrical connectors that are capable for the use in electrically driven or hybrid vehicles must fulfil even higher requirements.

[0005] Particularly, the cable cross-sections increase due to higher energy transmission requirements. With increasing cable cross-sections, the curving radius of the cables increases. Resulting in increased space requirements. To avoid these increased space requirements, angled connectors are required that allow e.g. a 90° connection. However, these 90° terminals, being capable of transmitting high amounts of energy are typically crimped onto the cable or provided with screwed electrical contact terminals. Those screwed and/or crimped terminals need to be assessable from at least two sides during installation. Therefore, those terminals are typically provided in connector housings, comprising of at least two housing halves.

[0006] However, to provide good sealing properties, integrally formed connector housings are preferred in the art. These integrally formed connector housings and in particular 90° angled integrally formed connector housings, cannot be used with crimped or screwed terminals, since for crimping and/or screwing, the terminal must be

assessable from at least two sides. Thus, typically two-part connector housing are provided. Alternatively an opening is provided in the connector housing that has to be closed afterwards.

[0007] Therefore, conventionally covers are used to cover these openings. However, covers as such provide a potential risk of losing the covers, resulting in an uncovered terminal. An uncovered terminal is prone to damage and/or to corrosion. Further, in particular in the field of high power transmission, uncovered terminals are a high risk for persons that are proximate to the connectors, having uncovered terminals.

[0008] Thus, there is a need in the art to securely cover openings provided in electrical connector housings, wherein the cover used provide preferably a sealing. Further, the cover should be easily to actuate preferably, repeatedly without being damaged.

Summary of the invention

[0009] The object is solved by an electrical connector assembly according to claim 1 and a method to assemble the electrical connector assembly according to claim 17.

[0010] Particularly, the object is solved by an electrical connector assembly, comprising a connector housing, comprising a locking means and having at least one opening. The electrical connector assembly further comprises a cover, being hinged to the connector housing to allow a repeated covering and uncovering of the opening of the connector housing, and a cover locking device, being adapted to be mounted onto the cover to be movable relative to the cover, wherein the cover locking device comprises a corresponding locking means for engaging with the locking means of the connector housing, thereby fixing the cover to the connector housing, so that the cover covers the opening of the connector housing.

[0011] Typically, the connector housing can be a one-piece housing. Alternatively, the connector housing can be a subassembly, assembled of two or more pieces. The opening, provided in the connector housing, is arranged for assessing and/or installing a terminal that is provided in the connector housing, such as a crimped and/or screwed terminal. Typically, those electrical connector assemblies form a female connector. However, it could also form a male connector.

[0012] The cover is provided to open and/or close the opening, i.e. to cover or uncover the opening. This covering and uncovering can be performed repeatedly, without damaging the connector housing and/or the cover. For instance, the covering and uncovering operation can be performed at least two times, preferably at least 10 times, and even most preferably at least 50 times without damaging the cover and/or the connector housing. The hinge, connecting the connector housing with the cover can be integrally formed with the connector housing and/or the cover. Alternatively, a hinge member can be provided on the connector housing, and the cover that is provided as a separate part, can be coupled to the hinge

member. It has to be understood, that the arrangement of the hinge member can be vice versa. Thereby, the hinge can define a movement of the cover to cover and/or uncover the opening. Preferably, the movement is a pivot movement that pivots the cover around a hinge axis.

[0013] The cover-locking device (CLD) is moveable relative to the cover and can be slidably arranged, pivotably arranged and/or otherwise arranged. Particularly preferred, the cover-locking device can be arranged in a pre-locked position, and can be moved relative to the cover to a final locked position. In the pre-locked position, the locking means and/or the corresponding locking means of the cover-locking device, respectively the connector housing, do not engage with each other. In the final locked position, the locking means engage with the corresponding locking means, so that the cover is fixed to the connector housing by means of the cover-locking device.

[0014] The cover-locking device allows to securely fix the cover to the connector housing. For example, when the cover-locking device is in the pre-locked position, the closed cover can be hinged in order to uncover the opening of the connector housing. If the cover is closed and the cover-locking device is in the final locked position, the cover cannot be hinged, so that the opening remains covered. To open the cover, firstly the cover-locking device has to be moved from the locked position to the pre-locked position and afterwards, the cover can be hinged in order to uncover/open the opening. Therefore, an unintentional uncovering of the opening can be prevented, since firstly the cover-locking device has to be actuated and afterwards the cover can be opened.

[0015] Further, the cover locking device may comprise at least one, preferably two locking leg(s), wherein each locking leg comprises a corresponding locking means for engaging with the locking means of the connector housing. Both locking legs may extend substantially into the same direction. Thus, the legs can clamp the cover and/or the housing in order to fix the cover to the connector housing. Further, the locking leg(s) provide a guiding functionality of the cover locking device onto the cover.

[0016] The locking means and/or the corresponding locking means may be formed as locking protrusion or as corresponding locking recess. Providing locking protrusions and/or corresponding locking recesses, enables the locking means and corresponding locking means to securely engage with each other and provide a secure locking of the cover-locking device with the connector housing, thereby fixing the cover to the connector housing. Particularly, the corresponding locking means of the cover locking device is formed as locking protrusion and the locking means of the connector housing is formed as locking recess. However, it will be understood that the arrangement can be vice-versa. Alternatively, two locking protrusions can be provided, such as locking hooks or locking noses that can engage with each other, in order to provide a locking between the cover locking device and the connector housing.

[0017] The cover locking device may be adapted to be mounted onto the cover by means of a key and keyway mechanism, wherein the cover locking device comprises preferably a key member and the cover comprises preferably a keyway member, or vice versa.

[0018] A key and keyway mechanism provides in particular two functionalities. The first functionality is a guiding of the cover-locking device onto the cover in the sliding direction of the movement of the cover-locking device. Thus, the cover-locking device can be slid relative to the cover. As a second functionality, a key and keyway mechanism secures the cover-locking device to the cover, preferably in a direction substantially perpendicular to the sliding direction. Thus, the cover-locking device can be mounted onto the cover to be slidably moveable relative to the cover.

[0019] The key member is preferably provided as a protrusion on the cover-locking device or alternatively on the cover. The corresponding keyway member is for instance provided as a slot or longitudinal recess that receives the key member and is provided on the cover, respectively on the cover-locking device.

[0020] The cover may comprise a key member guiding means that is adapted to guide the key member into the keyway member, so that the key member engages with the keyway member. The key member guiding means is used during the assembly of the cover-locking device and the cover in order to guide the key member into the keyway member. Thus, a correct function of the key and keyway mechanism can be achieved and the assembly is facilitated.

[0021] The cover may further comprise at least one primary locking means for direct locking with connector housing. A primary locking means provides a direct locking between the cover and the connector housing. Thereby the cover is fixed to the connector housing at a further fix point so that the cover is fixed securely to the connector housing. In particular, if a sealing functionality shall be achieved between the cover and the connector housing, multiple different fixing points will lead to an improved sealing functionality. For example at least three fixing points can be achieved by (i) the hinge, (ii) the locking means and (iii) the primary locking means.

[0022] The cover locking device may further comprise at least one blocking means that is adapted to be in blocking contact with the cover, in order to block a movement of the cover locking device in at least one direction, when the cover is not covering the opening of the connector housing, wherein the cover locking device preferably comprises at least one flexible arm, and wherein the blocking means is arranged on the flexible arm.

[0023] The blocking means of the cover-locking device engage with the cover to be in blocking contact. Thus, the cover-locking device cannot be moved in at least one direction along the sliding direction. Particularly, the cover-locking device is secured by the blocking means in the pre-locked position, i.e. in a position, wherein the corresponding locking means of the cover-locking device

and the locking means of the connector housing cannot engage with each other, even if the cover is closed and covers the opening. Thus, the cover-locking device can be held in a pre-locked position until the cover is closed and covers the opening of the connector housing. Thus, it can be ensured that the cover can be closed without disturbances that may result from an unintentional engaging of the locking means and the corresponding locking means. Further, it can be ensured that the cover-locking device is in a position, i.e. the pre-locked position, if the cover is closed, that enables moving the cover-locking device from said position into the final locked position, without the need of a previous adequately positioning of the cover-locking device before the cover shall be closed.

[0024] Providing a flexible arm facilitates the release-ment of the blocking contact between the blocking means and the cover, when the cover-locking device shall be moved from the pre-locked position into the final locked position. For example, the flexible arm facilitates a movement of the blocking means vertically to the sliding direction, in order to unblock the cover-locking device and the cover. Depending on the rigidity of the flexible arms, the releasing can be facilitated or hindered.

[0025] The connector housing may comprise at least one releasing-means, adapted to release the blocking means from the blocking contact with the cover, when the cover covers the opening of the connector housing. The releasing means can be formed as releasing protrusions that are adapted to engage with the blocking means, when the cover is closed and urge the blocking means out of blocking contact. Thus, the movement of the cover-locking device that is blocked, if the cover is opened, i.e. if the cover does not cover the opening, is automatically released if the cover is closed and covers the opening. Thus, a subsequent locking via the cover-locking device can be achieved without an additional releasing operation.

[0026] The cover may further comprise a final locking means, adapted to engage with the blocking means and/or the flexible arm, when the corresponding locking means of the cover locking device engages with the locking means of the connector housing.

[0027] The final locking means securely fix the cover-locking device in the final locked position. Therefore, also the cover is securely fixed to the connector housing. Particularly, a first locking is achieved between the locking means and corresponding locking means of the cover-locking device and the connector housing. A second locking is achieved between the final locking means and the blocking means and/or the flexible arm(s). Thus, before the cover can be re-opened, the second locking between the final locking means and the blocking means and/or the flexible arm(s) has to be released. Subsequently, the locking between the locking means and the corresponding locking means has to be released. It has to be understood that the releasement of the first and second locking can be performed substantially simultaneously,

e.g. by a single sliding movement of the cover locking device.

[0028] The cover may further comprise at least one guiding means that is adapted to guide a movement of the cover locking device relative to the cover, wherein the guiding means engage preferably with corresponding guiding means of the cover locking device, wherein the guiding means and/or the corresponding guiding means are formed preferably as guiding rails and/or guiding ribs.

[0029] The guiding means are preferably arranged on a top surface and/or a side face of the cover, in order to provide a defined movement, preferably a sliding movement, of the cover-locking device. For example, guiding rails and/or guiding ribs are suitable guiding means. Other guiding means can be provided. In particular, if guiding rails or guiding grooves are provided on either the cover or the cover-locking device, the corresponding guiding means can be formed as guiding ribs and/or as one or more guiding protrusions. The guiding means and/or corresponding guiding means can be integrally formed with the cover and/or the cover-locking device, with the blocking legs and/or the flexible arms.

[0030] The electrical connector assembly may be adapted for power transmission of more than 10 kW, and even more preferably of more than 20 kW. Even under high power transmission levels, the electrical connector can be used without excessive heating, and suitable electric insulation properties. Further, the connector housing and the cover protect the environment from currents or voltages transferred by the electrical connector.

[0031] The cover and/or the cover locking device may be adapted to be actuated manually without using tools. Allowing an actuation without the need of tools, facilitates the use of the electrical connector assembly and allows an easy access, e.g. if no tools are at hand.

[0032] The opening of the connector housing may have a circular shape, wherein the electrical connector assembly may comprise a sealing member that is arranged so that the cover seals the opening of the connector housing, when the cover covers the opening. A circular shape of the opening of the connector housing is preferred, since the circular shape facilitates the sealing of the opening. The sealing can, for example, be achieved by a sealing member that can be integrally formed with either the cover and/or the connector housing. For example, the sealing member can be manufactured by means of 2K injection molding. Alternatively, the sealing member can be assembled with the cover and/or the connector housing. When a sealing member is used, the entrance of moisture, liquids, dust, dirt and the like can be effectively prevented.

[0033] Preferably, the opening is a circular opening, having a diameter in the range of 8 mm to 52 mm, more preferably in the range of 12 to 38 mm and most preferably in the range of 19 mm to 35 mm.

[0034] The opening of the connector housing may be arranged to allow access to a contact terminal, being arranged inside connector housing. The access to a con-

tact terminal, being arranged inside the connector housing, allows e.g. initial installation of the terminal, facilitated maintenance and measurements, without the need of de-connecting the electrical connector assembly, when the same is in use, respectively installed.

[0035] The electrical connector assembly can be an angled connector assembly, having an angle of 45° to 135°, preferably of 60° to 120°, and most preferably of 90°. Angled connectors are preferred, since a bending of the electrical cable, the electrical connector is connected to can be avoided. Thus, the construction space needed can be reduced in applications of the electrical connector assembly.

[0036] The cover locking device may be captively secured to the cover and the cover may be captively secured to the connector housing, wherein the cover and the connector housing can be integrally formed. With a captively securing, an unintentional loss of the cover and/or the cover-locking device can be prevented, e.g. in industrial assembly lines. The captive securing of the cover to the connector housing can be achieved by integrally forming the cover and the connector housing, wherein the cover is connected with the connector housing, e.g. by means of a hinged portion. Alternatively, key and keyway mechanisms, locking devices and hinge portions and the like, as e.g. previously described, can be used to provide a captive securing.

[0037] The object is further solved by a method to assemble an electrical connector assembly as previously described, wherein the method comprises the steps of:

- Providing a connector housing, comprising a locking means and having at least one opening;
- Providing a cover, being hinged to the connector housing to allow a repeated covering and uncovering of the opening of the connector housing;
- Providing a cover locking device, comprising a corresponding locking means;
- Mounting the cover locking device onto the cover, so that the cover locking device is movable relative to the cover, and
- Moving the cover locking device, so that the corresponding locking means engage with the locking means of the connector housing, thereby fixing the cover to the connector housing, so that the cover covers the opening of the connector housing.

[0038] Assembling the electrical connector assembly as previously described, will lead to a connector assembly having the advantages described above.

Detailed description of the drawings

[0039] In the following, the invention is described in detail with reference to the figures. Thereby shows

Figure 1 a schematic exploded view of an electrical connector assembly;

Figure 2A a schematic exploded view of a cover and a cover locking device;

5 Figure 2B a schematic perspective view of a cover locking device;

Figure 2C a schematic perspective view of an assembled cover and a cover locking device;

10 Figure 2D a schematic detailed view of a key and keyway mechanism;

Figure 2E a schematic detailed view of a blocking means;

15 Figure 3A a schematic perspective view of an electrical connector assembly, wherein the opening is uncovered;

20 Figure 3B a schematic perspective view of an electrical connector assembly, wherein the opening is covered;

25 Figure 3C a schematic detailed view of a primary locking means;

Figure 3D a schematic detailed view of a releasing means;

30 Figure 4A a schematic perspective view of an electrical connector assembly, wherein the cover is fixed to the connector housing;

35 Figure 4B a schematic detailed view of a final locking means;

Figure 4C a schematic detailed view of a locking means;

40 Figure 4D a schematic cut view of the cover, covering the opening of the connector housing, and cover-locking device in final locked position

45 Figure 4E a schematic detailed view of a locking means.

[0040] In particular, Fig. 1 shows a schematic exploded view of an electrical connector assembly 1. The electrical connector assembly 1 comprises a cable (not shown), extending into the direction of cable A, indicated by arrow A. The electrical connector assembly 1 forms a female electrical connector that is an angled connector. The female electrical connector can be mated with a corresponding counter connector along the plug direction, indicated by arrow B. The angle of the electrical connector assembly 1 is defined by the angle enclosed between the direction of cable A and the plug direction B, which is approx. 90° in the embodiment shown in Fig. 1.

[0041] The electrical connector assembly 1 comprises a connector housing 10, a cover 30 and a cover-locking device 50. The connector housing 10 comprises an opening 12, which can be covered by the cover 30 and has a diameter in the range of preferably 19 mm to 35 mm. The cover 30 is coupled to the connector housing via a hinge bearing 18. Further, the cover 30 comprises a primary locking means 32 that can engage with the connector housing 10.

[0042] The cover-locking device 50 can be adapted relatively movable to the cover 30 in order to engage with the locking means 16 of the connector housing 10, as it is described in greater detail later. Further, releasing means 14 are shown on the connector housing 10.

[0043] Fig. 2A shows a schematic exploded view of the cover 30 and the cover-locking device 50, as shown in Fig. 1. The cover 30 comprises primary locking means 32 for engaging with the connector housing 10. Further, the cover 30 comprises a blocking portion 34 that can be in blocking contact with blocking means (not shown in Fig. 2A) and/or a flexible arm 64, 65 of the cover-locking device 50. The blocking portion 34 can block, in conjunction with the flexible arm 64, 65 and/or the blocking means (not shown), a movement of the cover-locking device 50, in order to secure the cover-locking device in a pre-locked position. Further, the cover 30 comprises a final locking means 36 that can engage with the flexible arms 64, 65 and/or blocking means (not shown) in order to secure the cover-locking device 50 in a final locked position.

[0044] The cover 30 further comprises key member guiding means 38 for guiding a key member 54 into the keyway member 40, in order to form a key and keyway mechanism. The key member 54 is preferably arranged on a locking leg 52, 53 of the cover-locking device 50. Further, corresponding locking means 56, 57 are arranged on the locking legs 52, 53 of the cover-locking device 50. These corresponding locking means 56, 57 are adapted to engage with the locking means 16, 17 of the connector housing 10.

[0045] On the topside of the cover 30, guiding means 42, 43 are arranged in form of guiding rails, for receiving the corresponding guiding means 62, 63 of the cover-locking device 50 in order to guide the movement of the cover-locking device 50 relative to the cover 30. The corresponding guiding means 62, 63 are formed as guiding ribs, as can be best seen in Fig. 2B. The movement of the cover-locking device, relative to the cover, along a sliding direction X is restricted by stop portions 44, 45 arranged on the topside of the cover 30. Still further, the cover 30 comprises a hinge portion 48 that can engage with the hinge bearing 18 of the connector housing.

[0046] Fig. 2B shows a schematic perspective view of a cover-locking device 50, as used in the embodiment shown in Fig. 2A. The cover-locking device 50 comprises two locking legs 52, 53, each provided with corresponding locking means 56, 57 for engaging with the locking means 16, 17 of the connector housing 10. Further, each locking leg 52, 53 comprises a key member 54, 55,

formed as protrusion that extends laterally outward of the cover-locking device 50. On the underside of the cover-locking device 50, corresponding guiding means 62, 63 are provided as guiding ribs that are adapted to engage with the guiding means 43, 42 provided on a topside of the cover 30 as best shown in Fig. 2A. Further, the flexible arms 64, 65 of the cover-locking device 50 are provided with blocking means 66, 67 that are adapted to be in blocking contact with the cover 30, if the cover locking device 50 is in the pre-locked position.

[0047] Still further, the cover-locking device 50 can comprise gripping recesses 70, 72 to facilitate the manual actuating of the cover-locking device 50.

[0048] Fig. 2C shows a schematic perspective of an assembled cover 30 and the cover-locking device 50. The reference signs used, correspond to the reference signs used with respect to Figs 2A and 2B. As can be seen, the key member 54 is received in the keyway member 40, in order to form a keyway mechanism. Further, the corresponding guiding means 62, 63 are received in the guiding means 42, 43.

[0049] Fig. 2D shows a schematic detailed view of the key and keyway mechanism that is formed by the key member 54 and the keyway member 40. The key member 54 is formed as a protrusion, protruding laterally outward of the locking leg 52. The keyway member 40 is formed as a recess in a sidewall of the cover 30. As indicated by arrow X, the cover-locking device 50 can be moved along the sliding direction X and is thereby guided and secured in the key and keyway mechanism. Further, the key member guiding means 38 is provided to support the assembly of the cover-locking device 50 and the cover 30. When the cover-locking device 50 is assembled with the cover 30, the key member 54 is captured by the key member guiding means 38. By pressing the cover-locking device 50 in direction of the cover 30, the locking leg 52 of the cover-locking device 50 is bent inwardly, due to the angled surface of the key member 54. When the key member 54 reaches the keyway member 40, the locking leg is deflected again and the key member 54 engages with the keyway member 40. Due to the shape of the key member 54 and the keyway member 40, the cover-locking device 50 is captively secured to the cover 30.

[0050] Fig. 2E shows a schematic detailed view of a blocking means 66. In particular, Fig. 2E shows a cut view of the blocking means 66. The blocking means 66 is arranged on the flexible arm 64 of the cover-locking device 50. The cover-locking device 50 provided on cover 30 in a pre-locked position. The cover-locking device 66 is in blocking contact with a blocking portion 34 of the cover 30. When trying to move the cover-locking device 50 into the sliding direction X, the blocking portion 34 and the blocking means 66 engage in blocking contact and prevent the movement. Further, a sealing member 80 is shown, for sealing the cover 30 with the connector housing 10 (not shown).

[0051] Fig. 3A shows a schematic perspective view of an electrical connector assembly 1, wherein the opening

12 of the connector housing 10 is uncovered, i.e. the cover 30 is open. The cover 30 is hinged to the connector housing 10 via the hinge bearing 18 and the hinge portion 48. This allows to pivot the cover 30 from the open position, as shown in Fig. 3A to the closed position as shown in Fig. 3B. The cover 30 is provided with a sealing member 80. Further, the cover-locking device 50 is pre-assembled with the cover 30 in a pre-locked condition as shown in Fig. 3B. In order to provide a primary locking between the cover 30 and the connector housing 10, the cover 30 is provided with a primary locking means 32 and the connector housing 10 is provided with a corresponding primary locking means 13. On an upper rim of the opening 12, releasing means 14, 15 are provided. The releasing means 14, 15 are described in greater detail with respect to Fig. 3D. Still further, the electrical connector assembly 1 forms an electrical female connector, having a 90° angle that is defined between the plug direction B and the direction A of the cable 90.

[0052] Fig. 3B shows the electrical connector assembly 1, wherein the cover 30 covers the opening 12 and the cover-locking device 50 is in the pre-locked position. Consequently, the locking means 16, 17 (not shown) of the connector housing 10 and the corresponding locking means 56, 57 of the cover-locking device 50 do not engage in the pre-locked position. Rather, the cover-locking device 50 is in blocking contact with the cover 30, as described with respect to Fig. 2E. The cover 30 is primary locked to the connector housing 10 by means of the primary locking means 32. This is best shown in Fig. 3C.

[0053] Fig. 3C is a schematic detailed view of the primary locking means 32. The primary locking means 32 of the cover 30 engage with the corresponding primary locking means 13 of the housing 10. The primary locking means 32 as well as a corresponding primary locking means 13, are formed as hooks that can engage with each other in order to secure the cover 30 to the connector housing 10. On a peripheral surface of the cover 30, a sealing member 80 is provided in order to provide a sealing between the cover 30 and the electrical connector housing 10.

[0054] In Fig. 3D, a cut view of the blocking means 66 is shown, when the cover 30 and the cover-locking device 50 are in the position shown in Fig. 3B, i.e. the cover 30 is closed and fixed to the connector housing 10 by the primary locking means 32. Thus, if the cover 30 is completely closed, the releasing means 14 of the electrical connector housing 10 engage with the blocking means 66, provided on the flexible arm 64 in order to release the blocking contact, as best shown in Fig. 2E. Thus, the blocking means 66 is urged out of the blocking portion 34 of the cover 30 and the blocking contact is thereby released. With providing the blocking means 66 on the flexible arm 64, the releasing is facilitated. Since the blocking contact is released, the cover-locking device 50 can be slid along the sliding direction X towards the final locking position, so that the blocking means 66 and/or the flexible arm 64 can engage with the final locking

means 36.

[0055] In Fig. 4A, the electrical connector assembly 1 is shown, wherein the cover-locking device 50 is in the final locked position. That means that the cover 30 is fixedly secured to the connector housing 10 by means of the primary locking means 32, the locking means 16, 17 and the corresponding locking means 56, 57 with the cover-locking device 50. To arrive at the final locked position shown in Fig. 4A, firstly the cover 30 has to be pivoted from the open position shown in Fig. 3A to the closed position shown in Fig. 3B. In the closed position, the cover covers the opening and the blocking contact of the cover-locking device 50 with the cover 30 is released. Thus, the cover-locking device 50 can be slid along the sliding direction X from the pre-locked position shown in Fig. 3B to the final locked position shown in Fig. 4A.

[0056] The final locked position shown in Fig. 4A, corresponds to the state of the electrical connector assembly 1 during use. In order to assess the terminal provided within the electrical connector housing 10, the cover-locking device 50 must be slid back into the pre-locked position. Thus, the locking means 16, 17 and the corresponding locking means 56, 57 are disengaged and the primary locking means 32 can be disengaged from the electrical connector housing 10. Subsequently, the cover 30 can be re-opened and the terminals are assessable.

[0057] In Fig. 4B, the blocking means 66 are shown in engagement with the final locking means 36. Thus, the cover-locking device 50 is secured in the final locked position to the cover 30. As further can be seen, the releasing means 14 is received in the blocking portion 34 of the cover 30.

[0058] Figs 4C and 4D show the engagement between the locking means 16, 17 and the corresponding locking means 56, 57. Further, as best seen in Fig. 4C, the key member 54 is received in the keyway member 40. A sealing member 80 is provided in order to seal the cover 30 against the connector housing 10. Thus, the opening 12 is covered and sealed.

[0059] Fig. 4E shows a partial cut view of the locking leg 52, allowing a view on the locking means 16 and the corresponding locking means 56. The cover-locking device 50 is in the pre-locked position. When the cover-locking device 50 is moved to the final locked position, the blocking means 66 and/or the flexible arm 64 (not shown) can engage with the final locking means 36. Further, the locking means 16 of the connector housing 10 will engage with the corresponding locking means 56 of the cover-locking device 50, thereby fixing the cover 30 to the connector housing 10 in order to cover the opening 12.

List of reference signs

[0060]

1 electrical connector assembly

10	connector housing
12	opening
13	corresponding primary locking means
14, 15	releasing means
16, 17	locking means
18	hinge bearing
30	cover
32	primary locking means
34	blocking portion
36	final locking means
38	key member guiding means
40	keyway member
42, 43	guiding means
44, 45	stop portion
48	hinge portion
50	cover locking device (CLD)
52, 53	locking leg
54, 55	key member
56, 57	corresponding locking means
62, 63	corresponding guiding means
64, 65	flexible arm
66, 67	blocking means
70, 72	gripping recess
80	sealing member
90	cable
A	direction of cable
B	plug direction
X	sliding direction

Claims

1. Electrical connector assembly (1), comprising a connector housing (10), comprising a locking means (16, 17) and having at least one opening (12); a cover (30), being hinged to the connector housing (10) to allow a repeated covering and uncovering of the opening (12) of the connector housing (10), and a cover locking device (50), being adapted to be mounted onto the cover (30) to be movable relative to the cover (30), wherein the cover locking device (50) comprises a corresponding locking means (56, 57) for engaging with the locking means (16, 17) of the connector housing (10), thereby fixing the cover (30) to the connector housing (10), so that the cover (30) covers the opening (12) of the connector housing (10).
2. The electrical connector assembly (1) according to claim 1, wherein the cover locking device (50) comprises at least one, preferably two locking leg(s) (52, 53), wherein each locking leg (52, 53) comprises a corresponding locking means (56, 57) for engaging with the locking means (16, 17) of the connector housing (10).
3. The electrical connector assembly (1) according to any preceding claim, wherein the locking means (16,

17) and/or the corresponding locking means (56, 57) are formed as locking protrusion or as corresponding locking recess.

4. The electrical connector assembly (1) according to any preceding claim, wherein the cover locking device (50) is adapted to be mounted onto the cover (30) by means of a key and keyway mechanism, wherein the cover locking device (50) comprises preferably a key member (54, 55) and the cover (30) comprises preferably a keyway member (40), or vice versa.
5. The electrical connector assembly (1) according to claim 4, wherein the cover (30) comprises a key member guiding means (38), that is adapted to guide the key member (54, 55) into the keyway member (40), so that the key member (54, 55) engages with the keyway member (40).
6. The electrical connector assembly (1) according to any preceding claim, wherein the cover (30) further comprises at least one primary locking means (32) for direct locking with connector housing (10).
7. The electrical connector assembly (1) according to any preceding claim, wherein the cover locking device (50) comprises at least one blocking means (66, 67) that is adapted to be in blocking contact with the cover (30) in order to block a movement of the cover locking device (50) in at least one direction, when the cover (30) is not covering the opening (12) of the connector housing (10), wherein the cover locking device (50) preferably comprises at least one flexible arm (64, 65), and wherein the blocking means (66, 67) is arranged on the flexible arm (64, 65).
8. The electrical connector assembly (1) according to claim 7, wherein the connector housing (10) comprises at least one releasing-means (14, 15), adapted to release the blocking means (66, 67) from the blocking contact with the cover (30), when the cover (30) covers the opening (12) of the connector housing (10).
9. The electrical connector assembly (1) according to any of claims 7 to 8, wherein the cover (30) comprises a final locking means (36), adapted to engage with the blocking means (66, 67) and/or the flexible arm (64, 65), when the corresponding locking means (56, 57) of the cover locking device (50) engage with the locking means (16, 17) of the connector housing (10).
10. The electrical connector assembly (1) according to any preceding claim, wherein the cover (30) com-

prises at least one guiding means (42, 43) that is adapted to guide a movement of the cover locking device (50) relative to the cover (30), and wherein the guiding means (42, 43) engage preferably with corresponding guiding means (62, 63) of the cover locking device (50), wherein the guiding means (42, 43) and/or the corresponding guiding means (62, 63) are formed preferably as guiding rails and/or guiding ribs.

11. The electrical connector assembly (1) according to any preceding claim, wherein the electrical connector assembly (1) is adapted for power transmission of more than 10 kW and even more preferably of more than 20 kW.
12. The electrical connector assembly (1) according to any preceding claim, wherein the cover (30) and/or the cover locking device (50) are adapted to be actuated manually without using tools.
13. The electrical connector assembly (1) according to any preceding claim, wherein the opening (12) has a circular shape, and wherein the electrical connector assembly (1) preferably comprises a sealing member (80) that is arranged so that the cover (30) seals the opening (12) of the connector housing (10), when the cover (30) covers the opening (12).
14. The electrical connector assembly (1) according to any preceding claim, wherein the opening (12) of the connector housing (10) is arranged to allow access to a contact terminal being arranged inside connector housing (10).
15. The electrical connector assembly (1) according to any preceding claim, wherein the electrical connector assembly (1) is an angled connector assembly, having an angle of 45° to 135°, preferably of 60° to 120°, and most preferably of 90°.
16. The electrical connector assembly (1) according to any preceding claim, wherein the cover locking device (50) is captively secured to the cover (30) and wherein the cover (30) is preferably captively secured to the connector housing (10), wherein the cover (30) and the connector housing (10) are preferably integrally formed.
17. Method to assemble an electrical connector assembly (1) according to any preceding claim comprising the steps of:

Providing a connector housing (10), comprising a locking means (16, 17) and having at least one opening (12);
 Providing a cover (30), being hinged to the connector housing (10) to allow a repeated covering

and uncovering of the opening (12) of the connector housing (10);
 Providing a cover locking device (50), comprising a corresponding locking means (56, 57);
 Mounting the cover locking device (50) onto the cover (30), so that the cover locking device (50) is movable relative to the cover (30), and
 Moving the cover locking device (50), so that the corresponding locking means (56, 57) engage with the locking means (16, 17) of the connector housing (10), thereby fixing the cover (30) to the connector housing (10), so that the cover (30) covers the opening (12) of the connector housing (10).

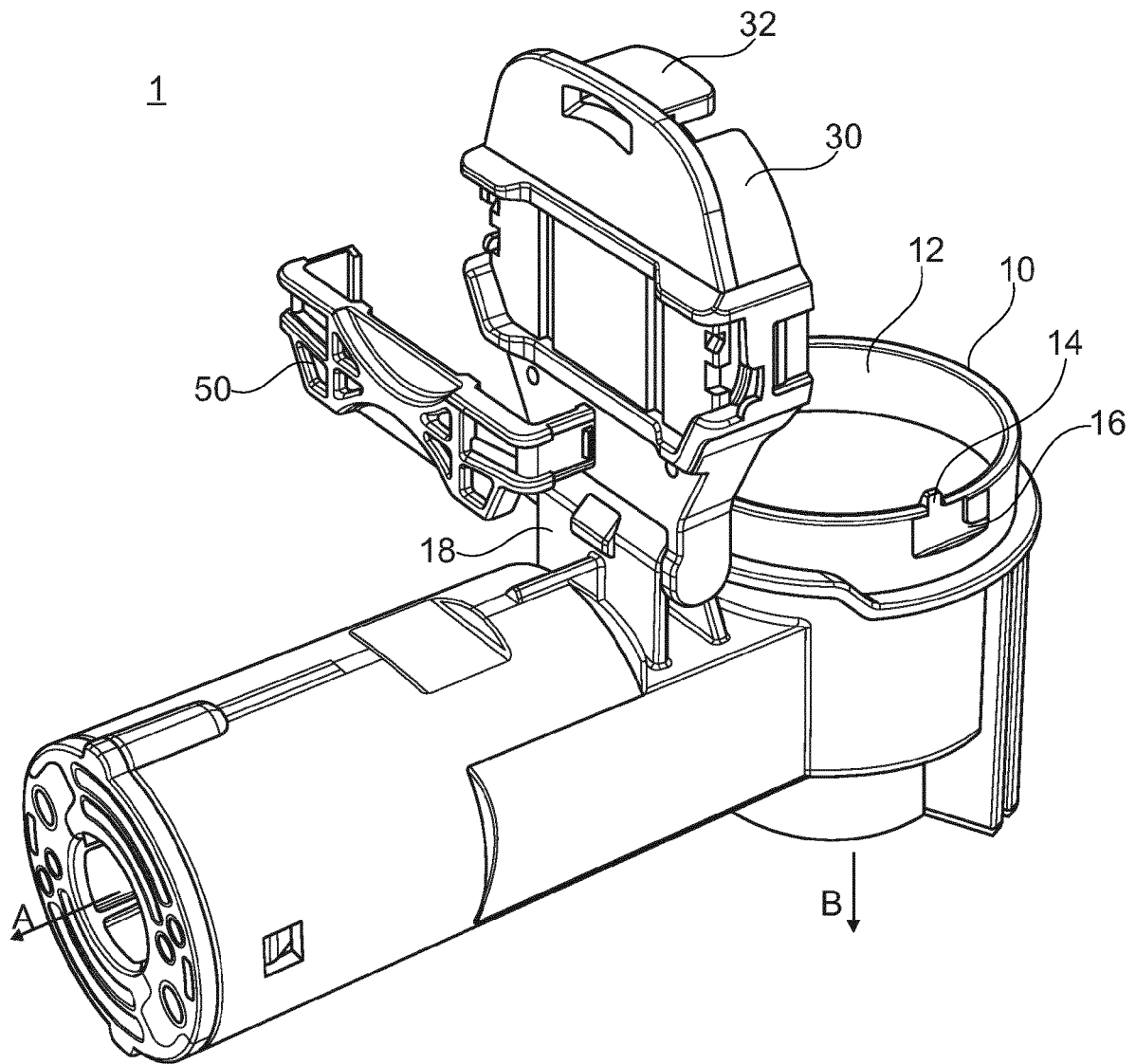
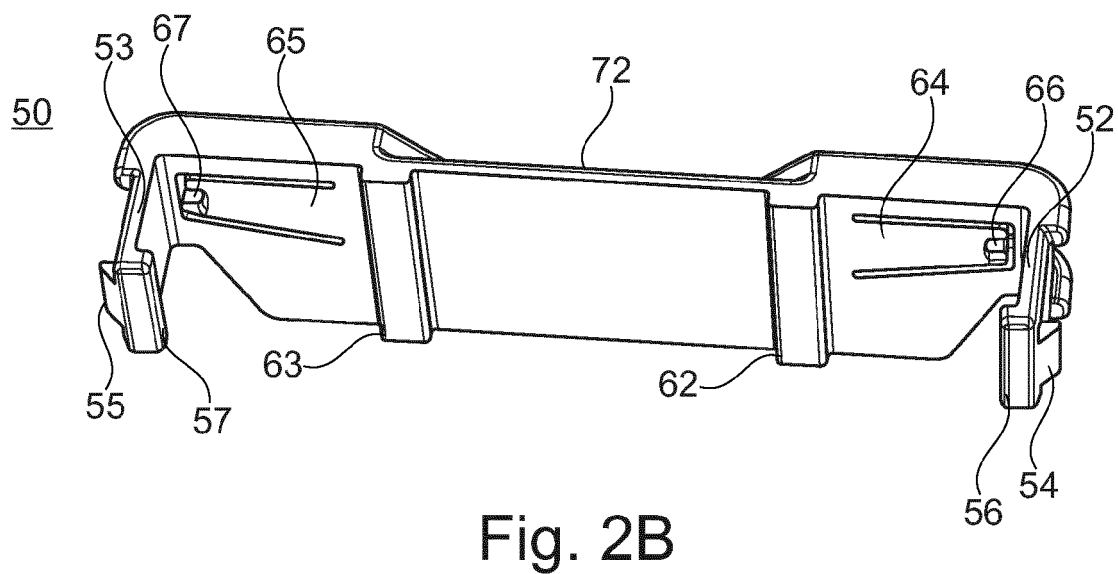
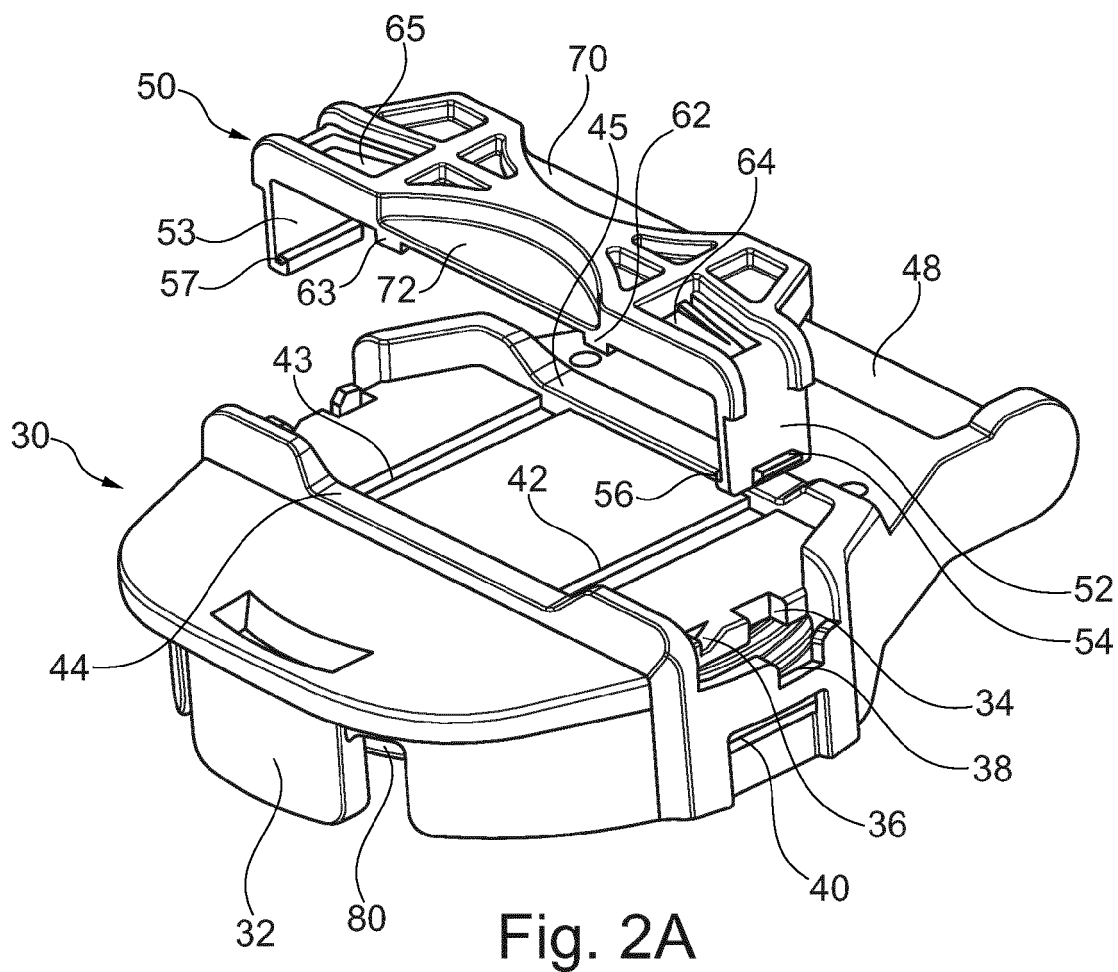


Fig. 1



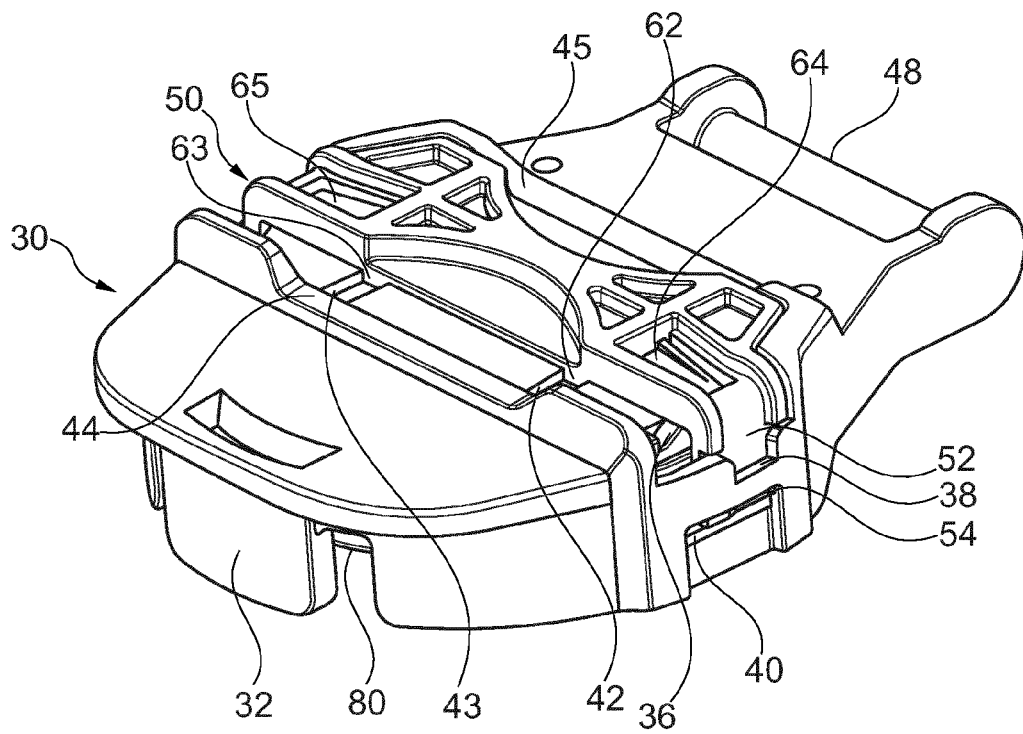


Fig. 2C

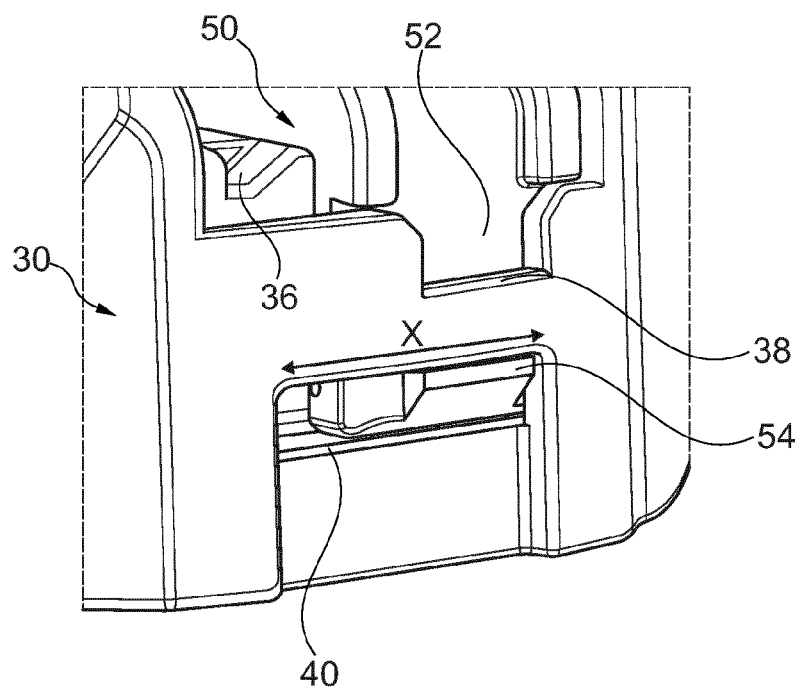


Fig. 2D

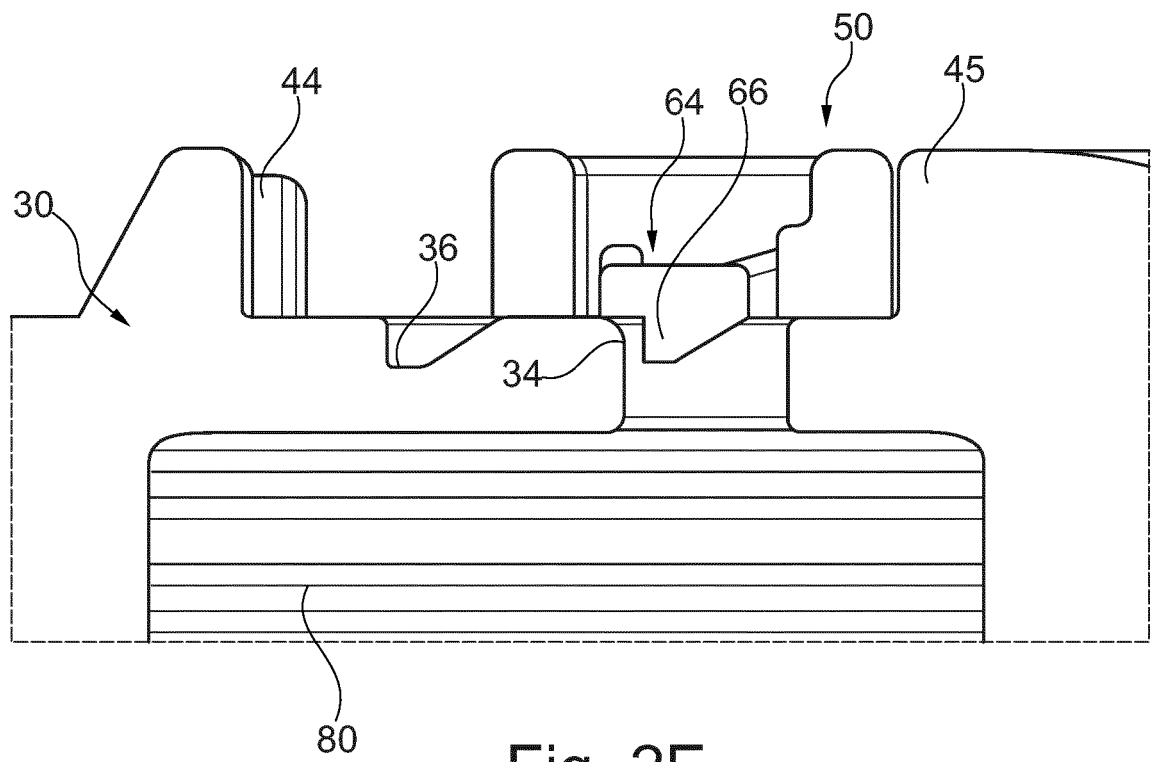
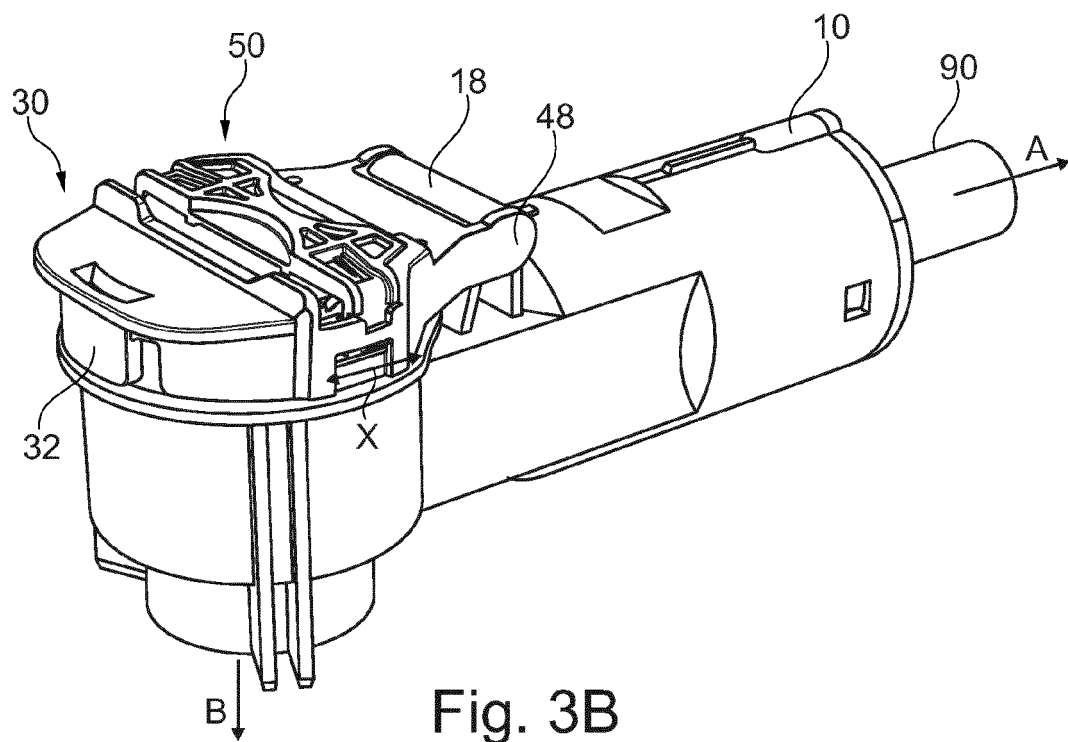
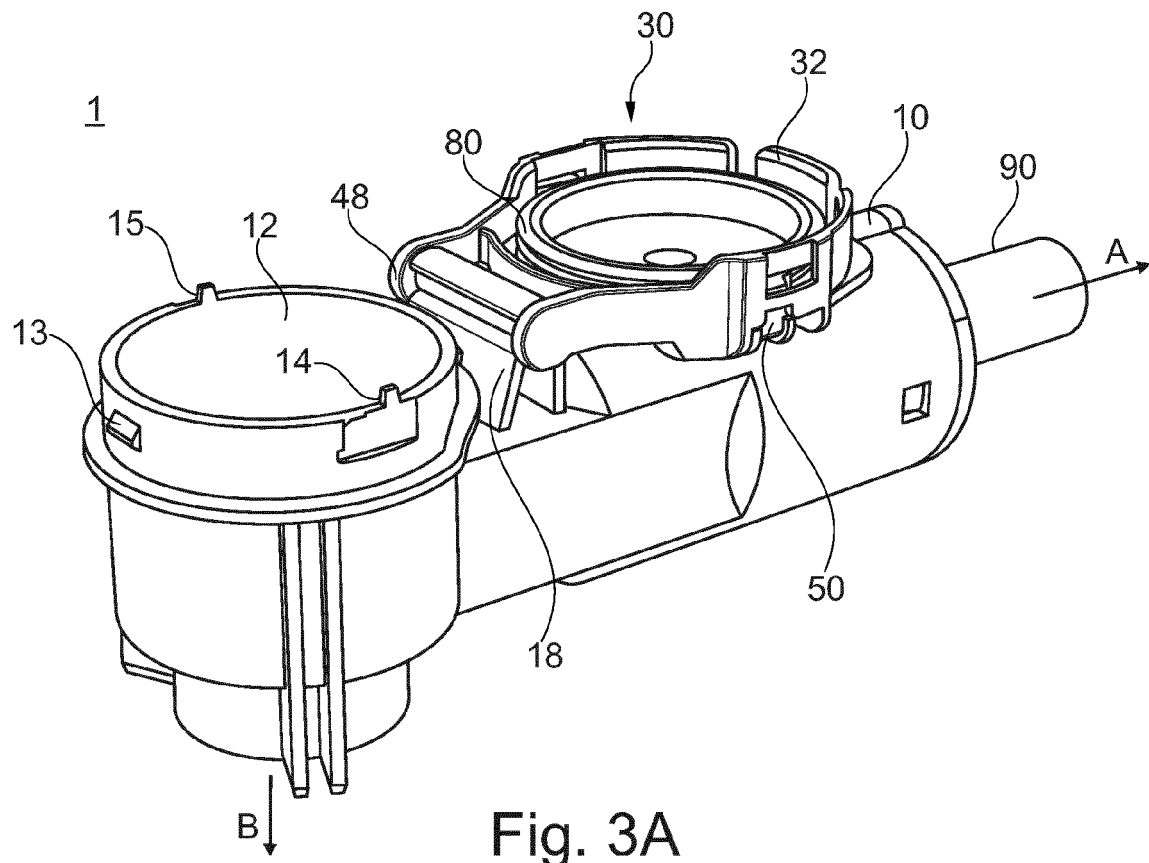


Fig. 2E



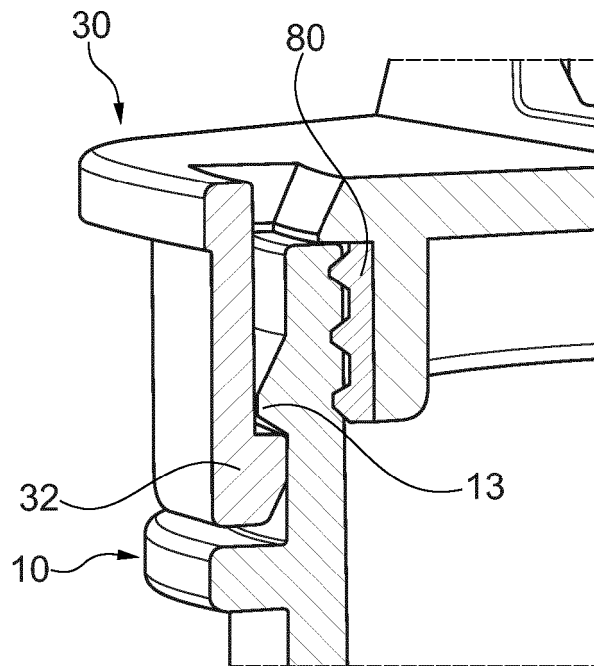


Fig. 3C

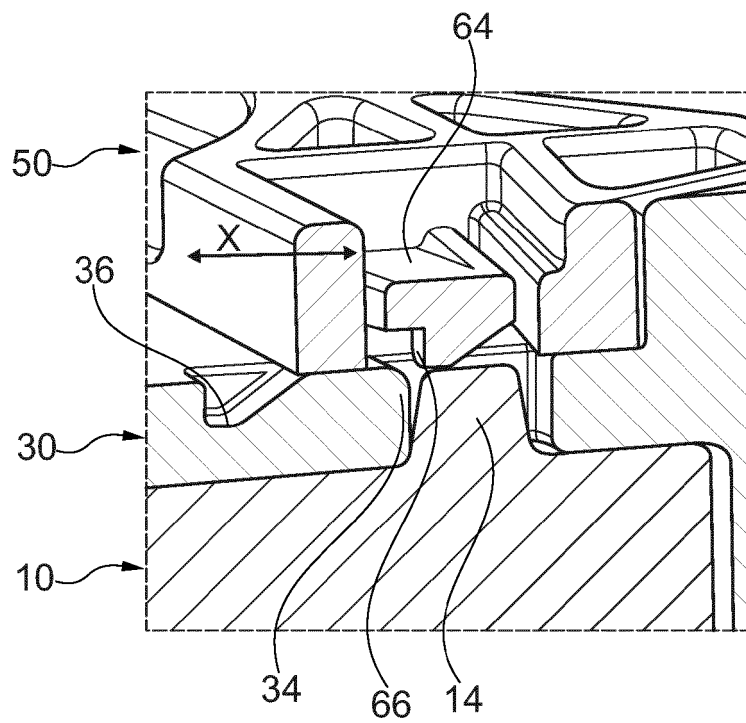
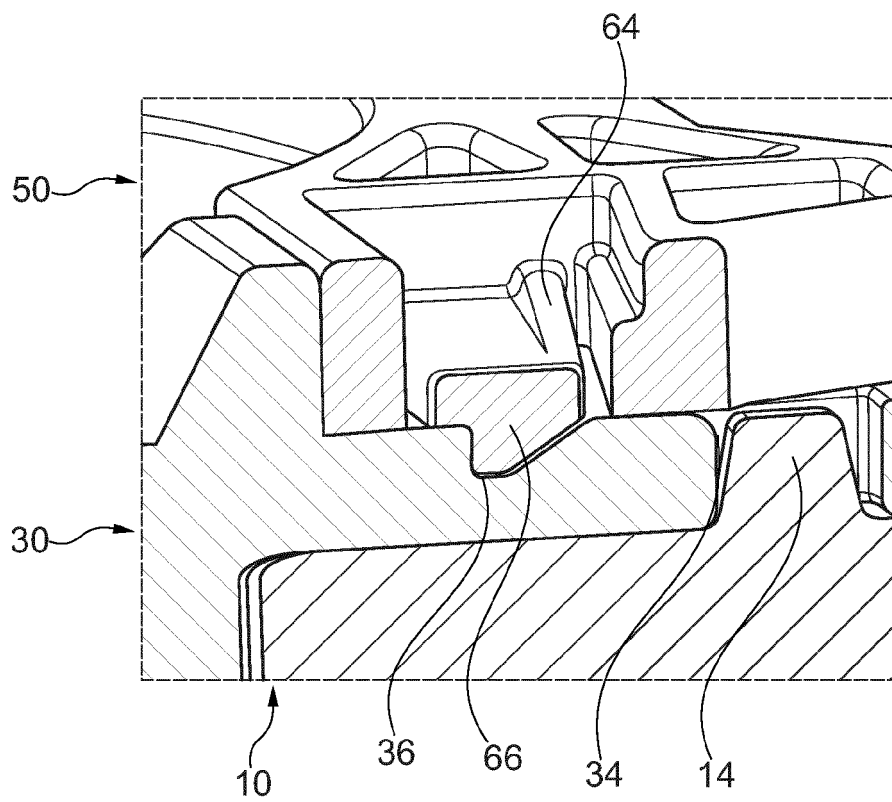
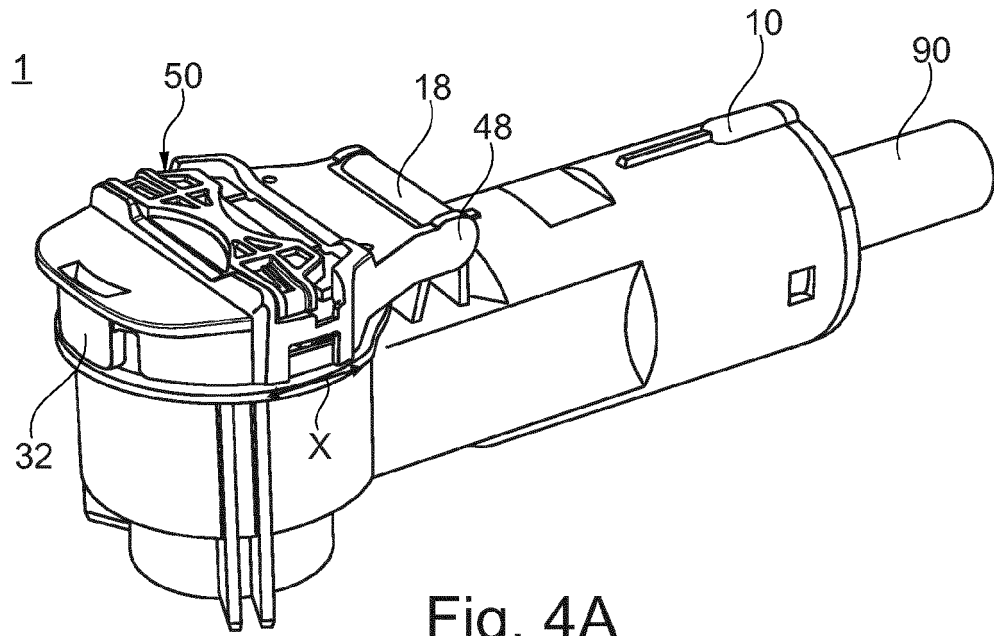


Fig. 3D



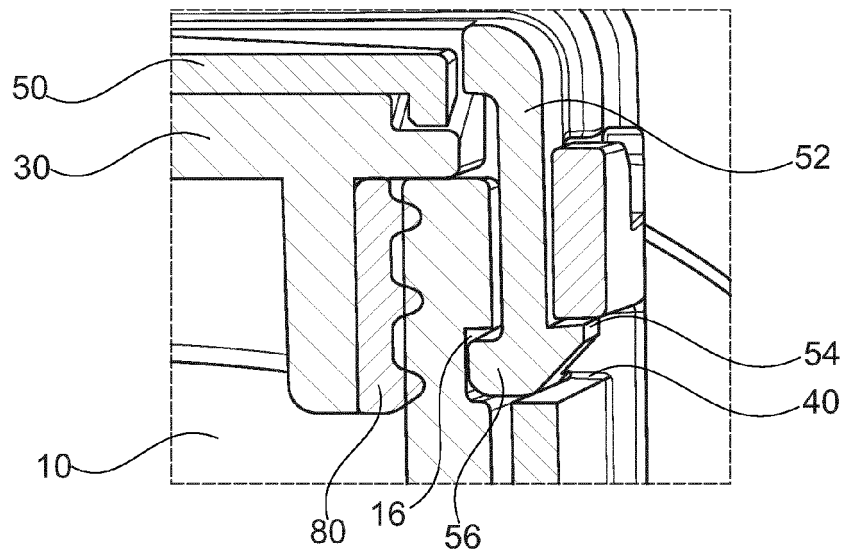


Fig. 4C

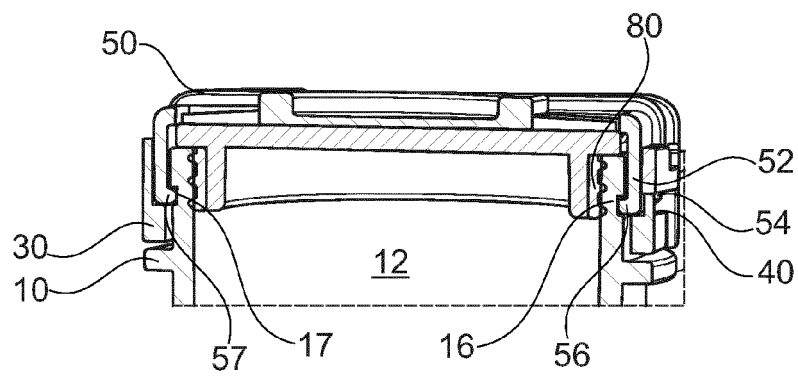


Fig. 4D

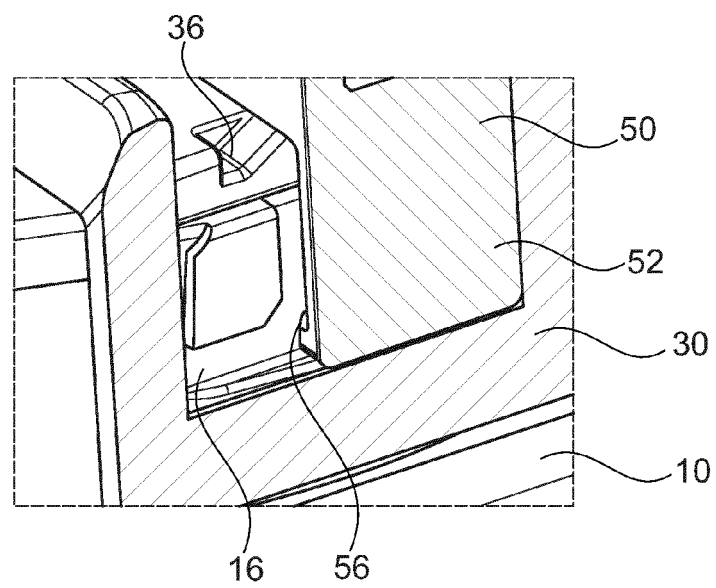


Fig. 4E



EUROPEAN SEARCH REPORT

 Application Number
 EP 16 17 1176

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			TECHNICAL FIELDS SEARCHED (IPC)
			H01R
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 24 October 2016	Examiner Pugliese, Sandro
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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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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24-10-2016

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