(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 4 560 847 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
28.05.2025 Bulletin 2025/22

(21) Application number: **24205561.4**

(22) Date of filing: **09.10.2024**

(51) International Patent Classification (IPC):
H01R 27/00 *(2006.01)* ***H01R 13/627*** *(2006.01)*

(52) Cooperative Patent Classification (CPC):
H01R 13/6277; H01R 27/00; H01R 13/6271

(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 MA MD TN

(30) Priority: **22.11.2023 US 202363601754 P**
01.08.2024 TW 113128670

(71) Applicant: **Moxa Inc.**
New Taipei City 242 (TW)

(72) Inventor: **Yang, Mao-Hung**
242 New Taipei City (TW)

(74) Representative: **Straus, Alexander**
2K Patentanwälte - München
Bajuwarenring 14
82041 Oberhaching (DE)

(54) MULTIPURPOSE RECEPTACLE ELECTRICAL CONNECTOR AND RELATED ELECTRICAL CONNECTOR ASSEMBLY

(57) A multipurpose receptacle electrical connector(11,11') is provided and includes a receiving component(111,111'), a first cooperating structure(112) and a second cooperating structure(114). The receiving component(111, 111') includes an inserting end(111A) and a fixing end(111B) opposite to the inserting end(111A) along a length direction(L) of the receiving component(111,111'). The first cooperating structure(112) and the second cooperating structure(114) are concavely formed on an inner wall and an outer wall of the receiving component(111,111'), respectively. The first cooperating structure(112) is for engaging with an inner engaging structure(122) of a first plug electrical connector(12) when the receiving component(111,111') at least partially receives a first inserting component(121) of the first plug electrical connector(12). The second cooperating structure(114) is for engaging with an outer engaging structure(133) of a second plug electrical connector(13) when the receiving component(111,111') at least partially receives a second inserting component(131) of the second plug electrical connector(13). A related electrical connector assembly is also provided.

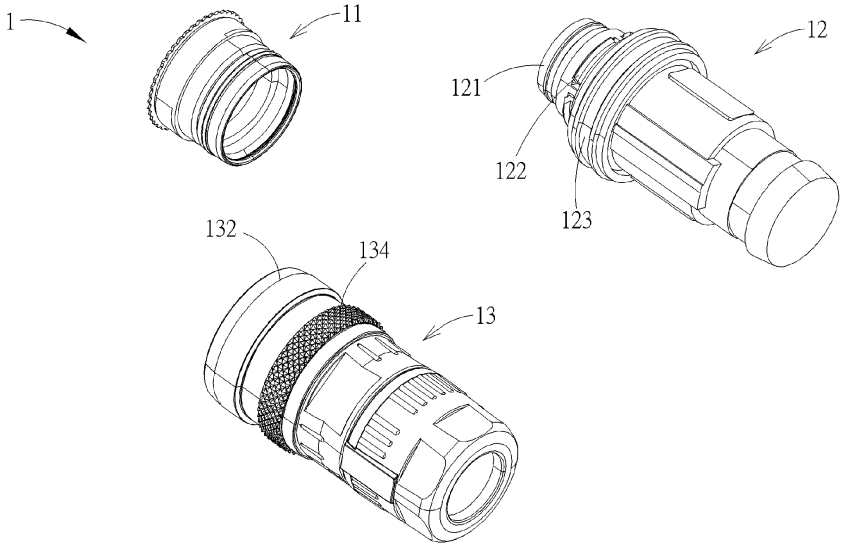

FIG. 1

EP 4 560 847 A1

Description

Field of the Invention

[0001] The present invention relates to a multipurpose receptacle electrical connector and an electrical connector assembly according to the pre-characterizing clauses of claims 1 and 15.

Background of the Invention

[0002] In order to prevent an unintentional separation of a receptacle electrical connector and a plug electrical connector, a locking mechanism is usually provided between the receptacle electrical connector and the plug electrical connector, so as to secure the receptacle electrical connector and the plug electrical connector together, e.g., by an outer latch, an inner latch or screw threads. However, the receptacle electrical connector and the plug electrical connector with different locking mechanisms cannot be connected to each other due to incompatibility, which causes inconvenience in use.

Summary of the Invention

[0003] This is mind, the present invention aims at providing a multipurpose receptacle electrical connector for universal use and a related electrical connector assembly.

[0004] This is achieved by a multipurpose receptacle electrical connector and an electrical connector assembly according to claims 1 and 15. The dependent claims pertain to corresponding further developments and improvements.

[0005] As will be seen more clearly from the detail description following below, the claimed multipurpose receptacle electrical connector includes a receiving component, a first cooperating structure and a second cooperating structure. The receiving component is configured to at least partially receive a first inserting component of a first plug electrical connector or a second inserting component of a second plug electrical connector. The receiving component includes an inserting end and a fixing end opposite to the inserting end along a length direction of the receiving component. The first cooperating structure is concavely formed on an inner wall of the receiving component. The first cooperating structure is located between the inserting end and the fixing end of the receiving component along the length direction of the receiving component and located adjacent to the inserting end of the receiving component. The first cooperating structure is configured to engage with an inner engaging structure of the first plug electrical connector when the receiving component at least partially receives the first inserting component of the first plug electrical connector. The second cooperating structure is concavely formed on an outer wall of the receiving component. The second cooperating structure is located between the first cooperating structure and the fixing end of the receiving component along the length direction of the receiving component. The second cooperating structure is configured to engage with an outer engaging structure of the second plug electrical connector when the receiving component at least partially receives the second inserting component of the second plug electrical connector.

[0006] Besides, the claimed electrical connector assembly includes at least one of a first plug electrical connector including an inner engaging structure and a second plug electrical connector including an outer engaging structure, and further includes the aforementioned multipurpose receptacle electrical connector.

[0007] In summary, the multipurpose receptacle electrical connector of the present invention can utilize the first cooperating structure to engage with the inner engaging structure of the first plug electrical connector, or the second cooperating structure to engage with the outer engaging structure of the second plug electrical connector, such that the present invention can prevent replacement and or adaptation on site due to mismatching of the electrical connectors, so as to enhance convenience in use.

Brief Description of the Drawings

[0008] In the following, the invention is further illustrated by way of example, taking reference to the accompanying drawings. Thereof:

FIG. 1 and FIG. 2 are schematic diagrams of a multipurpose receptacle electrical connector, a first plug electrical connector and a second plug electrical connector at different views according to an embodiment of the present invention,

FIG. 3 is a sectional diagram of the multipurpose receptacle electrical connector according to the embodiment of the present invention,

FIG. 4 is a partial enlarged diagram of the multipurpose receptacle electrical connector according to the embodiment of the present invention,

FIG. 5 is a diagram of the multipurpose receptacle electrical connector and the first plug electrical connector mated with each other according to the embodiment of the present invention,

FIG. 6 is a diagram of the multipurpose receptacle electrical connector and the second plug electrical connector mated with each other according to the embodiment of the present invention, and

FIG. 7 is a diagram of a multipurpose receptacle electrical connector and a third plug electrical connector mated with each other according to another embodiment of the present invention.

Detailed Description

[0009] In the following detailed description of the pre-

ferred embodiments, reference is made to the accompanying drawings which form a part hereof, and in which is shown by way of illustration specific embodiments in which the invention may be practiced. In this regard, directional terminology, such as "top", "bottom", "left", "right", "front", "back", etc., is used with reference to the orientation of the Figure(s) being described. The components of the present invention can be positioned in a number of different orientations. As such, the directional terminology is used for purposes of illustration and is in no way limiting. Accordingly, the drawings and descriptions will be regarded as illustrative in nature and not as restrictive. Also, if not specified, the term "connect" is intended to mean either an indirect or direct electrical/mechanical connection. Thus, if a first device is connected to a second device, that connection may be through a direct electrical/mechanical connection, or through an indirect electrical/mechanical connection via other devices and connections.

[0010] Please refer to FIG. 1 and FIG. 2. FIG. 1 and FIG. 2 are schematic diagrams of a multipurpose receptacle electrical connector 11, a first plug electrical connector 12 and a second plug electrical connector 13 at different views according to an embodiment of the present invention. As shown in FIG. 1 and FIG. 2, the multipurpose receptacle electrical connector 11 and at least one of the first plug electrical connector 12 and the second plug electrical connector 13 can form an electrical connector assembly 1 cooperatively. For example, the first plug electrical connector 12 and the second plug electrical connector 13 can be mounted on a first cable electrically connected to a first device and a second cable electrically connected to a second device, respectively, and the multipurpose receptacle electrical connector 11 can be mounted on a third device and compactible with the first plug electrical connector 12 and the second plug electrical connector 13, wherein the first cable, the first device, the second cable, the second device and the third device are not shown in the figures. The multipurpose receptacle electrical connector 11 can be mated with the first plug electrical connector 12 to establish an electrical connection between the first device and the third device via the first cable, or the multipurpose receptacle electrical connector 11 can be mated with the second plug electrical connector 13 to establish an electrical connection between the second device and the third device via the second cable.

[0011] Preferably, as shown in FIG. 1 and FIG. 2, the first plug electrical connector 12 and the second plug electrical connector 13 can be a push-pull plug connector with an inner engaging structure 122 and a push-pull plug connector with an outer engaging structure 133, respectively.

[0012] Please refer to FIG. 3 to FIG. 6. FIG. 3 is a sectional diagram of the multipurpose receptacle electrical connector 11 according to the embodiment of the present invention. FIG. 4 is a partial enlarged diagram of the multipurpose receptacle electrical connector 11 according to the embodiment of the present invention. FIG. 5 is a diagram of the multipurpose receptacle electrical connector 11 and the first plug electrical connector 12 mated with each other according to the embodiment of the present invention. FIG. 6 is a diagram of the multipurpose receptacle electrical connector 11 and the second plug electrical connector 13 mated with each other according to the embodiment of the present invention. As shown in FIG. 3 to FIG. 5, in order to achieve the mating of the multipurpose receptacle electrical connector 11 and the first plug electrical connector 12, the first plug electrical connector 12 includes a first inserting component 121 and the inner engaging structure 122 mounted on the first inserting component 121, and the multipurpose receptacle electrical connector 11 includes a receiving component 111 and a first cooperating structure 112 concavely formed on an inner wall of the receiving component 111. When the multipurpose receptacle electrical connector 11 and the first plug electrical connector 12 are mated with each other, the receiving component 111 is configured to at least partially receive the first inserting component 121 and the inner engaging structure 122, and the first cooperating structure 112 is configured to engage with the inner engaging structure 122 to secure the multipurpose receptacle electrical connector 11 and the first plug electrical connector 12 together for preventing an unintentional separation of the multipurpose receptacle electrical connector 11 and the first plug electrical connector 12.

[0013] Specifically, the inner engaging structure 122 can be an inner latch structure with at least one hook, and the first cooperating structure 112 can be an inner groove structure configured to engage with the inner latch structure. Understandably, the inner engaging structure 122 can be configured to resiliently move or deform outwardly to engage with the first cooperating structure 112, and the first plug electrical connector 12 can further include a first operating component 123 configured to slide to abut against the inner engaging structure 122 to drive the inner engaging structure 122 to resiliently move or deform inwardly to disengage from the first cooperating structure 112. For example, the first operating component 123 can be a sliding sleeve slidable relative to the first inserting component 121.

[0014] In this embodiment, the receiving component 111 includes an inserting end 111A and a fixing end 111B opposite to the inserting end 111A along a length direction L of the receiving component 111. The first cooperating structure 112 is located between the inserting end 111A and the fixing end 111B of the receiving component 111 along the length direction L of the receiving component 111 and located adjacent to the inserting end 111A of the receiving component 111.

[0015] Preferably, as shown in FIG. 3 and FIG. 4, a minimal thickness T of a portion of the receiving component 111, where the first cooperating structure 112 is formed, is within the range of 0.1 to 0.2 millimeters.

[0016] Besides, the multipurpose receptacle electrical

connector 11 further includes a guiding structure 113 protruding from the inner wall of the receiving component 111 and located between the inserting end 111A of the receiving component 111 and the first cooperating structure 112 along the length direction L of the receiving component 111. The guiding structure 113 includes a guiding inclined surface 1131 configured to abut against the inner engaging structure 122 of the first plug electrical connector 12, so as to drive the inner engaging structure 122 to resiliently move or deform inwardly before the inner engaging structure 122 engages with the first cooperating structure 112. Such configuration can enhance an operational hand feeling of an engagement of the inner engaging structure 122 and the first cooperating structure 112, so as to allow the a user to ascertain that the multipurpose receptacle electrical connector 11 and the first plug electrical connector 12 are mated with each other by sensation of the enhanced operational hand feeling.

[0017] Preferably, an inner chamber diameter defined by a portion of the guiding inclined surface 1131 adjacent to the first cooperating structure 112 is less than an inner chamber diameter defined by a portion of the guiding inclined surface 1131 adjacent to the inserting end 111A of the receiving component 111, and an inner chamber diameter defined by the guiding inclined surface 1131 decreases from the inserting end 111A of the receiving component 111 toward the first cooperating structure 112.

[0018] Furthermore, as shown in FIG. 4, the first cooperating structure 112 includes two cooperating inclined surfaces 1121, 1122 obliquely connected to each other. The guiding inclined surface 1131 of the guiding structure 113 is connected to the cooperating inclined surface 1121 of the first cooperating structure 112 at least by a curved surface AS1 between the guiding inclined surface 1131 and the cooperating inclined surface 1121. The guiding inclined surface 1131 of the guiding structure 113 is connected to an end surface of the inserting end 111A of the receiving component 111 at least by a curved surface AS2 between the guiding inclined surface 1131 and the end surface of the inserting end 111A. The two cooperating inclined surfaces 1121, 1122 of the first cooperating structure 112 are connected to each other at least by an arc surface AS3 between the two cooperating inclined surfaces 1121, 1122. The end surface of the inserting end 111A of the receiving component 111 is connected to an outer surface of the inserting end 111A of the receiving component 111 at least by a curved surface AS4 between the end surface of the inserting end 111A and the outer surface of the inserting end 111A.

[0019] Preferably, as shown in FIG. 3 and FIG. 4, in order to achieve the engagement of the inner engaging structure 122 of the first plug electrical connector 12 and the first cooperating structure 112 without any obstruction, a radius of the curved surface AS1 can be within the range of 0.05 to 0.2 millimeters, and a radius of the curved surface AS2 can be within the range of 0.1 to 0.3 millimeters. Besides, a radius of the arc surface AS3 can be within the range of 0.15 to 0.25 millimeters, and a radius of the curved surface AS4 can be within the range of 0.1 to 0.2 millimeters. Moreover, an inner chamber diameter D1 defined by the most protruding part of the curved surface AS1 can be within the range of 11.9 to 12.7 millimeters.

[0020] As shown in FIG. 3, FIG. 4 and FIG. 6, in order to achieve mating of the multipurpose receptacle electrical connector 11 and the second plug electrical connector 13, the second plug electrical connector 13 includes a second inserting component 131, an outer ring structure 132 and the outer engaging structure 133 mounted on the outer ring structure 132, and the multipurpose receptacle electrical connector 11 further includes a second cooperating structure 114 concavely formed on an outer wall of the receiving component 111. When the multipurpose receptacle electrical connector 11 and the second plug electrical connector 13 are mated with each other, the receiving component 111 is configured to at least partially receive the second inserting component 131 and further be at least partially located between the second inserting component 131 and the outer ring structure 132, and the second cooperating structure 114 is configured to engage with the outer engaging structure 133 to secure the multipurpose receptacle electrical connector 11 and the second plug electrical connector 13 together for preventing an unintentional separation of the multipurpose receptacle electrical connector 11 and the second plug electrical connector 13.

[0021] Specifically, the outer engaging structure 133 can be an outer latch structure with at least one hook, and the second cooperating structure 114 can be an outer groove structure configured to engage with the outer latch structure. Understandably, the outer engaging structure 133 can be configured to resiliently move or deform inwardly to engage with the second cooperating structure 114, and the second plug electrical connector 13 can further include a second operating component 134 configured to slide to abut against the outer engaging structure 133 to drive the outer engaging structure 133 to resiliently move or deform outwardly to disengage from the second cooperating structure 114. For example, the second operating component 134 can be a sliding sleeve slidable relative to the second inserting component 131.

[0022] In this embodiment, the second cooperating structure 114 is located between the first cooperating structure 112 and the fixing end 111B of the receiving component 111 along the length direction L of the receiving component 111.

[0023] Besides, the multipurpose receptacle electrical connector 11 further includes a pushing structure 115 protruding from the outer wall of the receiving component 111 and located between the inserting end 111A of the receiving component 111 and the second cooperating structure 114 along the length direction L of the receiving component 111. The pushing structure 115 is configured to abut against the outer engaging structure 133 of the second plug electrical connector 13, so as to drive the

outer engaging structure 133 to resiliently move or deform outwardly before the outer engaging structure 133 engages with the second cooperating structure 114. Such configuration can enhance an operational hand feeling of an engagement of the outer engaging structure 133 and the second cooperating structure 114, so as to allow the user to ascertain that the multipurpose receptacle electrical connector 11 and the second plug electrical connector 13 are mated with each other properly by sensation of the enhanced operational hand feeling.

[0024] Furthermore, as shown in FIG. 4, the second cooperating structure 114 includes an inclined surface 1141, a first flat surface 1142 and a second flat surface 1143 connected to the first flat surface 1142 and the inclined surface 1141. The first flat surface 1142 is perpendicular to the length direction L. The second flat surface 1143 is parallel to the length direction L, i.e., the second flat surface 1143 is perpendicular to the first flat surface 1142. The first flat surface 1142 of the second cooperating structure 114 is connected to an outer surface of a middle portion 111C of the receiving component 111 at least by a cambered surface ASS between the first flat surface 1142 and the outer surface of the middle portion 111C of the receiving component 111, wherein the middle portion 111C of the receiving component 111 is located between the inserting end 111A and the fixing end 111B of the receiving component 111 along the length direction L of the receiving component 111.

[0025] Preferably, as shown in FIG. 3 and FIG. 4, in order to achieve the engagement of the outer engaging structure 133 of the second plug electrical connector 13 and the second cooperating structure 114 without any obstruction, a radius of the cambered surface AS5 can be within the range of 0.05 to 0.15 millimeters, and a distance H1 between a connection of the two cooperating inclined surfaces 1121, 1122 of the first cooperating structure 112 and the first flat surface 1142 of the second cooperating structure 114 can be within the range of 3.63 to 3.73 millimeters.

[0026] As shown in FIG. 3 to FIG. 6, the multipurpose receptacle electrical connector 11 further includes an abutting protruding platform 116 and a transition platform 117. The abutting protruding platform 116 protrudes from the inner wall of the receiving component 111 and located between the first cooperating structure 112 and the fixing end 111B of the receiving component 111 along the length direction L of the receiving component 111. The transition platform 117 is formed on the inner wall of the receiving component 111 and located between the first cooperating structure 112 and the abutting protruding platform 116. When the multipurpose receptacle electrical connector 11 and the first plug electrical connector 12 are mated with each other, the abutting protruding platform 116 and the transition platform 117 are configured to abut against an end portion of the first inserting component 121 of the first plug electrical connector 12. An abutment of the transition platform 117 and the end portion of the first inserting component 121 of the first plug electrical connector 12 can provide a sealing effect for keeping terminals of the multipurpose receptacle electrical connector 11 and the first plug electrical connector 12 away from environmental dust and/or moisture, so as to protect the terminals of the multipurpose receptacle electrical connector 11 and the first plug electrical connector 12. An abutment of the abutting protruding platform 116 and the end portion of the first inserting component 121 of the first plug electrical connector 12 can prevent any relative vibration of the first plug electrical connector 12 and the multipurpose receptacle electrical connector 11, so as to secure the mating of the multipurpose receptacle electrical connector 11 and the first plug electrical connector 12.

[0027] When the multipurpose receptacle electrical connector 11 and the second plug electrical connector 13 are mated with each other, the abutting protruding platform 116 and the transition platform 117 are configured to abut against an end portion of the second inserting component 131 of the second plug electrical connector 13. An abutment of the transition platform 117 and the end portion of the second inserting component 131 of the second plug electrical connector 13 can provide a sealing effect for keeping terminals of the multipurpose receptacle electrical connector 11 and the second plug electrical connector 13 away from environmental dust and/or moisture, so as to protect the terminals of the multipurpose receptacle electrical connector 11 and the second plug electrical connector 13. An abutment of the abutting protruding platform 116 and the end portion of the second inserting component 131 of the second plug electrical connector 13 can prevent any relative vibration of the second plug electrical connector 13 and the multipurpose receptacle electrical connector 11, so as to secure the mating of the multipurpose receptacle electrical connector 11 and the second plug electrical connector 13.

[0028] Preferably, as shown in FIG. 3 and FIG. 4, in order to achieve the abutting protruding platform 116 and the transition platform 117 to abut against the end portion of the first inserting component 121 and the end portion of the second inserting component 131 for providing the aforementioned sealing and vibration-proof effects, an inner chamber diameter D2 defined by the transition platform 117 can be greater than an inner chamber diameter defined by the abutting protruding platform 116 and be within the range of 12.1 to 12.5 millimeters, and a distance H2 between an interface of the transition platform 117 and the abutting protruding platform 116 and the end surface of the inserting end 111A can be within the range of 4.2 to 4.3 millimeters.

[0029] It should be noticed that the multipurpose receptacle electrical connector 11 can be manufactured by cutting stainless steel, such that multipurpose receptacle electrical connector 11 can not only comply with the aforementioned dimensional specifications but also have enhanced structural strength.

[0030] Please further refer to FIG. 7. FIG. 7 is a diagram

of a multipurpose receptacle electrical connector 11' and a third plug electrical connector 14' mated with each other according to another embodiment of the present invention. As shown in FIG. 7, the multipurpose receptacle electrical connector 11' of this embodiment is similar to the multipurpose receptacle electrical connector 11 of the aforementioned embodiment. Different from the aforementioned embodiment, the multipurpose receptacle electrical connector 11' of this embodiment is compatible with not only the first plug electrical connector and the second plug electrical connector but also the third plug electrical connector 14' different from the first plug electrical connector and the second plug electrical connector. The multipurpose receptacle electrical connector 11' and at least one of the first plug electrical connector, the second plug electrical connector and the third plug electrical connector 14' can form an electrical connector assembly 1' cooperatively. Specifically, the multipurpose receptacle electrical connector 11' further includes a third cooperating structure 118' formed on an abutting protruding platform 116' and configured to engage with a screw structure 142' of the third plug electrical connector 14' in a screwing manner when a receiving component 111' at least partially receives a third inserting component 141' of the third plug electrical connector 14'. For example, the screw structure 142' can be an outer threaded structure different from the inner latch structure and the outer latch structure, and the third cooperating structure 118' can be an inner threaded structure matched with the screw structure 142'. Other details of this embodiment are the same as the ones of the aforementioned embodiment, and have similar variations. Detailed description is omitted herein for simplicity.

[0031] In contrast to the prior art, the multipurpose receptacle electrical connector of the present invention can utilize the first cooperating structure to engage with the inner engaging structure of the first plug electrical connector, or the second cooperating structure to engage with the outer engaging structure of the second plug electrical connector, such that the present invention can prevent replacement and or adaptation on site due to mismatching of the electrical connectors, so as to enhance convenience in use.

[0032] Those skilled in the art will readily observe that numerous modifications and alterations of the device and method may be made while retaining the teachings of the invention. Accordingly, the above disclosure should be construed as limited only by the metes and bounds of the appended claims.

Claims

1. A multipurpose receptacle electrical connector (11, 11') **characterized by**:

   a receiving component (111, 111') configured to at least partially receive a first inserting component (121) of a first plug electrical connector (12) or a second inserting component (131) of a second plug electrical connector (13), the receiving component (111, 111') comprising an inserting end (111A) and a fixing end (111B) opposite to the inserting end (111A) along a length direction (L) of the receiving component (111, 111');

   a first cooperating structure (112) concavely formed on an inner wall of the receiving component (111, 111'), the first cooperating structure (112) being located between the inserting end (111A) and the fixing end (111B) of the receiving component (111, 111') along the length direction (L) of the receiving component (111, 111') and located adjacent to the inserting end (111A) of the receiving component (111, 111'), the first cooperating structure (112) being configured to engage with an inner engaging structure (122) of the first plug electrical connector (12) when the receiving component (111, 111') at least partially receives the first inserting component (121) of the first plug electrical connector (12); and

   a second cooperating structure (114) concavely formed on an outer wall of the receiving component (111, 111'), the second cooperating structure (114) being located between the first cooperating structure (112) and the fixing end (111B) of the receiving component (111, 111') along the length direction (L) of the receiving component (111, 111'), the second cooperating structure (114) being configured to engage with an outer engaging structure (133) of the second plug electrical connector (13) when the receiving component (111, 111') at least partially receives the second inserting component (131) of the second plug electrical connector (13).

2. The multipurpose receptacle electrical connector (11, 11') of claim 1, further **characterized by**:
   a guiding structure (113) protruding from the inner wall of the receiving component (111, 111') and located between the inserting end (111A) of the receiving component (111, 111') and the first cooperating structure (112) along the length direction (L) of the receiving component (111, 111'), the guiding structure (113) comprising a guiding inclined surface (1131) configured to abut against the inner engaging structure (122) of the first plug electrical connector (12).

3. The multipurpose receptacle electrical connector (11, 11') of claim 2, **characterized in that** an inner chamber diameter defined by a portion of the guiding inclined surface (1131) adjacent to the first cooperating structure (112) is less than an inner chamber diameter defined by a portion of the guiding inclined

surface (1131) adjacent to the inserting end (111A) of the receiving component (111, 111').

4. The multipurpose receptacle electrical connector (11, 11') of any of claims 1 to 3, further **characterized by**:
an abutting protruding platform (116, 116') protruding from the inner wall of the receiving component (111, 111') and located between the first cooperating structure (112) and the fixing end (111B) of the receiving component (111, 111') along the length direction (L) of the receiving component (111, 111'), the abutting protruding platform (116, 116') being configured to abut against the first inserting component (121) of the first plug electrical connector (12) when the receiving component (111, 111') at least partially receives the first inserting component (121) of the first plug electrical connector (12), or the abutting protruding platform (116, 116') being configured to abut against the second inserting component (131) of the second plug electrical connector (13) when the receiving component (111, 111') at least partially receives the second inserting component (131) of the second plug electrical connector (13).

5. The multipurpose receptacle electrical connector (11, 11') of claim 4, further **characterized by**:
a transition platform (117) formed on the inner wall of the receiving component (111, 111') and located between the first cooperating structure (112) and the abutting protruding platform (116, 116') along the length direction (L) of the receiving component (111, 111'), the transition platform (117) being configured to abut against the first inserting component (121) of the first plug electrical connector (12) when the receiving component (111, 111') at least partially receives the first inserting component (121) of the first plug electrical connector (12), or the transition platform (117) being configured to abut against the second inserting component (131) of the second plug electrical connector (13) when the receiving component (111, 111') at least partially receives the second inserting component (131) of the second plug electrical connector (13).

6. The multipurpose receptacle electrical connector (11, 11') of claim 5, **characterized in that** an inner chamber diameter defined by the transition platform (117) is greater than an inner chamber diameter defined by the abutting protruding platform (116, 116').

7. The multipurpose receptacle electrical connector (11) of any of claims 4 to 6, further **characterized by**:
a third cooperating structure (118') formed on the abutting protruding platform (116') and configured to engage with a screw structure (142') of a third plug electrical connector (14') in a screwing manner when the receiving component (111') at least partially receives a third inserting component (141') of the third plug electrical connector (14').

8. The multipurpose receptacle electrical connector (11, 11') of any of claims 1 to 7, **characterized in that** the first cooperating structure (112) comprises two cooperating inclined surfaces (1121, 1122) obliquely connected to each other.

9. The multipurpose receptacle electrical connector (11, 11') of claim 8, **characterized in that** the two cooperating inclined surfaces (1121, 1122) of the first cooperating structure (112) are connected to each other by an arc surface (AS3).

10. The multipurpose receptacle electrical connector (11, 11') of claim 1, further **characterized by**:
a curved surface (AS1, AS2, AS4) connected between a guiding inclined surface (1131) of the guiding structure (113) and a cooperating inclined surface (1121) of the first cooperating structure (112), or between the guiding inclined surface (1131) of the guiding structure (113) and an end surface of the inserting end (111A) of the receiving component (111, 111'), or between the end surface of the inserting end (111A) of the receiving component (111, 111') and an outer surface of the inserting end (111A) of the receiving component (111, 111').

11. The multipurpose receptacle electrical connector (11, 11') of any of claims 1 to 7, **characterized in that** the second cooperating structure (114) comprises an inclined surface (1141), a first flat surface (1142) and a second flat surface (1143), the first flat surface (1142) is perpendicular to the length direction (L) of the receiving component (111, 111'), and the second flat surface (1143) is connected to the inclined surface (1141) and the first flat surface (1142) and perpendicular to the first flat surface (1142).

12. The multipurpose receptacle electrical connector (11, 11') of claim 11, **characterized in that** the first flat surface (1142) of the second cooperating structure (114) is connected to an outer surface of a middle portion (111C) of the receiving component (111, 111') by a cambered surface (ASS), and the middle portion (111C) of the receiving component (111, 111') is located between the inserting end (111A) and the fixing end (111B) of the receiving component (111, 111') along the length direction (L) of the receiving component (111, 111').

13. The multipurpose receptacle electrical connector (11, 11') of any of claims 1 to 12, further **characterized by**:
a pushing structure (115) protruding from the outer

wall of the receiving component (111, 111') and located between the inserting end (111A) of the receiving component (111, 111') and the second cooperating structure (114) along the length direction (L) of the receiving component (111, 111'), and the pushing structure (115) being configured to abut against the outer engaging structure (133) of the second plug electrical connector (13).

14. The multipurpose receptacle electrical connector (11, 11') of any of claims 1 to 13, **characterized in that** the multipurpose receptacle electrical connector (11, 11') is manufactured by cutting stainless steel.

15. An electrical connector assembly (1, 1') comprising at least one of a first plug electrical connector (12) comprising an inner engaging structure (122) and a second plug electrical connector (13) comprising an outer engaging structure (133); and further **characterized by**: the multipurpose receptacle electrical connector (11, 11') of any of claims 1 to 14.

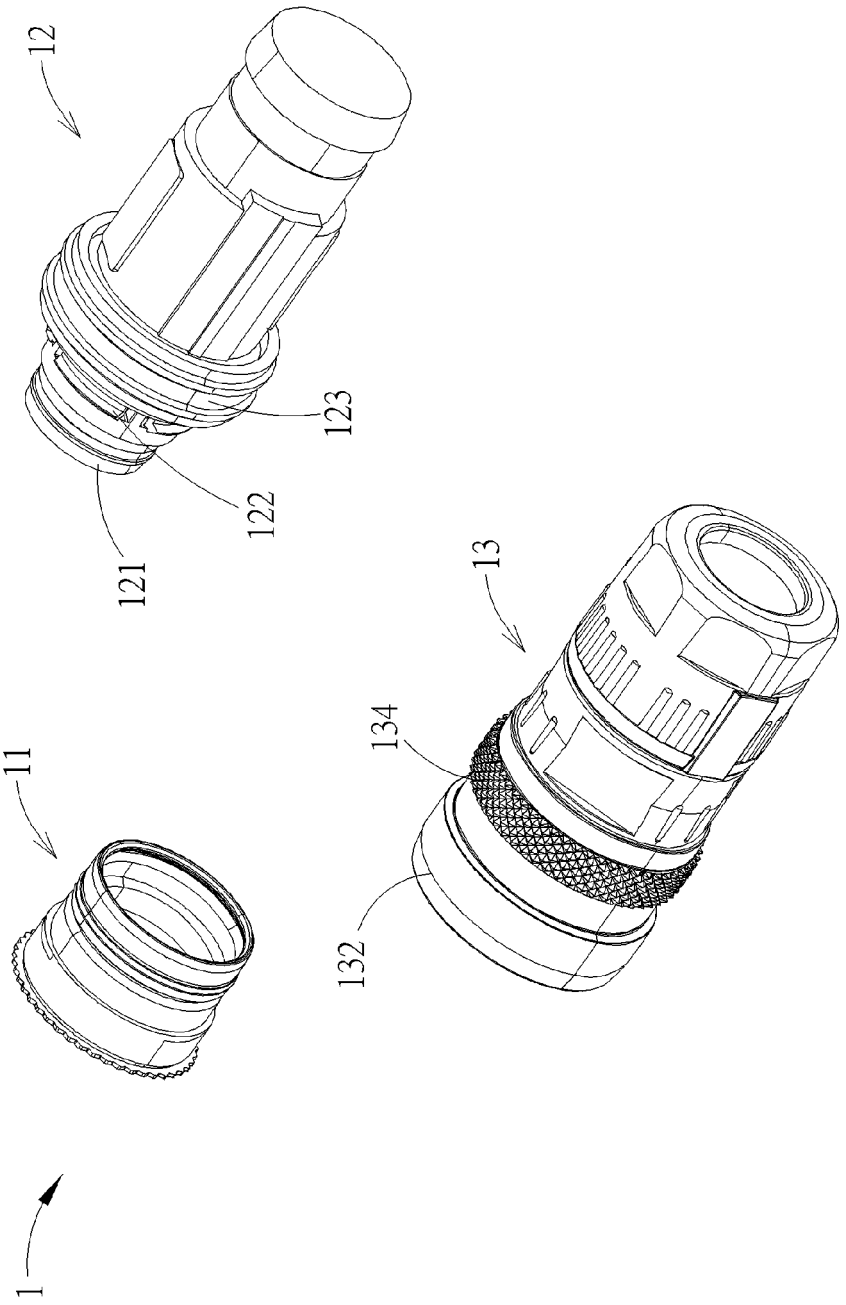

FIG. 1

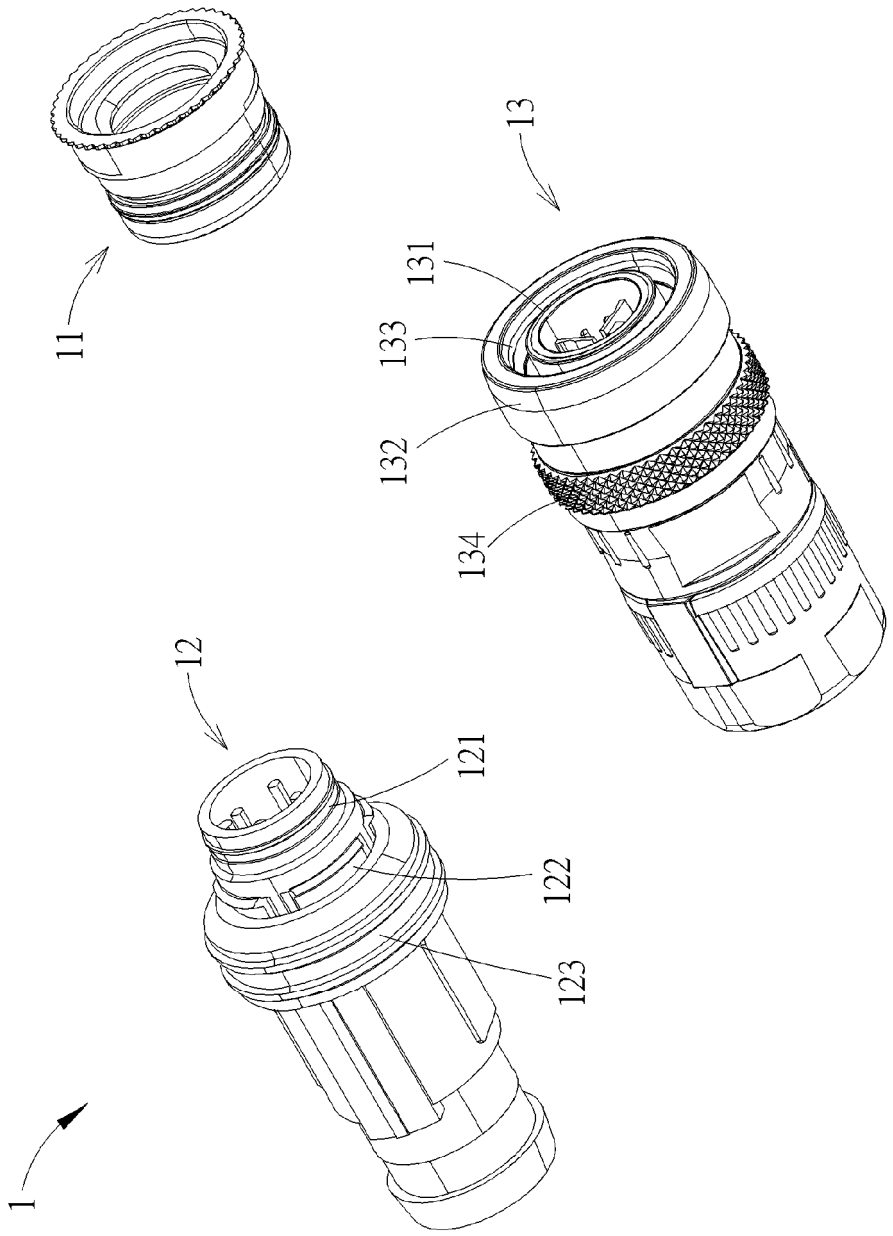

FIG. 2

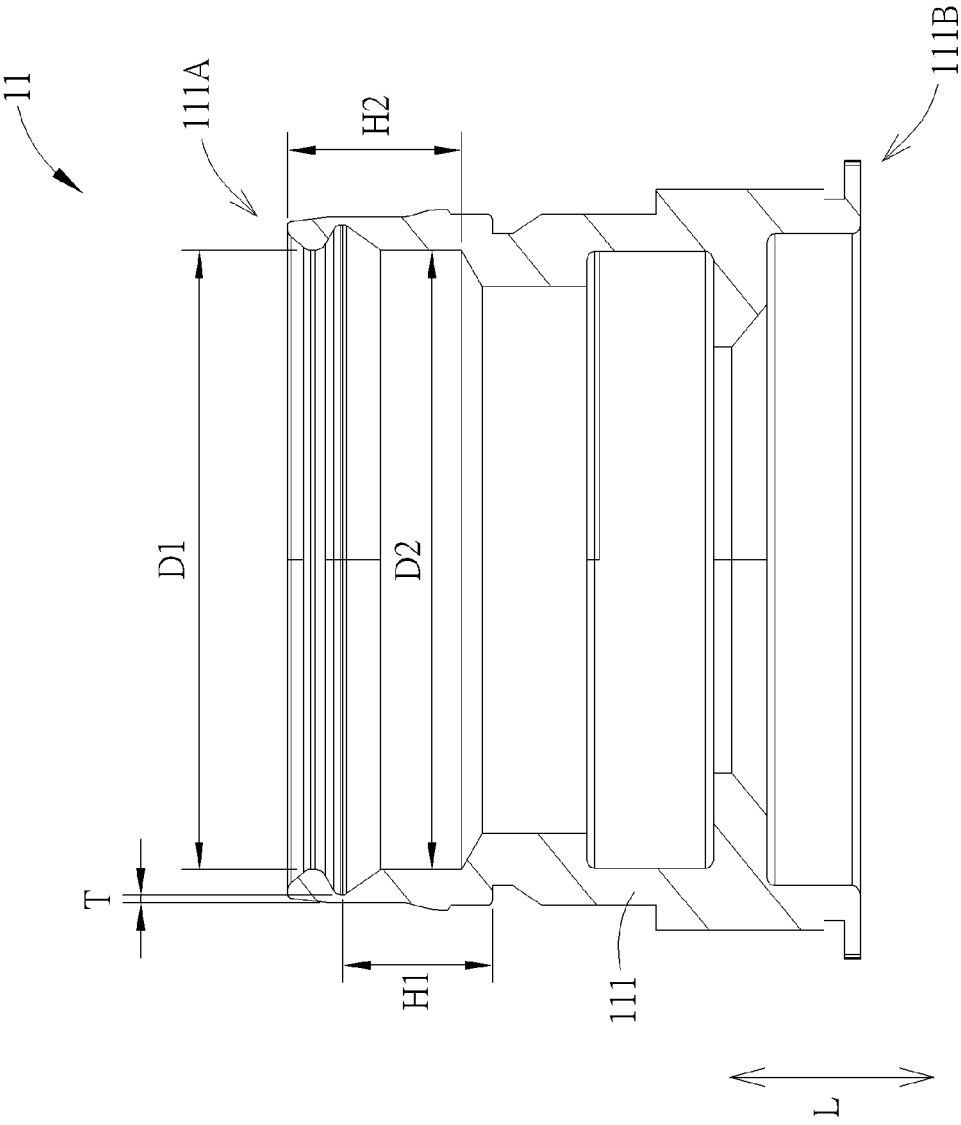

FIG. 3

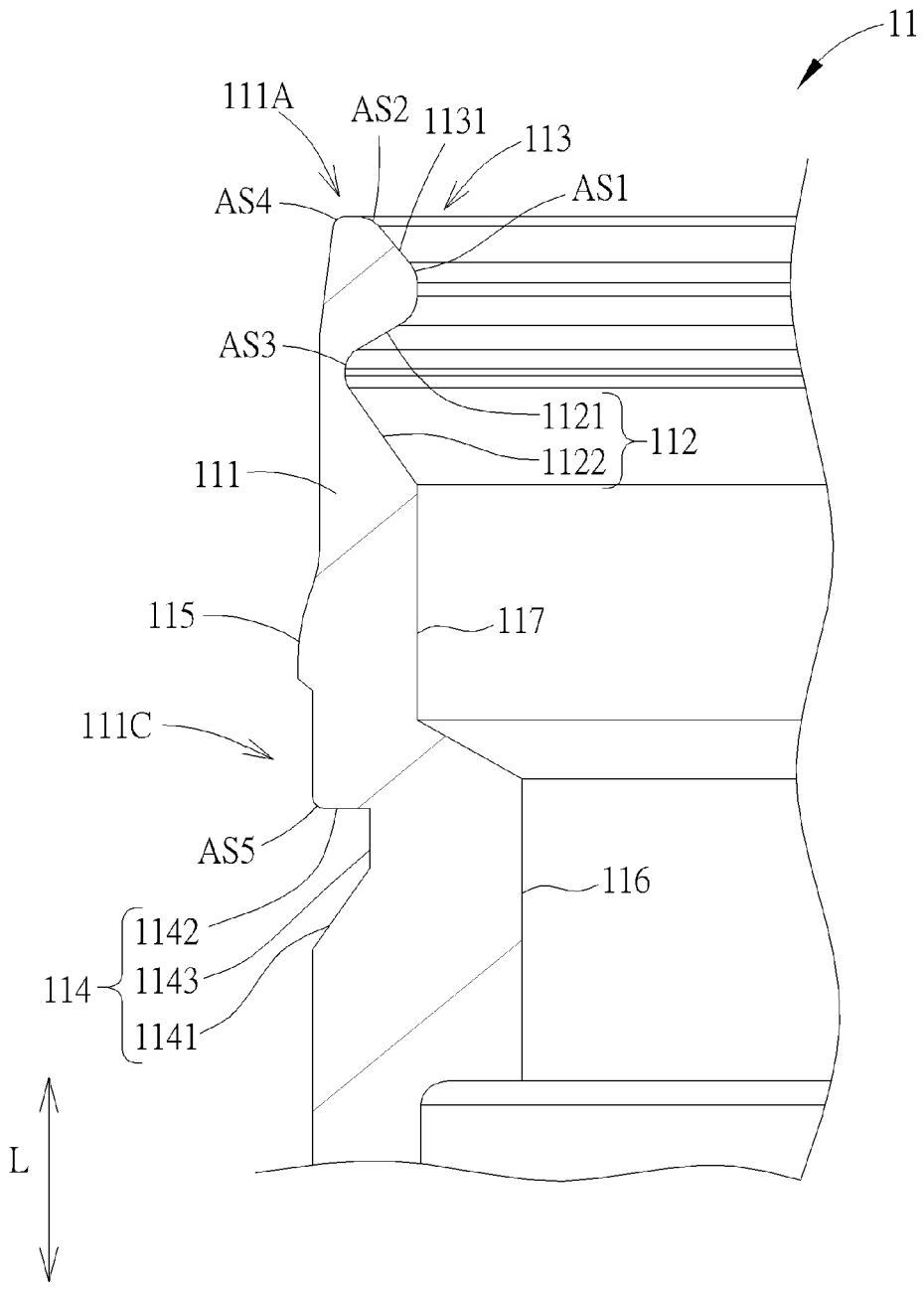
11
111A
AS2
1131
113
AS1
AS4
AS3
1121
1122
112
111
115
117
111C
AS5
116
1142
1143
1141
114
L

FIG. 4

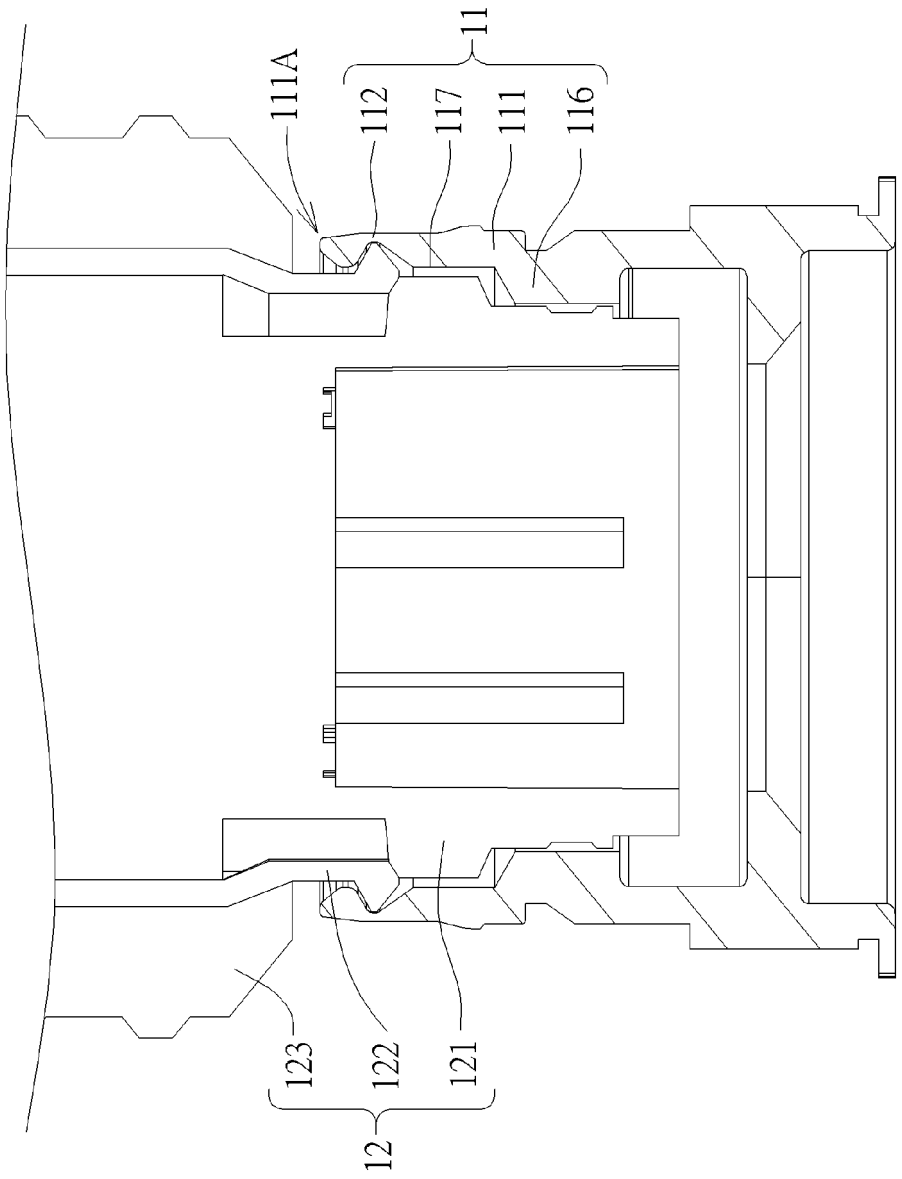

FIG. 5

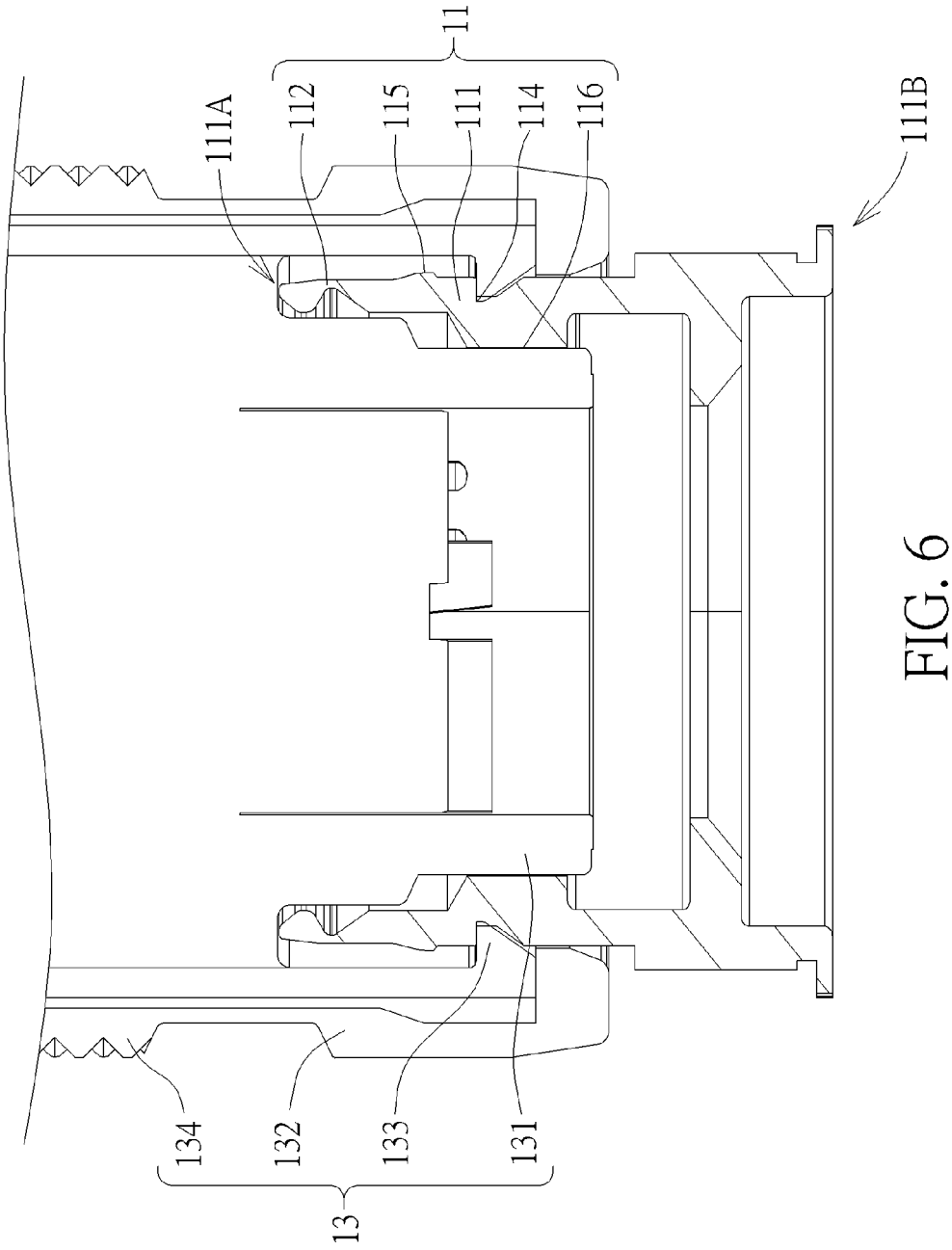

FIG. 6

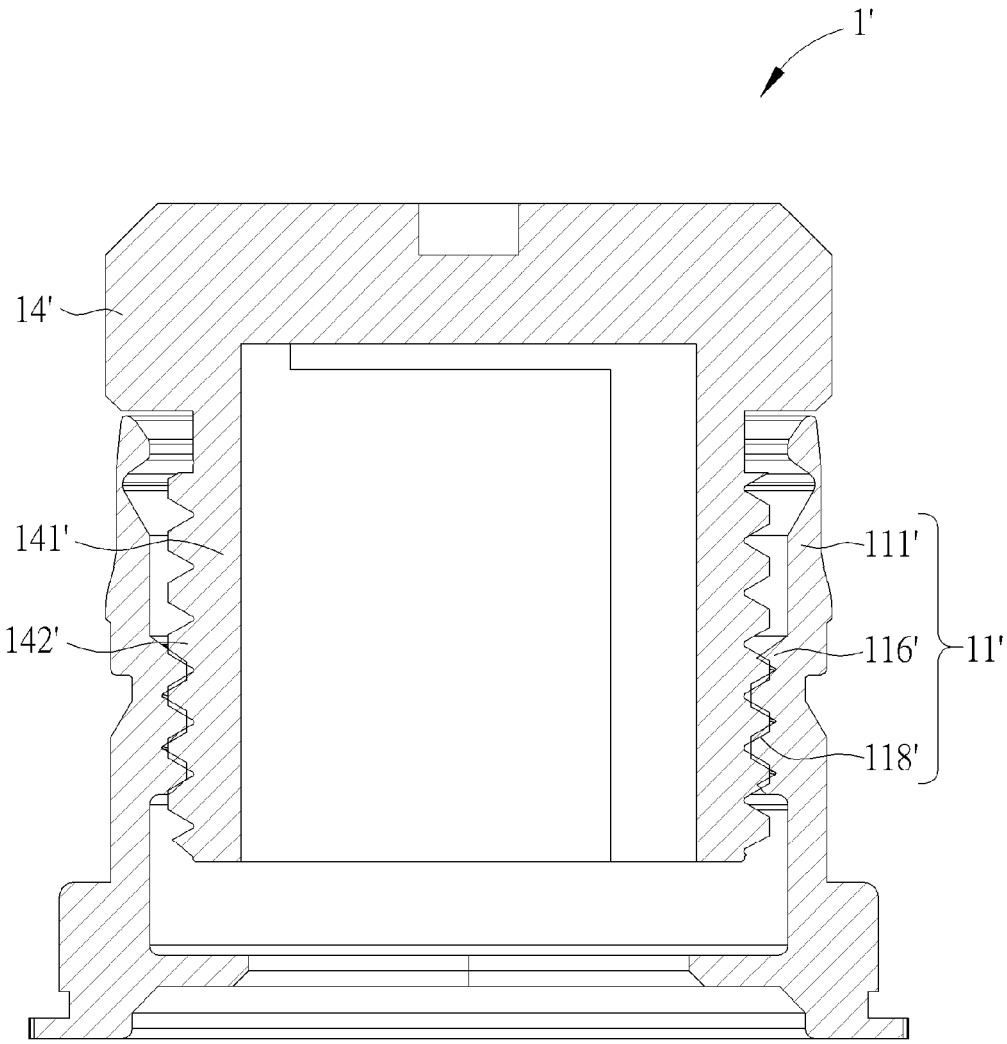

FIG. 7

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 24 20 5561

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y A	DE 10 2013 105602 A1 (HARTING ELECTRONICS GMBH [DE]) 4 December 2014 (2014-12-04) * the whole document *	1-6, 8-12,14, 15 13 7	INV. H01R27/00 H01R13/627
X A	US 2005/186822 A1 (SERINO DONALD A [US] ET AL) 25 August 2005 (2005-08-25) * the whole document *	1-3, 8-10,14 7	
X	CN 101 656 380 A (GUIZHOU SPACE APPLIANCE CO LTD) 24 February 2010 (2010-02-24) * abstract; figures 1-4 *	1,15	
A	US 2022/393386 A1 (LÜTTERMANN DIETER [DE]) 8 December 2022 (2022-12-08) * abstract; figures 1-4 *	1-15	
A	DE 10 2017 104029 A1 (HARTING ELECTRONICS GMBH [DE]) 30 August 2018 (2018-08-30) * abstract; figures 1-2 *	1-15	TECHNICAL FIELDS SEARCHED (IPC)
Y	US 2009/029584 A1 (SAMI TOSHIYUKI [JP]) 29 January 2009 (2009-01-29) * abstract; figures 1-17 *	13	H01R
A	WO 2020/119854 A1 (HARTING ELECTRONICS GMBH [DE]) 18 June 2020 (2020-06-18) * abstract; figures 1-2 *	1-15	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	26 March 2025	Georgiadis, Ioannis

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 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 24 20 5561

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.

26-03-2025

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 102013105602 A1	04-12-2014	DE 102013105602 A1	04-12-2014
		WO 2014190976 A1	04-12-2014
US 2005186822 A1	25-08-2005	NONE	
CN 101656380 A	24-02-2010	NONE	
US 2022393386 A1	08-12-2022	CN 114731015 A	08-07-2022
		DE 102020103896 A1	27-05-2021
		EP 4066330 A1	05-10-2022
		KR 20220133864 A	05-10-2022
		US 2022393386 A1	08-12-2022
		WO 2021104568 A1	03-06-2021
DE 102017104029 A1	30-08-2018	CN 210926542 U	03-07-2020
		DE 102017104029 A1	30-08-2018
		WO 2018153409 A1	30-08-2018
US 2009029584 A1	29-01-2009	CN 101355212 A	28-01-2009
		EP 2037543 A1	18-03-2009
		JP 4767923 B2	07-09-2011
		JP 2009032587 A	12-02-2009
		KR 20090012083 A	02-02-2009
		US 2009029584 A1	29-01-2009
WO 2020119854 A1	18-06-2020	CN 113196582 A	30-07-2021
		DE 102018131720 A1	18-06-2020
		EP 3895256 A1	20-10-2021
		KR 20210091343 A	21-07-2021
		US 2022013956 A1	13-01-2022
		WO 2020119854 A1	18-06-2020

EPO FORM P0459

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