



EUROPEAN PATENT APPLICATION

(43) Date of publication:
18.10.2023 Bulletin 2023/42

(21) Application number: **22167999.6**

(22) Date of filing: **12.04.2022**

(51) International Patent Classification (IPC):
H01R 13/44 ^(2006.01) **H01R 13/506** ^(2006.01)
H01R 13/6582 ^(2011.01) **H01R 13/6593** ^(2011.01)
H01R 13/187 ^(2006.01)

(52) Cooperative Patent Classification (CPC):
H01R 13/506; H01R 13/44; H01R 13/6582;
H01R 13/6593; H01R 13/187

(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 MK MT NL NO
PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

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(54) **ELECTRIC CONNECTOR ASSEMBLY FOR A HIGH-VOLTAGE TERMINAL AND METHOD FOR ASSEMBLING**

(57) Electric connector assembly for a high-voltage terminal comprising a contact member made of electro-conductive material, the contact member comprising a contact tube having a cavity extending along a longitudinal axis, the contact tube having an access opening towards the cavity for receiving a male terminal; and method for assembling an electric connector assembly for a high-voltage terminal.

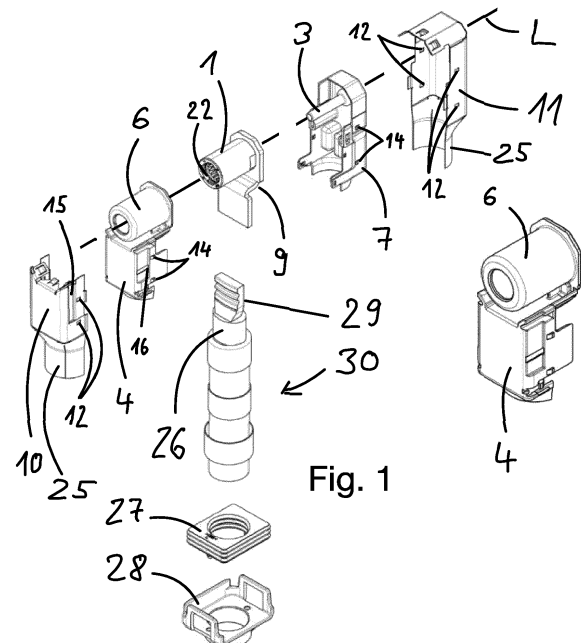


Fig. 1

Description

[0001] This disclosure relates to an electric connector assembly for a high-voltage terminal comprising a contact member made of electroconductive material, the contact member comprising a contact tube having a cavity extending along a longitudinal axis, the contact tube having an access opening towards the cavity for receiving a male terminal; and to a method for assembling an electric connector assembly for a high-voltage terminal.

[0002] Electric connectors and high-voltage terminals are used to establish electric connections between components. For example, electric connectors are used in electrical circuits between components in a power distribution box or to connect a wiring harness to an electrical device. Electrical connectors typically include electrically conductive parts, which engage a corresponding terminal. To prevent accidental contact with the electrically conductive parts, electric connectors may further comprise protective parts made of dielectric material.

[0003] US 9 444 205 B2 discloses an electric connector including a connector body and a conductor base attached to the connector body. A plurality of contact arms extend from the conductor base away from the connector body and are located around a central space. The electric connector also includes a pin attached to the connector body and located in the central space, which pin may be made of electrically non-conductive plastic.

[0004] It can be an objective to improve an electric connector assembly for a high-voltage terminal with regard to facilitated assembly.

[0005] According to an aspect, the objective can be achieved by an electric connector assembly according to claim 1. According to a further aspect, a method according to claim 11 for assembling an electric connector assembly for a high-voltage terminal can achieve the objective.

[0006] The electric connector assembly for a high-voltage terminal comprises a contact member made of electroconductive material, the contact member comprising a contact tube having a cavity extending along a longitudinal axis, the contact tube having an access opening towards the cavity for receiving a male terminal, and a rear opening. The electric connector assembly further comprises a front cover made of dielectric material having a tubular member receiving the contact tube and a rear cover made of dielectric material having a protective pin extending through the rear opening into the cavity of the contact tube. The front cover and the rear cover are latched to each other to form a cover housing encasing the contact member.

[0007] The two-part cover housing is advantageously simple to assemble. It covers the electroconductive contact member with dielectric to prevent it from inadvertent contact, wherein the most exposed contact tube is covered on its outer surface by the tubular member of the front cover and wherein the protective pin of the rear cover located inside the cavity prevents inadvertent contact

on the interior of the contact tube.

[0008] The contact tube may have the form of a hollow cylinder, although other cross sections perpendicular to the longitudinal axis than round may be applicable as well. The protective pin may extend along the longitudinal axis inside the contact tube. The contact tube, the tubular member and the protective pin may be concentrically arranged to each other and to the longitudinal axis, respectively. The protective pin may be formed integral with the rear cover and the tubular member be formed integral with the front cover. Both front cover and rear cover may be molded plastic parts. The front cover and the rear cover may be latched to each other in the sense of corresponding latching arrangements on both parts, which may provide a positive locking, for example a snap-fit connection between respective latching arms and latching retainers.

[0009] According to an embodiment, the electric connector assembly further comprises a shielding made of electroconductive material encasing the cover housing. The shielding may comprise a front shield and a rear shield, advantageously facilitating assembly of the shielding. The front shield may have shield locking means interacting with cover locking means of the front cover to secure the front shield on the cover housing. The rear shield may have shield locking means interacting with cover locking means of the rear cover to secure the rear shield on the cover housing. The front shield may be mechanically locked to the rear shield but does not have to, as the cover housing provides appropriate locking for the shielding. The shielding may form a contacting structure around the tubular member to provide electrical contact to a shielding member of the male terminal.

[0010] According to a further embodiment, the front shield can have shield coding means interacting with cover coding means of the front cover, for example to prevent misalignment.

[0011] According to a further embodiment, the front cover has at least one latching arm interacting with at least one corresponding latching retainer of the rear cover to establish a positive locking. A plurality of latching arms, for example extend in parallel to the longitudinal direction from the front cover, which are inserted into corresponding latching retainers. However, latching arms may as well be arranged on the rear cover and the latching retainers on the front cover, or both front cover and rear cover have both latching arms and latching retainers.

[0012] According to a further embodiment, the protective pin has a base portion fitting into the rear opening of the contact tube. A position along the longitudinal axis of a tip end of the protective pin and the access opening of the contact tube may be identical.

[0013] According to a further embodiment, the electric connector assembly further comprises a contact spring made of electroconductive material having a plurality of spring arms, the contact spring being arranged inside the cavity of the contact tube to facilitate electric contact to the male terminal when inserted into the contact tube.

[0014] The method for assembling an electric connector assembly for a high-voltage terminal comprises the steps:

providing a contact member made of electroconductive material having a contact tube forming a cavity extending along a longitudinal axis L, the contact tube having an access opening towards the cavity for receiving a male terminal, and a rear opening; providing a front cover made of dielectric material having a tubular member; providing a rear cover made of dielectric material having a protective pin; mating the rear cover and the contact member, thereby inserting the protective pin through the rear opening to extend into the cavity of the contact tube. mating the contact member and the front cover, thereby inserting the contact tube into the tubular member with the access opening ahead; wherein the front cover and the rear cover are latched to each other to form a cover housing encasing the contact member.

[0015] According to an embodiment, the method further comprises the steps:

providing a front shield and a rear shield, establishing a positive locking of the front shield and the front cover and establishing a positive locking of the rear shield and the rear cover to form a shielding.

[0016] According to a further embodiment, the method further comprises the steps: providing a wire, connecting a conductor of the wire to the contact member, and connecting a wire shielding to the shielding.

[0017] Various aspects will become apparent to those skilled in the art from the following detailed description of an exemplary embodiment, when read in light of the accompanying drawings.

Figure 1 is an exploded view of an electric connector assembly and a wire subassembly;

Figure 2 is a further exploded view of the electric connector assembly of Figure 1 without shielding;

Figure 3 is a plan view of a section along a longitudinal axis of the assembled electric connector assembly of Figure 1;

Figure 4 is a perspective view of a section along the longitudinal axis of the assembled electric connector assembly of Figure 2;

Figure 5 is a plan view of a section along the longitudinal axis of the electric connector assembly of Figure 4;

Figure 6 is a perspective view of the electric connector assembly of Figure 4;

Figure 7 is a further perspective view of the electric connector assembly of Figure 4;

Figure 8 is a perspective view of a section along the longitudinal axis of the electric connector assembly of Figure 4 without front cover;

Figure 9 is a plan view of a section along the longitudinal axis of the electric connector assembly of Figure 8;

Figure 10 is a plan view of a section along the longitudinal axis of a rear cover of the electric connector assembly of Figure 8;

Figure 11 is a perspective view of a section along the longitudinal axis of the rear cover of Figure 9;

Figure 12 is a perspective view of the rear cover of Figure 9;

Figure 13 is a further perspective view of the rear cover of Figure 9;

Figure 14 is a perspective view of a section along the longitudinal axis of the electric connector assembly of Figure 4 without rear cover;

Figure 15 is a plan view of a section along the longitudinal axis of the electric connector assembly of Figure 14;

Figure 16 is a plan view of a section along the longitudinal axis of a front cover of the electric connector assembly of Figure 14;

Figure 17 is a perspective view of a section along the longitudinal axis of the rear cover of Figure 16;

Figure 18 is a perspective view of the rear cover of Figure 16;

Figure 19 is a further perspective view of the rear cover of Figure 16.

[0018] Figures 1 to 3 show an embodiment of an electric connector assembly in different illustrations, which will be described together. The electric connector assembly for a high-voltage terminal comprises a contact member 9 made of electroconductive material, the contact member 9 comprising a contact tube 1 having a cavity 24 extending along a longitudinal axis L. The contact tube 1 has an access opening 22 towards the cavity 24 for receiving a male terminal (not depicted), and a rear opening 20. A front cover 4 is made of dielectric material and has a tubular member 6 for receiving the contact tube 1. A rear cover 7 is also made of dielectric material and has a protective pin 3 extending through the rear opening 20

into the cavity 24 of the contact tube 1. The front cover 4 and the rear cover 7 are latched to each other to form a cover housing 5 encasing the contact member 9. A shielding 8 made of electroconductive material encases the cover housing 5, which shielding 8 comprises a front shield 10 and a rear shield 11. The front shield 10 has shield locking means 12 interacting with cover locking means 14 of the front cover 4 to secure the front shield 10 on the cover housing 5. The rear shield 11 has shield locking means 12 interacting with cover locking means 14 of the rear cover 7 to secure the rear shield 11 on the cover housing 5. The front shield 10 may have shield coding means 15 interacting with cover coding means 16 of the front cover 4.

[0019] An embodiment of the method for assembling the electric connector assembly is also described with regard to Figures 1 to 3. The method for assembling the electric connector assembly for a high-voltage terminal comprises the following steps: providing the contact member 9, providing the front cover 4 and providing the rear cover 7. The contact member 9 and the front cover 4 are mated, thereby inserting the contact tube 1 into the tubular member 6 with the access opening 25 ahead in a direction along the longitudinal axis L. The rear cover 7 and the contact member 9 are mated, thereby inserting the protective pin 3 in a direction along the longitudinal axis L through the rear opening 20 to extend into the cavity 24 of the contact tube 1. The front cover 4 and the rear cover 7 are latched to each other to form the cover housing 5 encasing the contact member 9. The latching process and a latching arrangement will be described later with regard to detailed illustrations of the front cover 4 and the rear cover 7. Subsequently, the front shield 10 and the rear shield 11 may be provided. A positive locking of the front shield 10 and the front cover 4 is established and a positive locking of the rear shield 11 and the rear cover 7 is established, so that the front shield 10 and the rear shield 11 together form the shielding 8. A wire 30 having a wire seal 27 and a holder 28 may be provided to form the high-voltage terminal. A conductor 29 of the wire 30 is connected to the contact member 9, for example by ultrasonic welding. Any other suitable method may be applied instead. A wire shielding 26 is connected to the shielding 8, for example by crimping a crimp portion 25 of the shielding 8 to the wire 30.

[0020] Figures 4 through 6, which are described together, illustrate the assembled electric connector assembly without the shielding 8. The latched front cover 4 and rear cover 7 form the cover housing 5 electrically insulating the contact member 9 to prevent inadvertent contact, which feature is also referred to as a touch protection or finger touch protection. To protect the cavity 24 of the contact tube 1, the protective pin 3 extends throughout the cavity 24. The protective pin 3 has a base portion 19 fitting into the rear opening 20 of the contact tube 1, as can be seen in the section of Figure 5. A position along the longitudinal axis L of a tip end 21 of the protective pin 3 and the access opening 22 of the contact

tube 1 are identical.

[0021] Figures 8 and 9 illustrate the assembled electric connector assembly without the shielding 8 and without the front cover 4. Figures 10 through 13 show the rear cover 7 in various views. The Figures 8 through 13 are now described together. The rear cover 7 may be a molded plastic part. The protective pin 3 is formed as an integral part of the rear cover 7. In the embodiment shown, four latching retainers 18 are arranged on the rear cover 7 to establish a positive locking with a corresponding arrangement at the front cover 4, which will be described next.

[0022] Figures 14 and 15 illustrate the assembled electric connector assembly without the shielding 8 and without the rear cover 7. Figures 16 through 19, which are now described together, show the front cover 4 in various views. The front cover 4 may be a molded plastic part. The tubular member 6 is formed as an integral part of the front cover 4. In the embodiment shown, the front cover 4 has four latching arms 17 interacting with the corresponding four latching retainers 18 of the rear cover 7 to establish a positive locking between the front cover 4 and the rear cover 7. The cantilevered deflectable latching arms 17 each have a hook near their free ends and a ramp chamfering towards the respective free end. When the latching arms 17 are inserted into the latching retainers 18, the ramps engage the latching retainers 18, deflecting the latching arms 17. When the latching arms 17 are fully inserted in the latching retainers 18, the biased latching arms 19 snap back to engage respective windows with the hooks, thus positively locking the front cover 4 and the rear cover 7. Referring to Figures 14 and 15, the electric connector assembly further comprises a contact spring 2 made of electroconductive material having a plurality of spring arms 23, the contact spring 22 being arranged inside the cavity 24 of the contact tube 1 to facilitate contacting the male terminal when inserted into the contact tube 1.

Reference Numerals

[0023]

1	Contact tube
2	Contact spring
3	Protective pin
4	Front cover
5	Cover housing
6	Tubular member
7	Rear cover
8	Shielding
9	Contact member
10	Front shield
11	Rear shield
12	Shield locking means
14	Cover locking means
15	Shield coding means
16	Cover coding means

17 Latching arm
 18 Latching retainer
 19 Base portion
 20 Rear opening
 21 Tip end
 22 Access opening
 23 Spring arms
 24 Cavity
 25 Crimp portion
 26 Wire shielding
 27 Seal
 28 Holder
 29 Conductor
 30 Wire
 L Longitudinal axis

Claims

1. Electric connector assembly for a high-voltage terminal comprising:

a contact member (9) made of electroconductive material, the contact member comprising a contact tube (1) having a cavity (24) extending along a longitudinal axis (L), the contact tube having an access opening (22) towards the cavity (24) for receiving a male terminal, and a rear opening (20);

a front cover (4) made of dielectric material having a tubular member (6) receiving the contact tube (1);

a rear cover (7) made of dielectric material having a protective pin (3) extending through the rear opening (20) into the cavity (24) of the contact tube (1);

wherein the front cover (4) and the rear cover (7) are latched to each other to form a cover housing (5) encasing the contact member (9).

2. Electric connector assembly according to claim 1, further comprising a shielding (8) made of electroconductive material encasing the cover housing (5).

3. Electric connector assembly according to claim 2, wherein the shielding (8) comprises a front shield (10) and a rear shield (11).

4. Electric connector assembly according to claim 3, wherein the front shield (10) has shield locking means (12) interacting with cover locking means (14) of the front cover (4) to secure the front shield (10) on the cover housing (5).

5. Electric connector assembly according to any one of claims 3 or 4, wherein the rear shield (11) has shield locking means (12) interacting with cover locking means (14) of the rear cover (7) to secure the

rear shield (11) on the cover housing (5).

6. Electric connector assembly according to any one of claims 3 to 5, wherein the front shield (10) has shield coding means (15) interacting with cover coding means (16) of the front cover (4).

7. Electric connector assembly according to any one of claims 1 to 6, wherein the front cover (4) has at least one latching arm (17) interacting with at least one corresponding latching retainer (18) of the rear cover (7) to establish a positive locking.

8. Electric connector assembly according to any one of claims 1 to 7, wherein the protective pin (3) has a base portion (19) fitting into the rear opening (20) of the contact tube (1).

9. Electric connector assembly according to any one of claims 1 to 8, wherein a position along the longitudinal axis of a tip end (21) of the protective pin (3) and the access opening (22) of the contact tube (1) are identical.

10. Electric connector assembly according to any one of claims 1 to 9, further comprising a contact spring (2) made of electroconductive material having a plurality of spring arms (23), the contact spring being arranged inside the cavity (24) of the contact tube (1).

11. Method for assembling an electric connector assembly for a high-voltage terminal comprising the steps:

providing a contact member (9) made of electroconductive material having a contact tube (1) forming a cavity (24) extending along a longitudinal axis L, the contact tube (1) having an access opening (5) towards the cavity for receiving a male terminal, and a rear opening (20);

providing a front cover (4) made of dielectric material having a tubular member (6);

providing a rear cover (7) made of dielectric material having a protective pin (3);

mating the contact member (9) and the front cover (4), thereby inserting the contact tube (1) into the tubular member (6) with the access opening (25) ahead;

mating the rear cover (7) and the contact member (9), thereby inserting the protective pin through the rear opening (20) to extend into the cavity (24) of the contact tube (1).

12. Method according to claim 11, wherein the front cover (4) and the rear cover (7) are latched to each other to form a cover housing (5) encasing the contact member (9).

13. Method according to any one of claims 11 or 12,

providing a front shield (10) and a rear shield (11), establishing a positive locking of the front shield (10) to the front cover (4) and establishing a positive locking of the rear shield (11) to the rear cover (7) to form a shielding (8).

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14. Method according to any one of claims 11 to 13, providing a wire (30), connecting a conductor (29) of the wire (30) to the contact member (9), and connecting a wire shielding (26) to the shielding (8).

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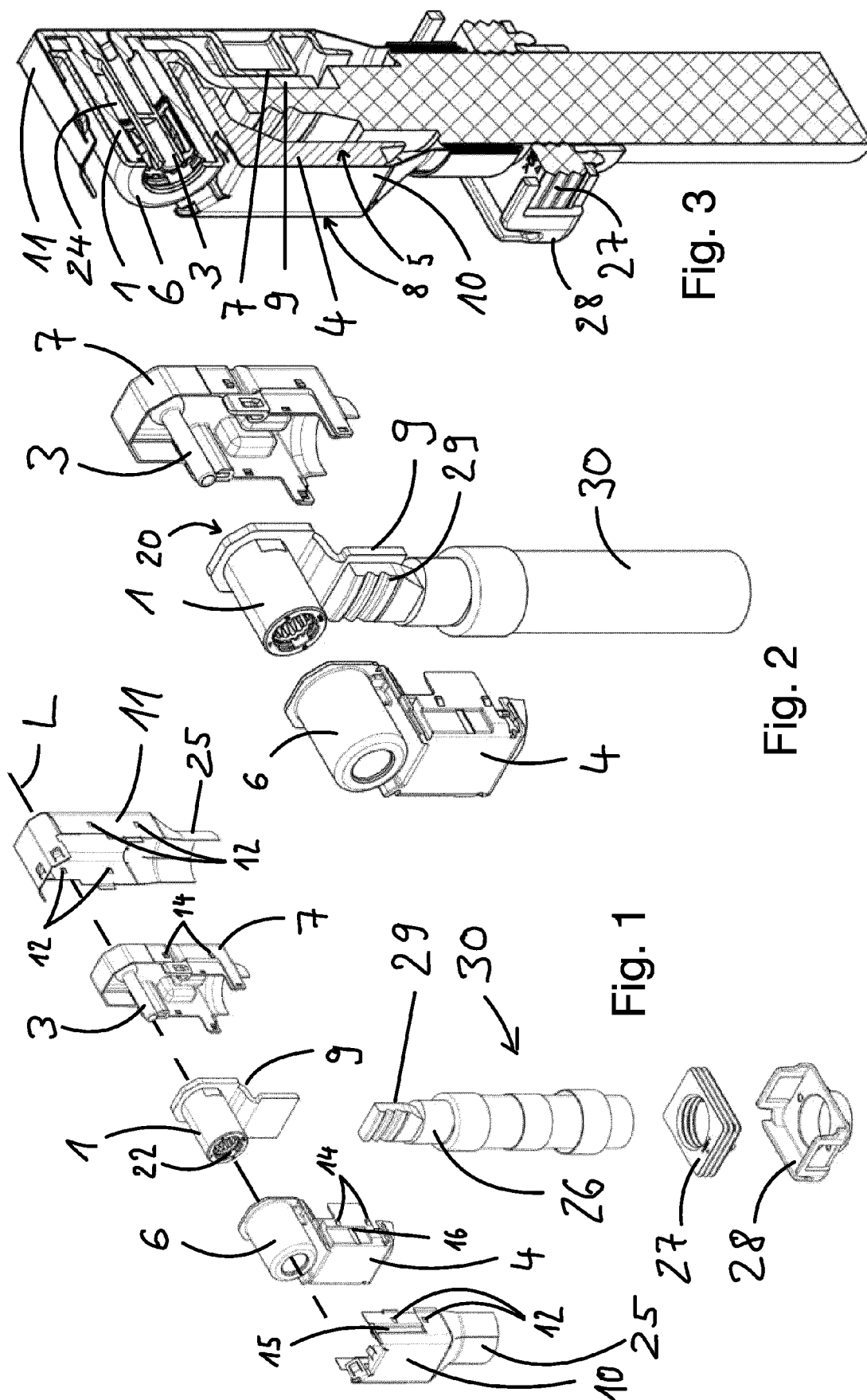
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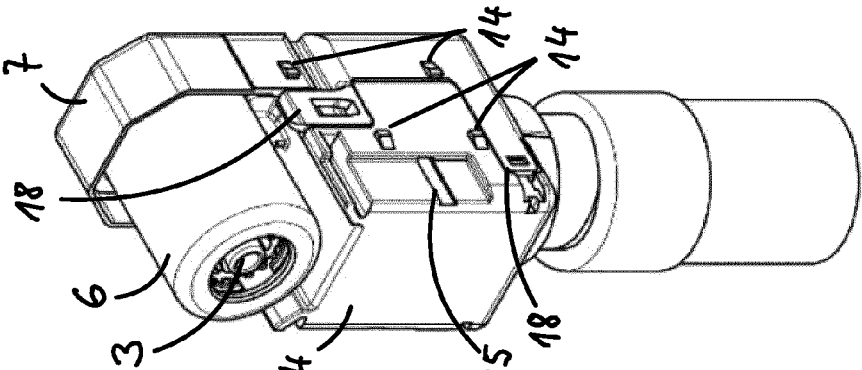


Fig. 7

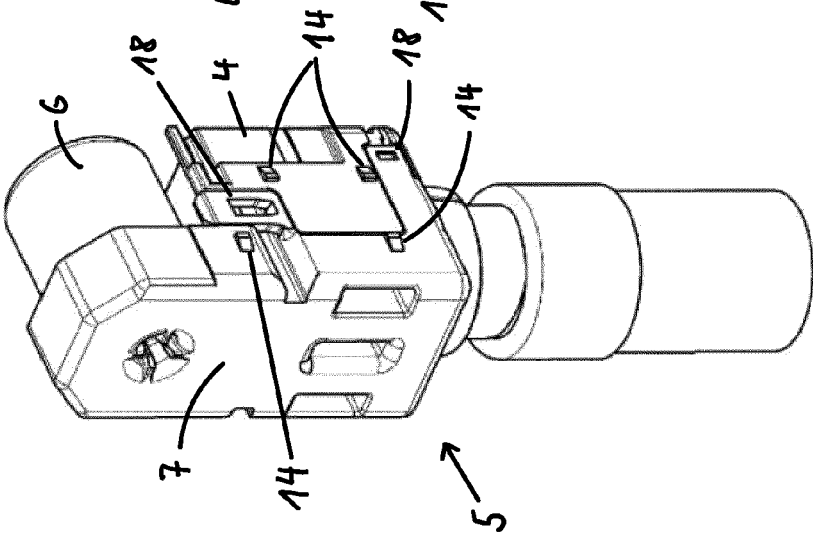


Fig. 6

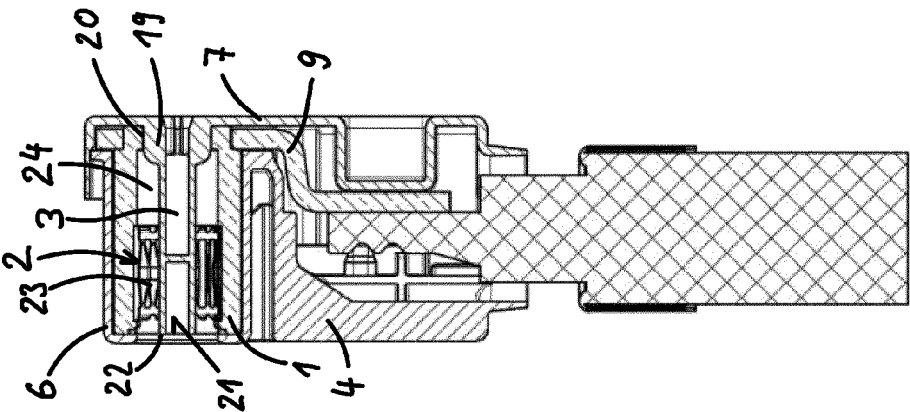


Fig. 5

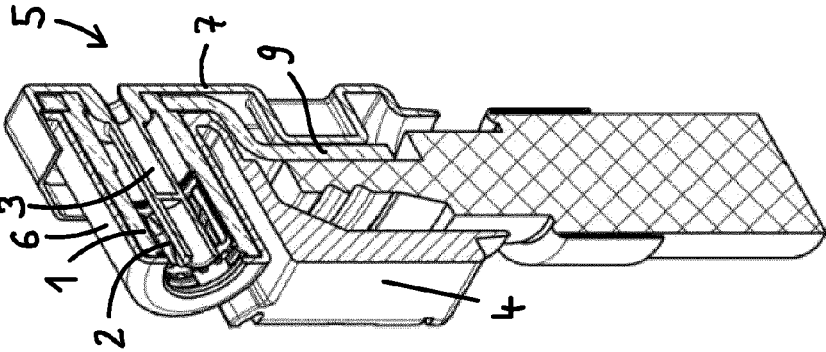
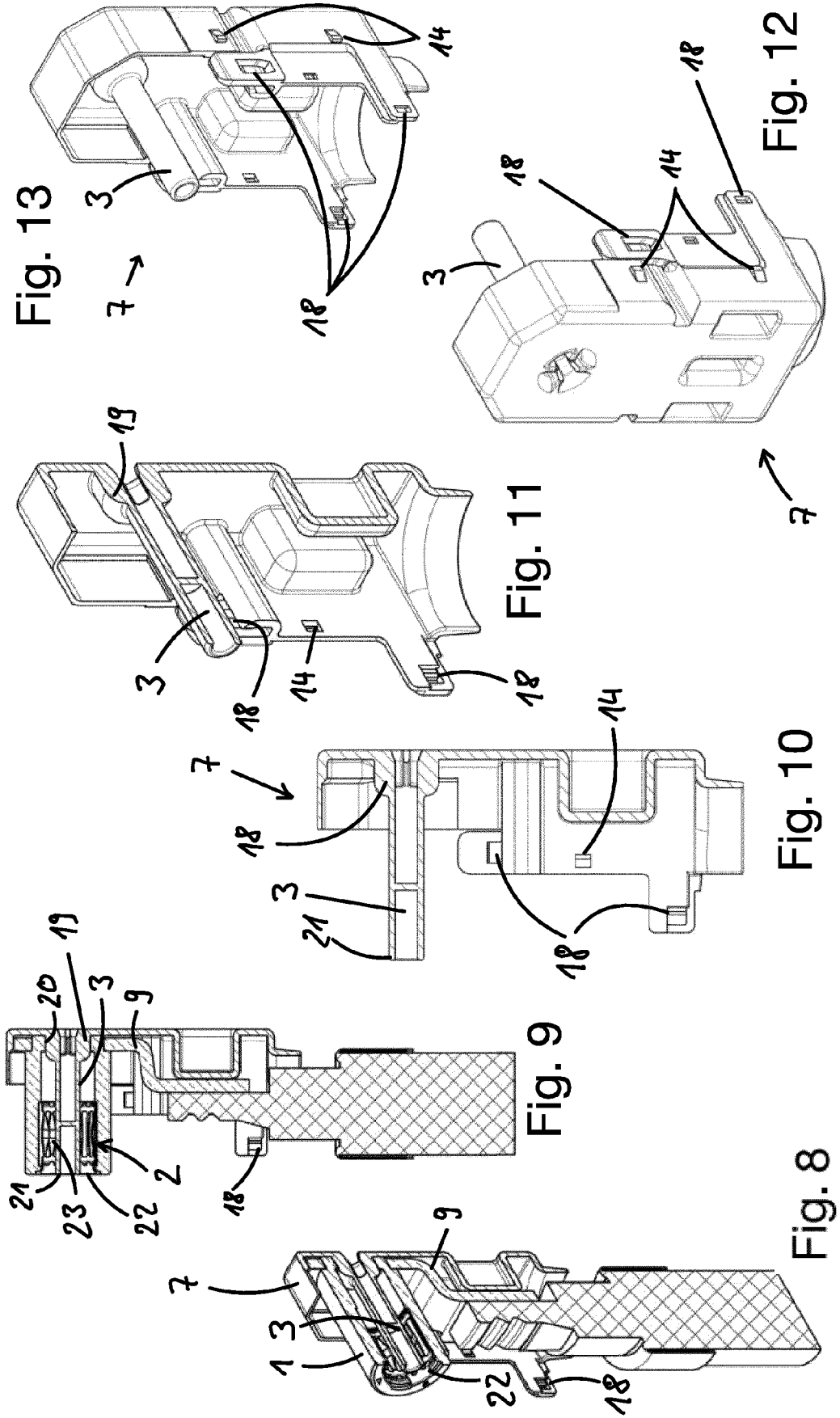
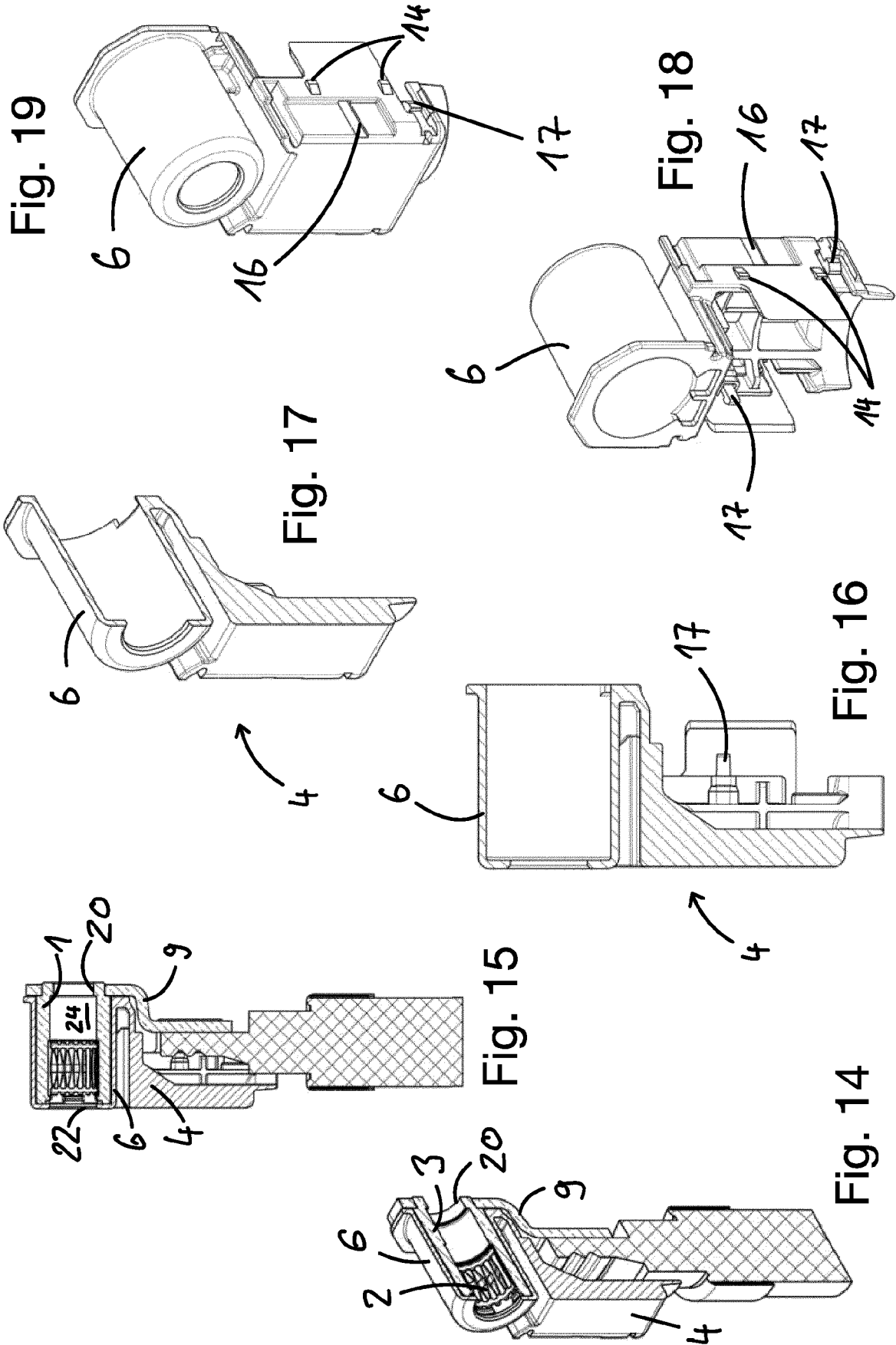


Fig. 4







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EPO FORM 1503 03.82 (P04C01)

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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC) H01R
Place of search The Hague		Date of completion of the search 15 September 2022	Examiner Vautrin, Florent
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	

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

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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. 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.

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