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(54) **Hermetic two-pole or multipole electrical connector**

(57) A hermetic two-pole or multipole electrical connector (10) comprising a central engagement portion (11) for at least two electrical terminals (12, 13), from which a corresponding number of laterally adjacent tubular parts (14, 15), at least one first male tubular part (14) and at least one first female tubular part (15), protrude so as to surround the terminals (12, 13), each one of the tubular

parts (14, 15) being designed to mate with a corresponding tubular part (14a, 15a) of an associated similar electrical connection element. A hermetic containment and closure portion (16) extends from the central portion (11) for the segments (17, 18) for crimping the terminals (12, 13) to the respective electrical cables (19, 20); the portion (16) is formed by two half-shells (21, 22) hinged to the central portion (11).

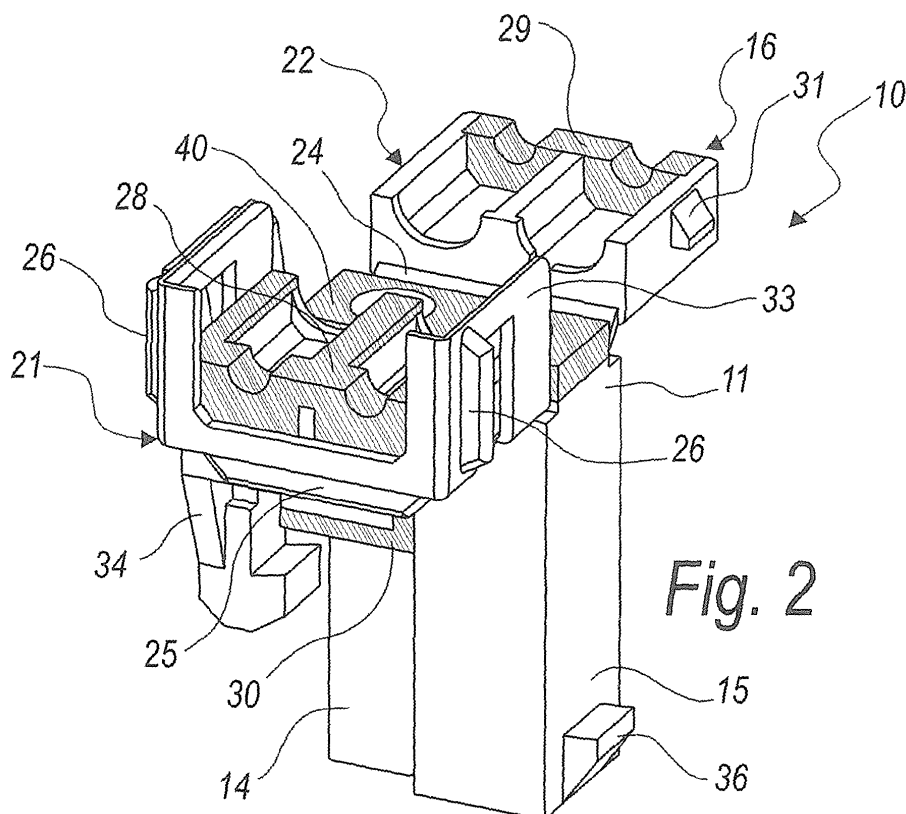


Fig. 2

Description

[0001] The present invention relates to a hermetic two-pole or multipole electrical connector.

[0002] Hermetic connection devices, designed to provide electrical contacts in particularly damp or even wet areas as may occur in a refrigerator or in a heat exchange machine (climate control unit and the like,) are currently known and widespread.

[0003] Generally, in conventional non-hermetic connection devices and connectors, the electrical cables are inserted easily in holes that have a larger cross-section than such cables; instead, in hermetic connection devices and in general in hermetic connectors, in order to provide tightness with respect to water and moisture, the spaces provided between the cables and at least the regions for feeding such cables into the respective insertion holes must be obstructed by means of suitably contoured sealing elements.

[0004] These known types of hermetic connection device are shown for the sake of simplicity in the accompanying Figure 1, which is an exploded view thereof, and are generally designated by the reference letter A. The connection devices A comprise two connectors, a first male connector B and a second female connector C, with two or more poles, the first male connector B having tubular parts D that extend from a central body E to surround corresponding male terminals F inserted in such central body.

[0005] A central body G of the second female connector C has tubular seats H which accommodate female terminals F' for coupling with the male terminals F of the first connector B, which are shaped complementarily with respect to the tubular parts D of the first connector B.

[0006] The two connectors B and C are joined by snap engagement tabs L.

[0007] The tightness of the connection device A is provided by

- a first sealing element M, which is contoured so as to surround at the base the protruding tubular parts D of the first male connector B, and is provided separately and therefore adapted to be mounted by hand on such first connector,
- a second sealing element N, which is formed by cylindrical protrusions P designed to be each crossed axially by an electrical cable R (with the male terminal F) for wiring, thus providing the seal on such cables; the cylindrical protrusions P protrude from a flat base S designed to provide a perimetric seal on a free face T of the first connector B, the second element N being designed to be installed manually with the electrical cables R and forced, again manually, in corresponding seats V formed in the central body E of the first connector B,
- a third sealing element N', which is fully similar to the second element N and is formed by cylindrical protrusions P' designed to be each crossed axially

by an electrical cable R' (with a female terminal F') for wiring, thus providing the seal on such cables; the cylindrical protrusions P' extend from a flat base S' designed to provide the perimetric seal on a free face T' of the second connector C, the third element N' being designed to be provided manually with the electrical cables R' and forced, again manually, in corresponding seats formed in the central body G of the second connector C.

[0008] The provision of such known type of hermetic connection device therefore reveals some limitations.

[0009] A first limitation lies in the need to provide separately and to assemble manually the described sealing elements, with significant costs in terms of molding equipment, assembly time and therefore labour.

[0010] A second limitation is that it is necessary to provide two different connectors, a male one and a female one, each of which requires the preparation of a dedicated mold.

[0011] Moreover, such first and second connectors, being long known and in use, are not structured to ensure the anti-flammability safety distances from a hot body in contact that are imposed by applicable national and international statutory provisions.

[0012] The aim of the present invention is to provide a hermetic two-pole or multipole electrical connector that is capable of obviating the above-mentioned drawbacks of known devices.

[0013] Within this aim, an object of the present invention is to provide a hermetic connector that is simpler and quicker to install with respect to known connectors and equally quick to mate in order to provide a hermetic connection device.

[0014] Another object of the present invention is to provide a connector whose installation requires less labour than known connectors.

[0015] Another object of the present invention is to provide a hermetic connector that is less expensive in terms of equipment for providing its components.

[0016] Another object of the present invention is to provide a hermetic connector whose mechanical performance is not inferior to that of known connectors and which is safer in terms of anti-flammability, in accordance with applicable statutory provisions at the national and international level.

[0017] Another object of the present invention is to provide a hermetic two-pole or multipole electrical connector that can be manufactured with known equipment and technologies.

[0018] This aim and these and other objects, that will become better apparent hereinafter, are achieved by a hermetic two-pole or multipole electrical connector, **characterized in that** it comprises a central engagement portion for at least two electrical terminals from which a corresponding number of laterally adjacent tubular parts, at least one first male tubular part and at least one first female tubular part, protrude so as to surround said termi-

nals, each one of said tubular parts being designed to mate with a corresponding male or female tubular part of an associated similar electrical connection element, a hermetic containment and closure portion extending from said central portion, opposite with respect to said tubular parts, for the segments for crimping the terminals to the respective electrical cables, said hermetic containment portion being formed by two half-shells designed to close onto each other, at least one of said two half-shells being articulated to said central portion by way of hinge means, said electrical connector also comprising reversible extraction-preventing means for quick coupling to a similar corresponding associated electrical connection element.

[0019] Further characteristics and advantages of the invention will become better apparent from the following detailed description of a preferred but not exclusive embodiment thereof, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figure 1 is an exploded top view of a hermetic connection device according to the background art;
 Figure 2 is a first perspective view of a connector according to the invention in the open configuration;
 Figure 3 is a second perspective view of the connector according to the invention in the open configuration;
 Figure 4 is a top view of the connector according to the invention in the open configuration;
 Figure 5 is a sectional view, taken along the longitudinal plane V-V of Figure 4, of the connector according to the invention in the open configuration;
 Figure 6 is a sectional view of two facing half-shells of a hermetic containment and sealing portion of the connector according to the invention;
 Figure 7 is a top view of the hermetic connection device composed of two identical connectors according to the invention;
 Figure 8 is a side view of the device of Figure 7;
 Figure 9 is a sectional view, taken along the line IX-IX of the device of Figure 8.

[0020] With reference to the figures, a hermetic two-pole or multipole electrical connector according to the invention is designated generally by the reference numeral 10.

[0021] The hermetic electrical connector 10 comprises a central engagement portion 11 for at least two electrical terminals.

[0022] In the embodiment of the connector 10 according to the invention described here by way of non-limiting example of the invention, the portion 11 is for the engagement of two electrical terminals, respectively 12 and 13, which are shown in Figure 9.

[0023] A corresponding number of laterally adjacent tubular parts 14 and 15, a first male tubular part 14 and a first female tubular part 15, extend from the central portion 11 so as to surround the terminals 12 and 13.

[0024] Each one of the tubular parts 14 and 15 is de-

signed to mate with a corresponding female tubular part 15a and male tubular part 14a of an associated similar electrical connection element and in particular of an identical additional second connector 10a according to the invention, as shown in Figures 6, 7 and 8.

[0025] The connector 10 holds, in the illustrated example of embodiment, two terminals 12 and 13, which are of a male cylindrical type, while the second connector 10a bears female cylindrical terminals 12a and 13a.

[0026] A hermetic closure and containment portion 16 for segments 17 and 18 for crimping the terminals 12 and 13 to respective electrical cables 19 and 20 extends from the central portion 11, opposite with respect to the tubular parts 14 and 15.

[0027] The hermetic containment portion 16 is formed by two half-shells 21 and 22 designed to close onto each other.

[0028] The two half-shells 21 and 22 are articulated to the central portion 11 by way of hinge means.

[0029] Such hinge means, in the exemplifying embodiment of the invention, are constituted, for each half-shell, by a bridge-like hinge 23 and 24, which is provided simultaneously with the monolithic molding of the central portion 11 with the tubular parts 14 and 15 and of the half-shells 21 and 22, with such half-shells in the open configuration.

[0030] The hermetic electrical connector 10 according to the invention also comprises reversible extraction-preventing means for quick coupling to a similar corresponding associated electrical connection element, described better hereinafter.

[0031] The electrical connector 10 is also **characterized in that** it comprises a series of spacing ribs, designated by the reference numerals 25 and 26, which are designed to ensure a predefined safety distance for a body in contact.

[0032] The hermetic sealing elements for the half-shells 21 and 22 are constituted by:

- a first gasket 28 and 29, which is overmolded at the regions where the half-shells 21 and 22 surround the electrical cables 19 and 20 proximate to the crimping 17 and 18, and at the surfaces of the first half-shell 21 that are designed to abut against the corresponding surfaces of the second half-shell 22 in the closed configuration,
- a second gasket 30, which is arranged at the base of the male tubular part 14, between such base and the head of the female tubular part 15a of the identical second connector 10a.

[0033] Such first and second gaskets are both overmolded on the open half-shells 21 and 22 and on the central portion 11, respectively.

[0034] This avoids the separate provision of the gaskets and provides savings in terms of assembly of such gaskets, as instead occurs for known types of connector and connection device.

[0035] The two half-shells 21 and 22 are retained in the closed configuration on each other by snap-acting interlocking means, which are constituted by a pair of opposite engagement teeth 31 that protrude laterally from the second half-shell 22 and are adapted to each enter by snap action a corresponding opening 32 formed on a shoulder 33 that extends from the corresponding side of the first half-shell 21.

[0036] The extraction-preventing means for quick coupling with a similar corresponding associated electrical connection element, exemplified here as an identical second hermetic electrical connector 10a according to the invention, are provided by a snap-acting engagement tab 34, which protrudes from the central portion 11 and cantilevers out laterally with respect to the male tubular part 14.

[0037] The tab 34 has, at the end that lies on the side of the tubular parts 14 and 15, a first tooth 35 for snap-acting engagement with a corresponding second tooth 36a formed on an associated connection element, or at the end of the female tubular part 15a of the second connector 10a according to the invention, and at the opposite end a maneuvering tail 37 for manual disengagement of the tab 34.

[0038] A bridge 38 for connecting the tab 34 to the central portion 11 is elastically deformable.

[0039] The quick engagement means also comprise a second tooth 36, which protrudes at the end of the female tubular part 15 and is available for engagement with a first tooth 35a of a tab 34a for the snap engagement of the second associated identical electrical connector 10a.

[0040] The spacing ribs 25 and 26, as well as 25a and 26a of the second connector 10a, are defined so as to protrude from the outer surfaces of the half-shells 21 and 22.

[0041] The connector 10 according to the invention is completed by a third gasket 40, which is molded on the central portion 11 around the inlets of engagement seats 41 for the male terminals 12 and 13, as shown in Figures 2 and 5.

[0042] One of the features of the electrical connector 10 according to the invention is indeed that it is designed for quick and reversible engagement with another second identical electrical connector 10a provided with male and/or female terminals designed for mating with the corresponding female and/or male terminals of the first electrical connector 10.

[0043] In practice it has been found that the invention thus described achieves the intended aim and objects.

[0044] In particular, the present invention provides a hermetic connector that is simpler and quicker to install and equally quick to mate for the provision of a hermetic connection device.

[0045] The connector 10 according to the invention in fact has overmolded gaskets 28, 29, 30 and 40, with advantages in terms of production of a smaller number of components and therefore in terms of labor and assembly times.

[0046] Moreover, the present invention provides a hermetic connector that is less expensive in terms of equipment for providing its components, since it is not necessary to provide molds dedicated to the production of the seals to be assembled at a later time.

[0047] Moreover, the present invention provides a hermetic connector that is safer in terms of anti-flammability, in accordance with applicable statutory provisions at the national and international level, by way of the ribs 25 and 26, which are sized and positioned so as to meet the applicable statutory provisions related to the minimum distance at which an electrical connection (understood as the mating between two terminals) must be located with respect to a body in contact that might potentially generate an amount of heat that is dangerous for the integrity of such connector and of the electrical connection.

[0048] Moreover, the present invention provides a hermetic two-pole or multipole electrical connector that can be manufactured with known systems and technologies.

[0049] The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims.

[0050] In practice, the materials used, so long as they are compatible with the specific use, may be any according to requirements and to the state of the art.

[0051] The disclosures in Italian Patent Application No. PD2008A000197 from which this application claims priority are incorporated herein by reference.

[0052] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. A hermetic two-pole or multipole electrical connector (10), **characterized in that** it comprises a central engagement portion (11) for at least two electrical terminals (12, 13) from which a corresponding number of laterally adjacent tubular parts (14, 15), at least one first male tubular part (14) and at least one first female tubular part (15), protrude so as to surround said terminals (12, 13), each one of said tubular parts (14, 15) being designed to mate with a corresponding male or female tubular part (14a, 15a) of an associated similar electrical connection element (10a), a hermetic containment and closure portion (16) extending from said central portion (11), opposite with respect to said tubular parts (14, 15), for segments (17, 18) for crimping said terminals (12, 13) to respective electrical cables (19, 20), said hermetic containment portion (16) being formed by two half-shells (21, 22) designed to close onto each other.

er, at least one of said two half-shells (21, 22) being articulated to said central portion (11) by way of hinge means (23, 24), said electrical connector (10) also comprising reversible extraction-preventing means for quick coupling to a similar corresponding associated electrical connection element (10a), and also comprising a series of spacer ribs (25, 26) designed to ensure a predefined safety distance for a body in contact.

2. The electrical connector according to claim 1, **characterized in that** said two half-shells (21, 22) are both hinged to said central portion (11) by means of a bridge-like hinge (23, 24) and provided simultaneously with the monolithic molding of said central portion (11) with said tubular parts (14, 15) and of said half-shells (21, 22) with these last in the open configuration.

3. The electrical connector according to the preceding claims, **characterized in that** the hermetic sealing means for said half-shells (21, 22) are provided

- by a first gasket (28, 29), which is overmolded on at least one first half-shell (21, 22) at the regions where said half-shells (21, 22) surround the electrical cables (19, 20) proximate to the crimping portions (17, 18) and at the surfaces of at least one of the two half-shells (21, 22) that are adapted to abut against the corresponding surfaces of the other half-shell in the closed configuration,
- by a second gasket (30), which is arranged in at least one region between the base of the male tubular part (14) and the head of the female tubular part (15).

4. The connector according to the preceding claim, **characterized in that** it comprises a third gasket (40) that is molded on the central portion (11) around the inlets of engagement seats (41) for the terminals (12, 13).

5. The electrical connector according to the preceding claims, **characterized in that** said two half-shells (21, 22) are retained in a mutually closed condition by snap-acting interlocking means.

6. The connector according to the preceding claim, **characterized in that** said snap-acting interlocking means are provided by a pair of engagement teeth (31) that protrude laterally and in a mutually opposite arrangement from the second half-shell (22) and are adapted to each enter with a snap action a corresponding opening (32) formed on a shoulder (33) that extends from the corresponding side of the first half-shell (21).

7. The electrical connector according to the preceding claims, **characterized in that** said extraction-preventing means for quick engagement with a similar corresponding associated electrical connection element (10a) are constituted by a snap-acting engagement tab (34) that protrudes from said central portion (11) and extends in a cantilever fashion laterally with respect to said male tubular portion (14), said tab (34) having, at the end that extends on the side of said tubular parts (14, 15), a first tooth (35) for snap-acting engagement with a corresponding second tooth (36a) formed on an associated connection element and, at the opposite end, a maneuvering tail (37) for the manual disengagement of the tab (34), whose bridge (38) for connection to said central portion (11) is elastically deformable, said quick engagement means also comprising a second tooth (36) that protrudes at the end of said female tubular part (15) available for engagement with the first tooth (35a) of a snap-acting engagement tab (34a) of another associated identical electrical connector (10a).

8. The electrical connector according to the preceding claims, **characterized in that** said central portion (11) is contoured to accommodate cylindrical terminals (12, 13), either of the male type or of the female type or both male and female.

9. The electrical connector according to the preceding claims, **characterized in that** a first electrical connector (10) is designed for quick and reversible engagement with another second identical electrical connector (10a) provided with male and/or female terminals designed for mating with the corresponding female and/or male terminals of the first electrical connector (10).

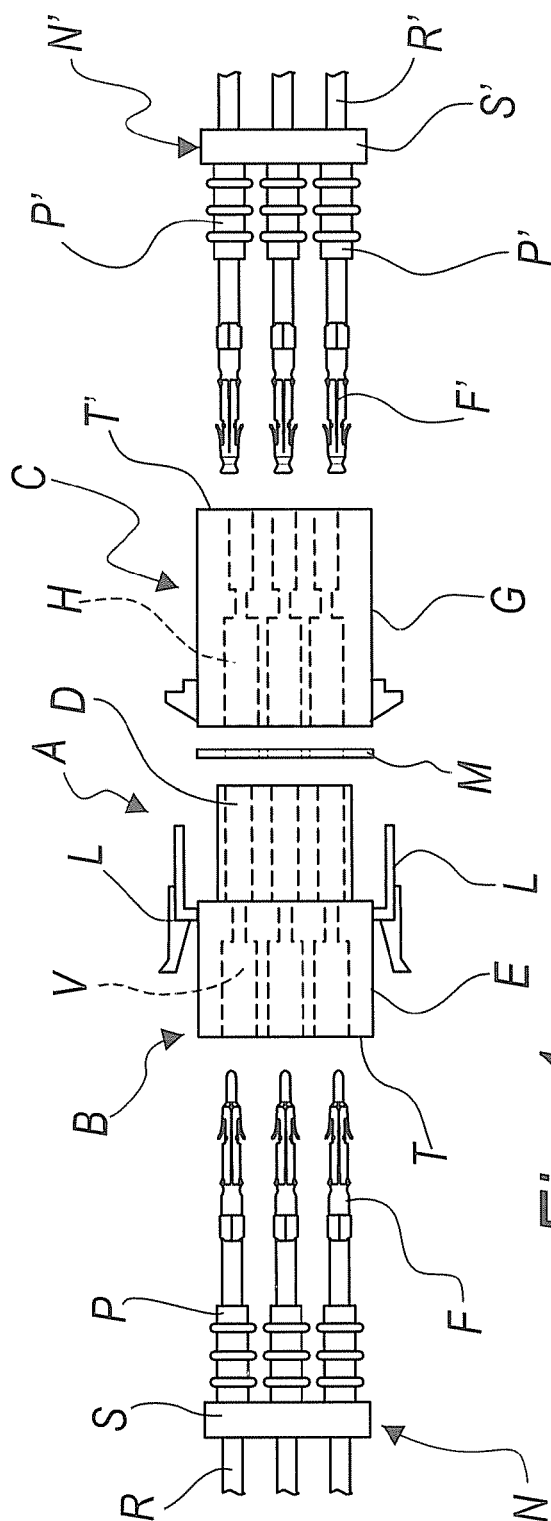


Fig. 1

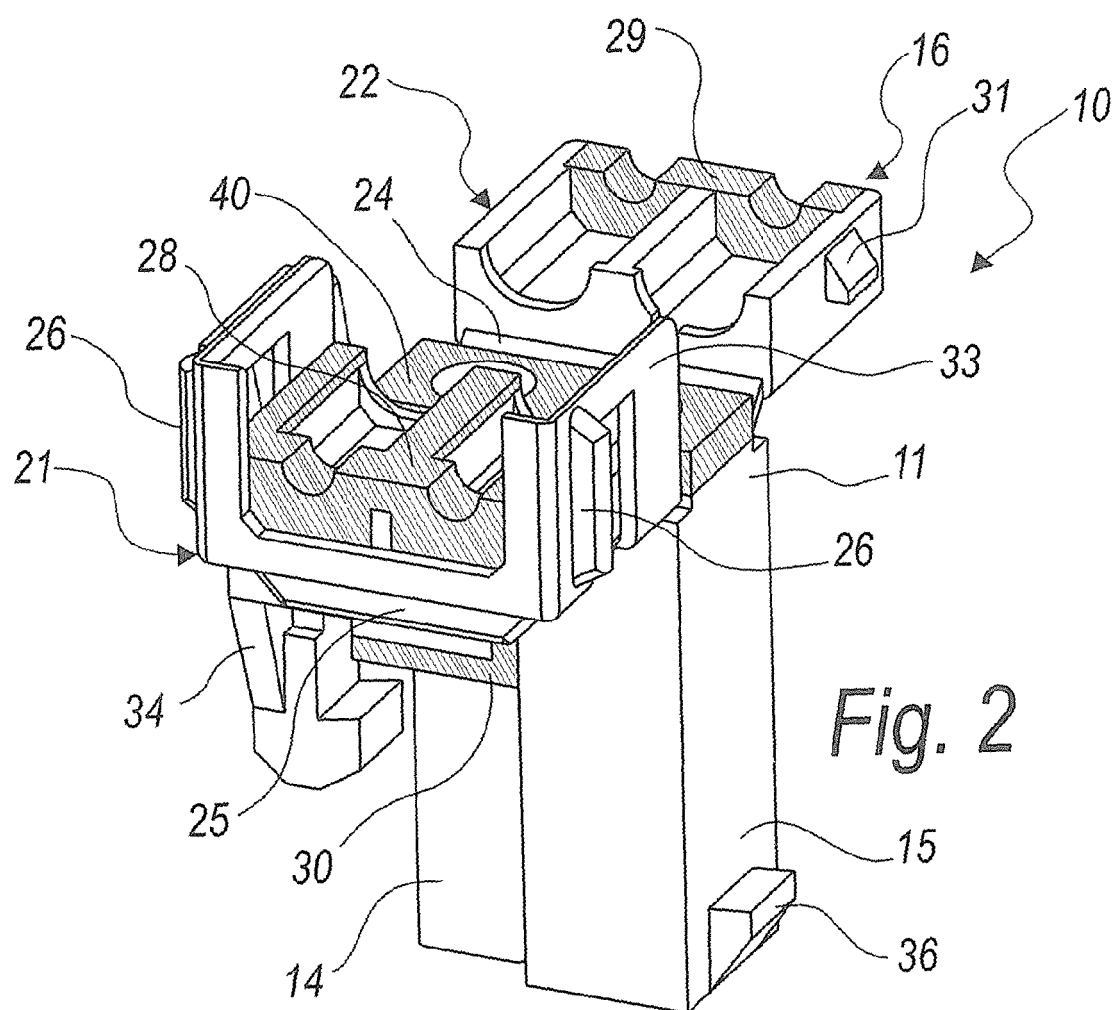
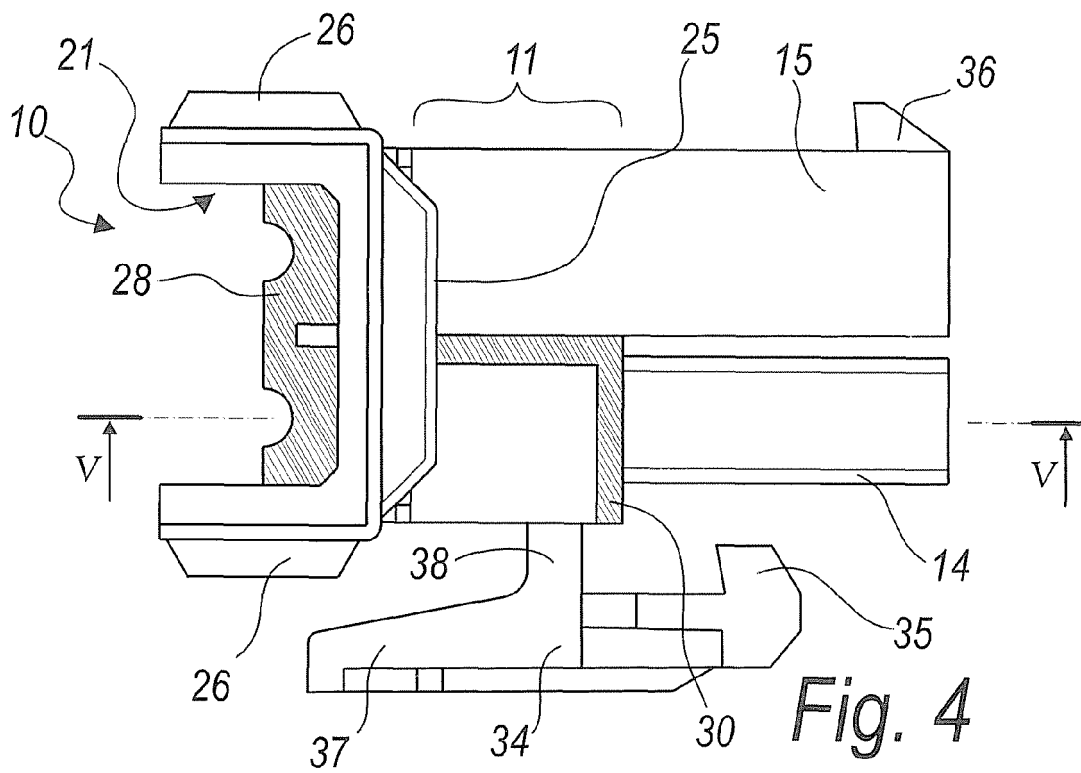
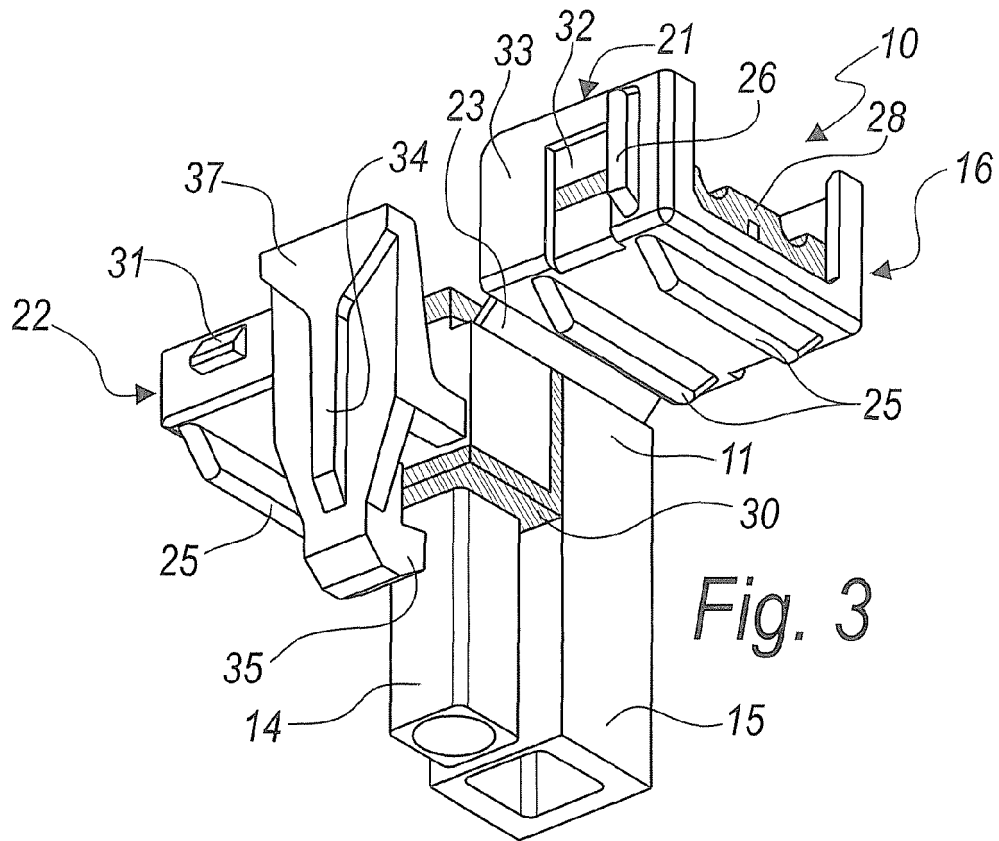
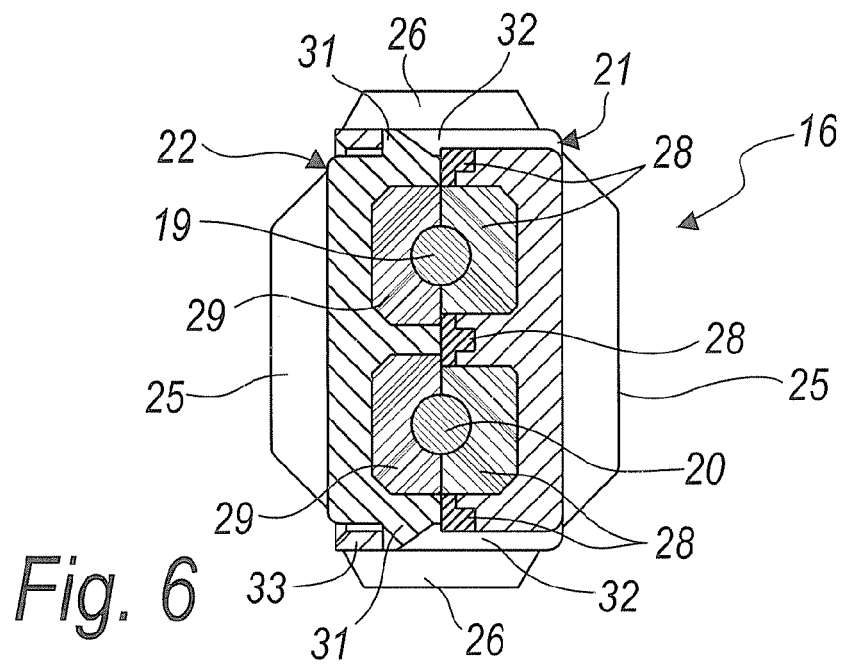
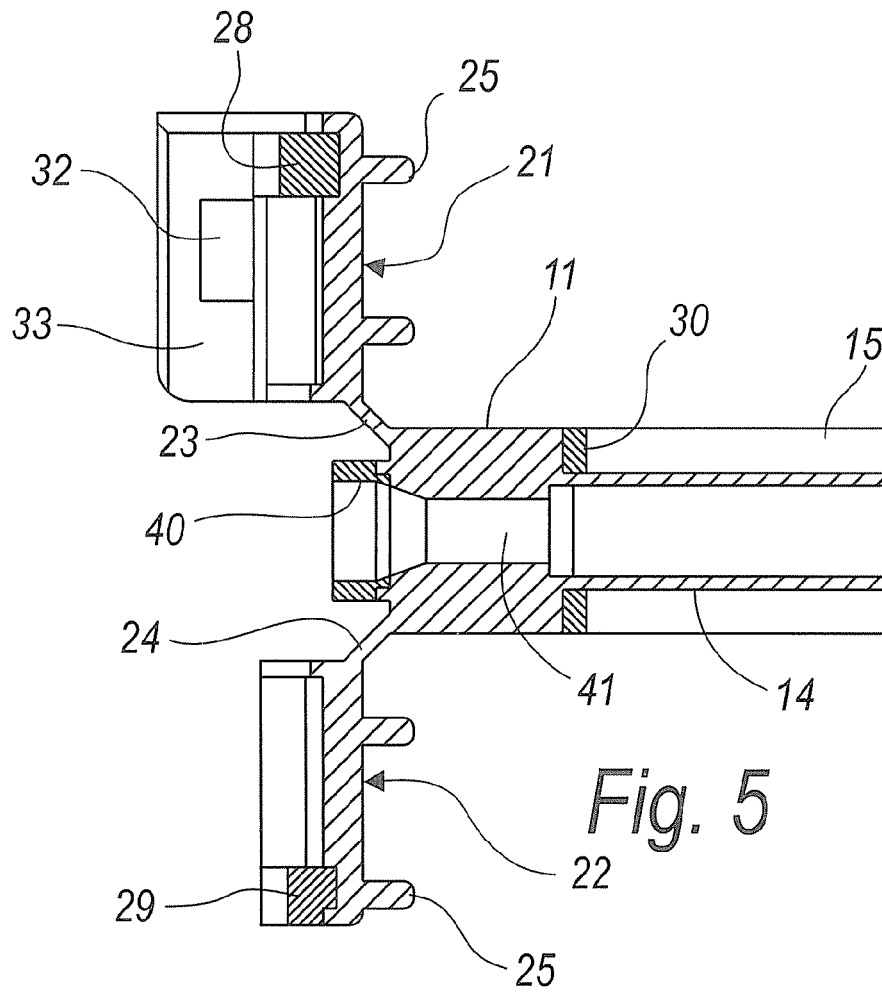
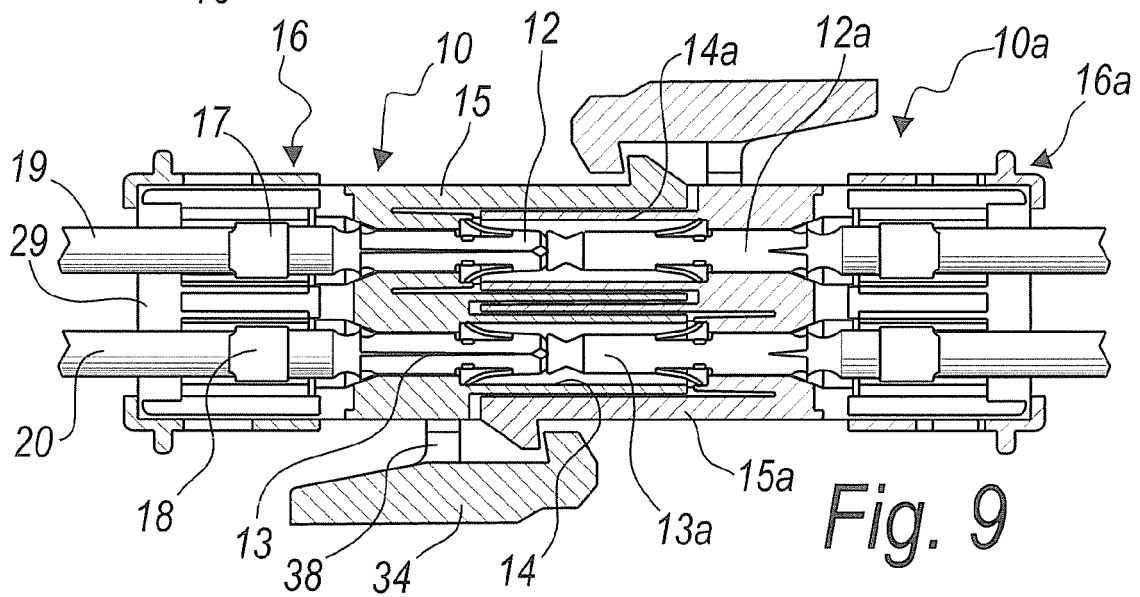
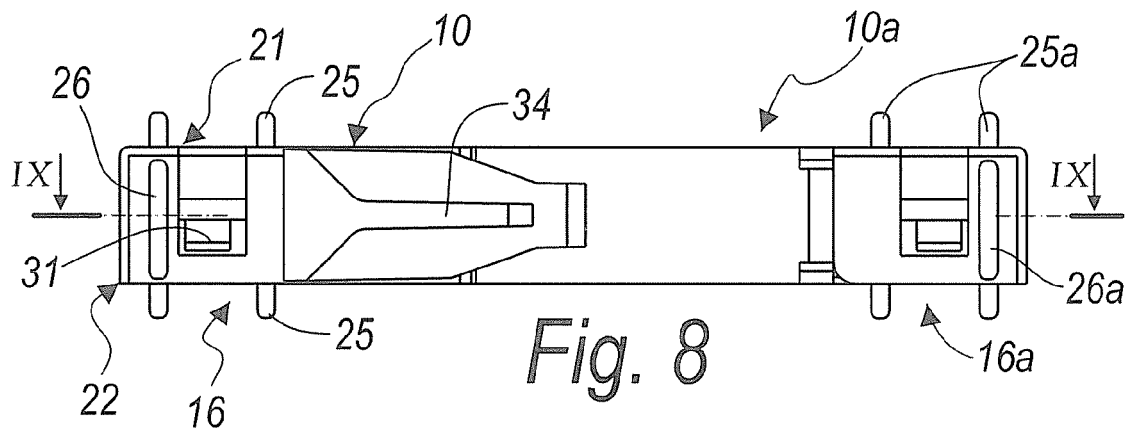
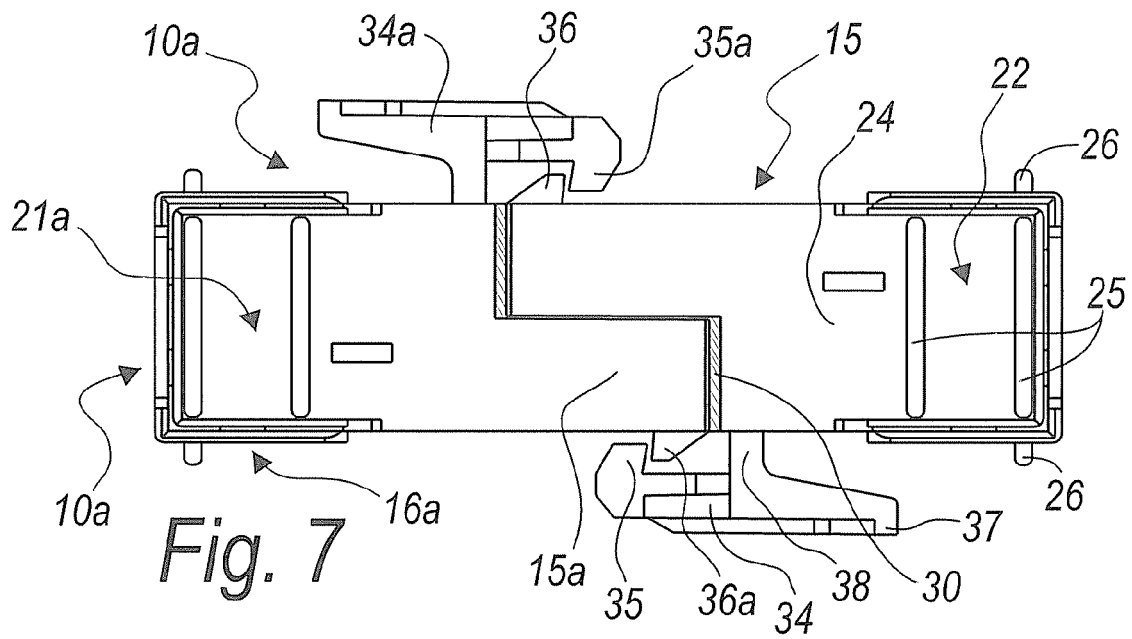


Fig. 2









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Application Number
EP 09 16 3994

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 2 December 2009	Examiner Serrano Funcia, J
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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