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(54) **SEALED CONNECTOR ASSEMBLY**

(57) Electrical female connector with a female housing (6), a sealing means (14) being overmoulded on the female housing (6) and a mate assist actuating lever (7). The sealing means (14) comprises two lever seals, each comprising at least one first portion (25) intercalated between at least a portion of the female housing (6) and a portion the actuating lever (7), and at least one second portion intercalated between an inner surface of a

flange of the actuating lever (7) and a respective female housing side face. The first portion (25) and second portion of the lever seals are configured to form, between each inner faces and the respective female housing side face, a continuous sealing barrier around the rotation axis of the actuating lever (7). Connector assembly comprising such a female connector and a male connector.

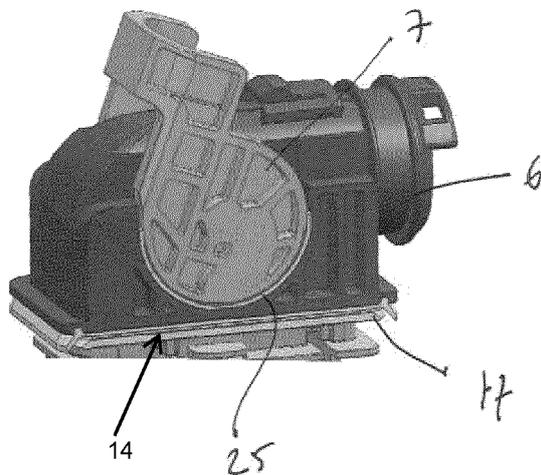


Fig. 10

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**Description**

closure will be described in more detail in the following with reference to the drawings showing in:

**Technical field**

**[0001]** The present disclosure relates to an electrical female connector and to an electrical connector assembly including such a female connector and a male connector configured to be uncoupled from and coupled to one another via a mate assist lever locking mechanism. More particularly, the female connector is a sealed electrical connector.

5 - Fig. 1 is a schematic perspective view of an example of embodiment of an electrical connector assembly comprising a female and a male connectors mated together;

10 - Fig. 2 is a schematic perspective view of the female connector of the connector assembly of Fig. 1, a portion of a side wall of the housing of this female connector being removed;

**Background**

**[0002]** Motor vehicle doors contain electrical devices such as window raisers, mirror adjusters, etc. To power and/or control these devices, sealed connectors are fitted to the door or car body. As connectors of this type have a large number of contacts, mating assistance devices are required to prevent, in particular, musculoskeletal disorders for the operators responsible for fitting them. To this end, the connectors are fitted with mate assist systems comprising a slider or a lever. In addition, waterproofing and/or dustproofing, for example, are essential to ensure that the function of these connectors remains properly fulfilled over the long term.

15 - Fig. 3 is a schematic perspective view of the male connector of the connector assembly of Fig. 1;

20 - Fig. 4 is a schematic perspective view of the housing of the female connector of Fig. 2, a portion of a side wall of the housing of this female connector being removed;

- Fig. 5 is a schematic perspective view of sealing means of the female connector of Fig. 2;

25 - Fig. 5 is a schematic perspective view of sealing means of the female connector of Fig. 2;

**[0003]** A sealed connector and an assembly comprising such a sealed connector is disclosed below in the context of seeking to improve the combined functions of mating assistance and sealing.

30 - Fig. 6 is a schematic perspective view of the housing of the female connector of Fig. 4, with the sealing means of Fig. 5 overmolded on this housing;

**Summary**

**[0004]** The present disclosure relates to an electrical female connector according to claim 1. The watertight barrier thus formed increases the connector's resistance to water, dust, etc.

35 - Fig. 7 is a schematic perspective view of the actuating lever of the female connector shown in Figs. 1 and 2, with the sealing means shown in Fig. 5;

- Fig. 8 is a schematic perspective view of a flange of the actuating lever shown in Fig. 7, with a polished area;

**[0005]** More particularly, this type of female connector is usually equipped with an interfacial seal between the connector and a male connector (i.e., counter-connector to be mated with the female connector), and a cable seal, or rear seal, between the cable and the female connector housing. As a result, lever seals complete and perfect the sealing of the connector, since the connector no longer includes any opening or gap that is not sealed with a gasket.

40 - Fig. 9 is a schematic perspective view of the electrical connector assembly shown in Fig. 1, with the lever in open position and the female and a male connectors in a "pre-position" (at the beginning of the mating operation), a portion of a side wall of the housing of this female connector being removed;

- Fig. 10 is similar to Figure 9, with the cross-section of the side wall shifted outwards;

**[0006]** According to further embodiments of the present disclosure, the electrical female connector comprises, independently of each other or in combination with one or more others, one or several features according to any one of claims 2 to 9.

50 - Fig. 11 is a schematic cross-section (perpendicular to the mating face and parallel to the rotation axis) of the electrical connector assembly shown in Figs. 9 and 10;

**[0007]** According to another aspect, the present disclosure relates to an electrical connector assembly according to claim 10 or claim 11.

55 - Fig. 12 is similar to Figure 10, with the lever in closed position and the female and a male connectors fully mated; and

**Brief description of the drawings**

**[0008]** An exemplary embodiment of the present dis-

- Fig. 13 is a cross-section, similar to Figure 11, of the electrical connector assembly of Fig. 12.

### Detailed description

**[0009]** The disclosure illustrated in Figs. 1 and 2 relates a cable connector assembly 100. For example, this cable connector assembly 100 is designed to connect cables (not shown) through an opening in a frame 35 of a car door or of a car body.

**[0010]** This cable connector comprises a connector 1 and a counter-connector 2. The connector 1 and the counter-connector 2 are intended to be mated in a mating direction MD and electrically connected together.

**[0011]** For example, the counter-connector 2 is a male connector and comprises a male housing 3 intended to be fastened to the frame. The male housing 3 is made of molded plastic and accommodates electrical male terminals (not shown). The male housing 3 comprises two actuating pins 4, each extending from a male housing side face 5 essentially perpendicular to the mating direction MD.

**[0012]** For example, the connector 1 is a female connector and comprises a female housing 6. The female housing 6 is made of molded plastic and accommodates electrical female terminals (not shown). An actuating lever 7 is rotatably mounted onto the female housing 6 about a rotation axis RA essentially perpendicular to the mating direction MD. The actuating lever 7 is made of molded plastic. In particular, the actuating lever 7 comprises two pivots 29 aligned with the rotation axis RA. The actuating lever 7 provides mate assist means. When the actuating lever 7 is in open position, the female connector 1 can be mated with a counter-connector 2 (e.g., they can be brought closer to each other in "preposition"). When the actuating lever 7 is in open position, the two lever arms 20 form an angle which is, for example, comprised between 40 and 90 degrees, for example close to 70 degrees. When the actuating lever 7 is in closed position the female connector 1 is mated with a counter-connector 2. When the actuating lever 7 is in closed position the two lever arms 20 form an angle which is, for example, comprised between 0 and 20 degrees with the mating face 10, for example close to 0 degree. In the closed position, the actuating lever 7 is flush with the female housing 6, taking up less space.

**[0013]** The female housing 6 comprises a first female housing side face 8, a second female housing side face 9 and a mating face 10 (see Fig. 4). The mating face 10 is essentially perpendicular to the mating direction MD. The first female housing side face 8 and the second female housing side face 9 extend essentially parallel to the mating direction MD. A compartment 11 is arranged over each of the first female housing face 8 and the second female housing side face 9 respectively (see Figs. 1 and 11). Each compartment 11 partially covers a respective female housing side face 8, 9. Each compartment 11 comprises an external wall 32 and an internal wall 33

(See Fig. 11). The external wall 32 and the internal wall 33 extend essentially perpendicular to the rotation axis RA.

**[0014]** A concave surface 12 is formed inside each compartment 11 (See Fig. 4). Each concave surface 12 extends along a portion of a first arc of a circle 13 centred on the rotation axis RA.

**[0015]** The female housing 6 comprises guiding slots 18 longitudinally extending essentially perpendicular to the mating face 10. When the female 1 and male 2 connectors are brought closer to each other in "preposition", each actuating pin 4 engages a respective guiding slot 18 (See Fig. 9). During the mating operation of the female 1 and male 2 connectors, each actuating pin 4 moves along a respective guiding slot 18. Each guiding slot allows a respective pin 4 to pass through an internal wall 33, so that each respective pin 4 can engage and cooperate with a cam slot 28, thereby providing a mating assistance when the actuating lever 7 is rotated from the open position to the closed position.

**[0016]** The connector 1 comprises sealing means 14 overmoulded on the female housing 6 (see Figs. 2, 5 and 6 for example). In other words, the female housing 6 is a two-component part. Indeed, the female housing 6 comprises a hard plastic portion 15 and the elastomeric sealing means 14 overmoulded on the hard plastic portion 15 (See Fig. 6). The sealing means 14 comprises two lever seals 16 and an interfacial seal 17 (See Fig. 5). Each lever seal 16 is connected to the interfacial seal 17. For example, each lever seal 16 is connected to the interfacial seal 17 through one of the guiding slots 18 (See Fig. 6).

**[0017]** The female housing 6 comprises bonding surfaces 31 on which the lever seal 16 is overmoulded (See Fig. 4).

**[0018]** The actuating lever 7 has two lever flanges 19 and two lever arms 20 respectively connecting one lever flange 19 to a lever handle 21. Each lever flange 19 is at least partially accommodated in a respective compartment 11 (In Figs 2, 4, 6, 9, 10 and 12, the external wall 32 of a compartment 11, is removed in order to show one of the flanges 19 of the lever 7). This configuration prevents the flanges 19 from moving apart. Indeed, the flanges 19 are blocked in directions parallel to the rotation axis RA by the external walls 32 on the one hand and by the internal walls 33 of the compartments on the other. Each lever flange 19 has an inner face 22 facing a respective female housing side face 8, 9 (i.e., facing an internal wall 33) and an outer surface 30 facing an inner surface of the respective compartment 11 (i.e., facing the inner surface of an external wall 32). Each pivot 29 extends from an outer surface 30. Each pivot 29 engages a respective hole formed in the inner surface of the respective compartment 11. Each lever flange 19 has a convex surface 23 that extends along a portion of a second arc of a circle 24 centred on the rotation axis RA, when the actuating lever 7 is rotatably mounted on the female housing 6.

**[0019]** Each lever seal 16 comprises at least one first portion 25 intercalated between at least a portion of said

concave surface 12 and a portion of said convex surface 23, and at least one second portion 26 intercalated between each inner face 22 of a lever flange 19 and a portion of the inner wall 33 of a respective female housing side face 8, 9. The first portion 25 and second portion 26 of the lever seals 16 are configured to form, between each inner faces 22 and the respective female housing side face 8, 9, a continuous sealing barrier around the rotation axis RA, at least when the actuating lever 7 is in closed position. In the example of embodiment shown in the figures, the first portion 25 and second portion 26 of the lever seals 16 are also configured to form, between each inner faces 22 and the respective female housing side face 8, 9, a continuous sealing barrier around the rotation axis RA, when the actuating lever 7 is in open position. Advantageously, each inner face 22 of a lever flange 19 has a polished area 27 onto which wipes said at least one second portion 22 of the sealing means 14. This polished area 27 extends all around a cam slot 28 designed to engage the actuating pin 4 to assist coupling and uncoupling of the connector 1 and the counter-connector 2. This polished area 27 promotes a better contact of the second portion 26 of each lever seal 16 on each lever flange 19 and improves tightness. Lips 34 may be provided on the second portion 26 to improve water tightness and/or dust-tightness. The first portion 25 and second portion 26 of each lever seal 16 form, between each inner faces 22 and the respective female housing side face 8, 9, a continuous sealing barrier around each cam slot 28, at least when the actuating lever 7 is in closed position. In the example of embodiment shown in the figures, the first portion 25 and second portion 26 of each lever seal 16 form, between each inner faces 22 and the respective female housing side face 8, 9, a continuous sealing barrier around each cam slot 28, when the actuating lever 7 is in open position too.

**[0020]** As shown in Figures 9, 10 and 11, the lever flanges 19 are sufficiently thick for the pins 4 to enter the cam slot 28, but the lever flanges 19 are in continuous contact with the first portions 25 on the second arcs of a circle 24.

**[0021]** As illustrated by Figs. 10 and 11, the sealing means 14 is already in place when the connector 1 and the counter-connector 2 are in preposition (i.e., with the lever 7 at 70°). And of course, the sealing means 14 the sealing is already in place when the connector 1 and the counter-connector 2 are fully mated (i.e., with the lever 7 at 0° - see Figures 12 and 13).

**[0022]** As can be seen in Figs. 11 and 13, the cam slots 28, the guiding slots 18 and the pins 4 are located inside a watertight region delimited by the lever seals 14 and more particularly by its first 25 and second 26 portions.

## Claims

1. An electrical female connector (1) with a female housing (6), a sealing means (14) being over-

moulded on the female housing (6) and an actuating lever (7), wherein the female housing (6) has a mating face (10) and two female housing side faces (8, 9) on which the lever arm (7) is rotatably mounted about a rotation axis (RA) between an open position and a closed position,

wherein the actuating lever (7) has two lever flanges (19) and two lever arms (20) respectively connecting each lever flange (20) to a lever handle (21), each lever flange (19) having an inner face (22) facing a respective female housing side face (8, 9),

wherein each female housing side face (8, 9) has a concave surface (12) that extends along a portion of a first arc of a circle (13) centred on the rotation axis (RA),

wherein each lever flange (19) has a convex surface (23) that extends along a portion of a second arc of a circle (24) centred on the rotation axis (RA), **characterized in that** the sealing means (14) comprises two lever seals (16), each comprising at least one first portion (25) intercalated between at least a portion of said concave surface (12) and a portion of said convex surface (23), and at least one second portion (26) intercalated between each inner face (22) and a respective female housing side face (8, 9), and

**in that** the first portion (25) and second portion (26) of the lever seals (16) are configured to form, between each inner faces (22) and the respective female housing side face (8, 9), a continuous sealing barrier around the rotation axis (RA), at least when the actuating lever (7) is in closed position.

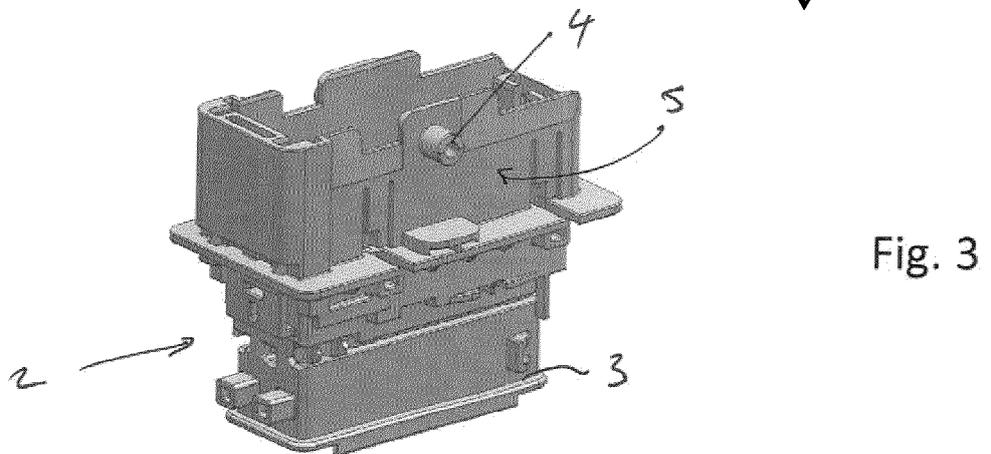
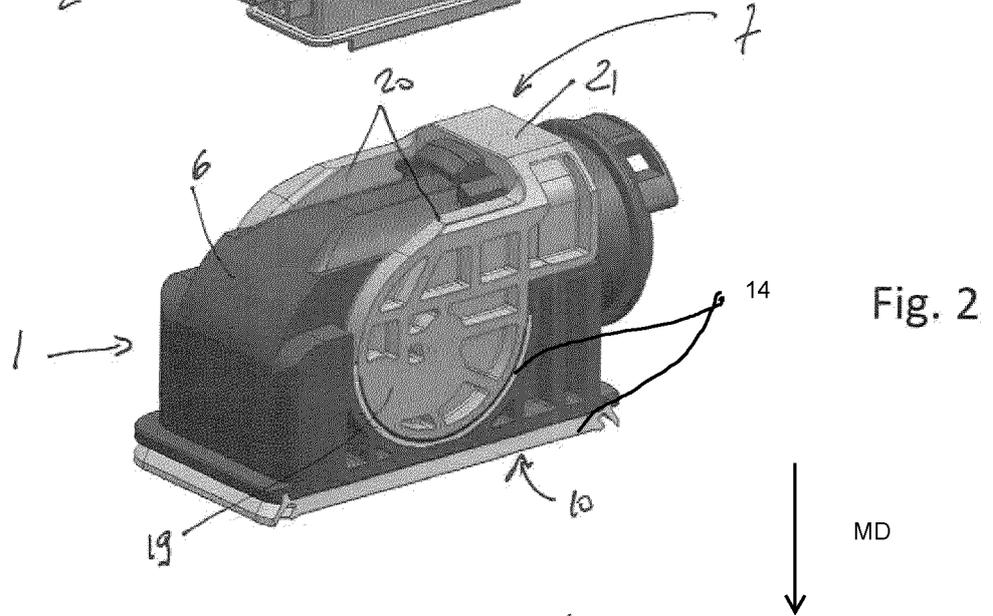
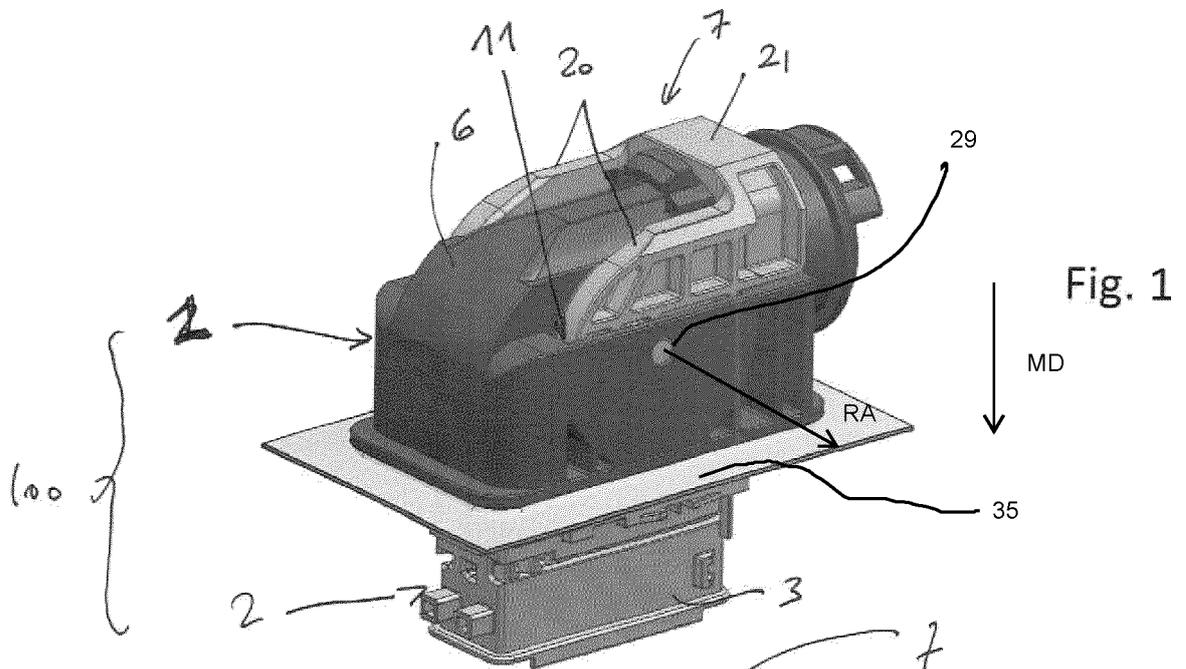
2. The electrical connector according to claim 1, wherein each lever flange (19) comprises a cam slot (28), and the first portion (25) and second portion (26) of each lever seal (16) form, between each inner faces (22) and the respective female housing side face (8, 9), a continuous sealing barrier around each cam slot (28), at least when the actuating lever (7) is in closed position.
3. The electrical connector according to claim 2, the first portion (25) and second portion (26) of each lever seal (16) form, a continuous sealing barrier around each cam slot (28), when the actuating lever (7) is in open position.
4. The electrical connector according any one of the preceding claims, wherein each lever seal (16) is connected to an interfacial seal (17).
5. The electrical connector according to claim 4, wherein the housing (6) has a guiding slot (18) longitudin-

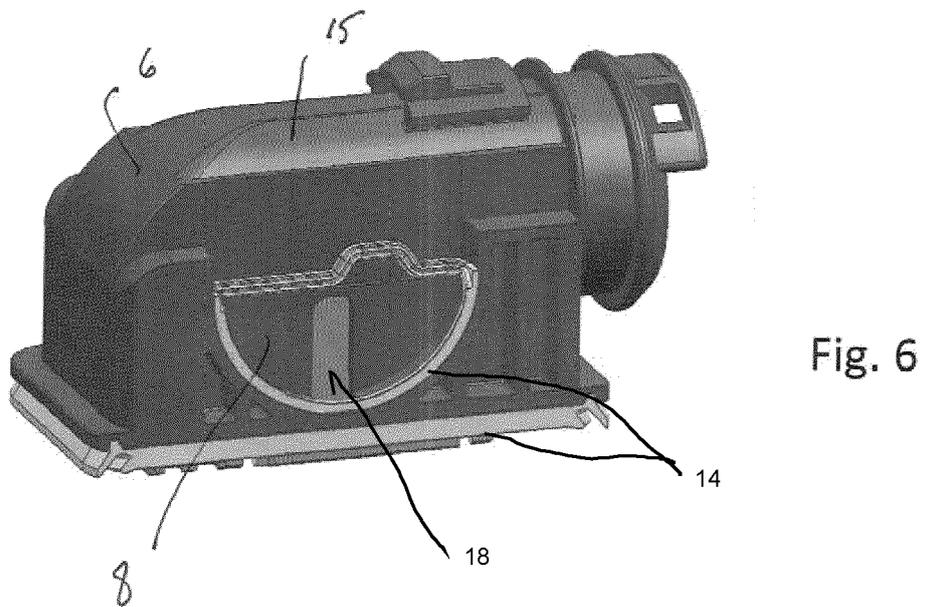
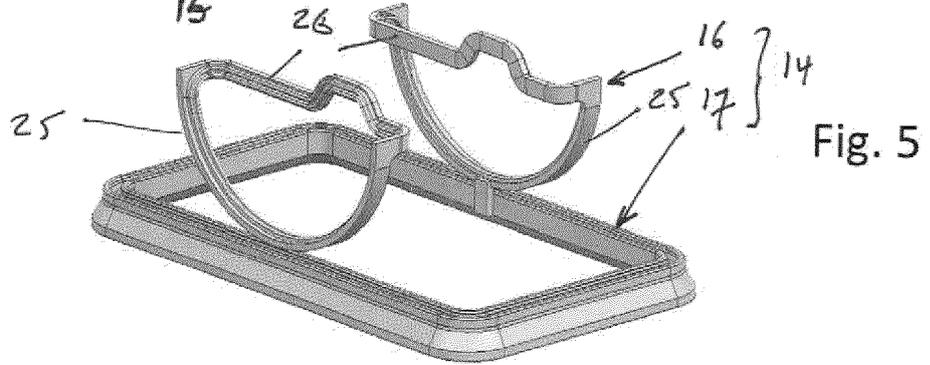
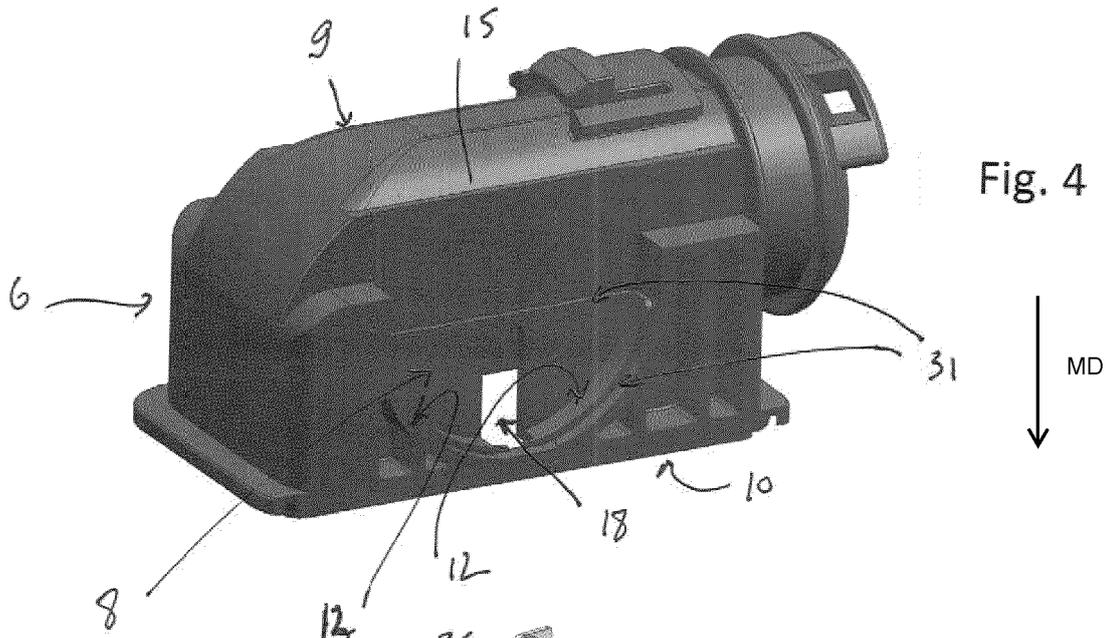
ally extending essentially perpendicular to the mating face (10) and each lever seal (16) is connected to the interfacial seal through the guiding slot (18).

6. The electrical connector according to any one of the preceding claims, wherein each inner face (22) of the lever flanges (19) has c 5
7. The electrical connector according to claim 6, wherein said at least one second portion (26) of the sealing means (14) has longitudinal lips (34) running along said at least one second portion (26) of the sealing means (14), and configured to slide on said polished area (27), when the lever is rotated between the closed and open positions and vice-versa. 10 15
8. The electrical connector according any one of the preceding claims, wherein the two lever arms (20) form an angle comprised between 40 and 90 degrees with the mating face (10) when the actuating lever (7) is in open position in which the female connector (1) can be mated with a counter-connector (2). 20
9. The electrical connector according any one of the preceding claims, wherein the two lever arms (20) form an angle comprised between 0 and 20 degrees with the mating face (10) when the actuating lever (7) is in closed position in which the female connector (1) is mated with a counter-connector (2). 25 30
10. An electrical connector assembly (100), comprising a connector (1) according to any one of claims 1 to 7 and a counter-connector (2) mated to the connector (1), wherein the actuating lever (7) is in closed position with the two lever arms (20) forming an angle comprised between 0 and 20 degrees with the mating face (10), wherein the counter-connector (2) comprises two actuating pins (4), each actuating pin (4) extending from a side face (5) of the counter-connector (2), and wherein each actuating pin (4) is located inside a region delimited by said a continuous sealing barrier. 35 40
11. The electrical connector assembly (100) of claim 10, wherein each actuating pin (4) passes through a guiding slot (18) located inside a region delimited by said a continuous sealing barrier. 45

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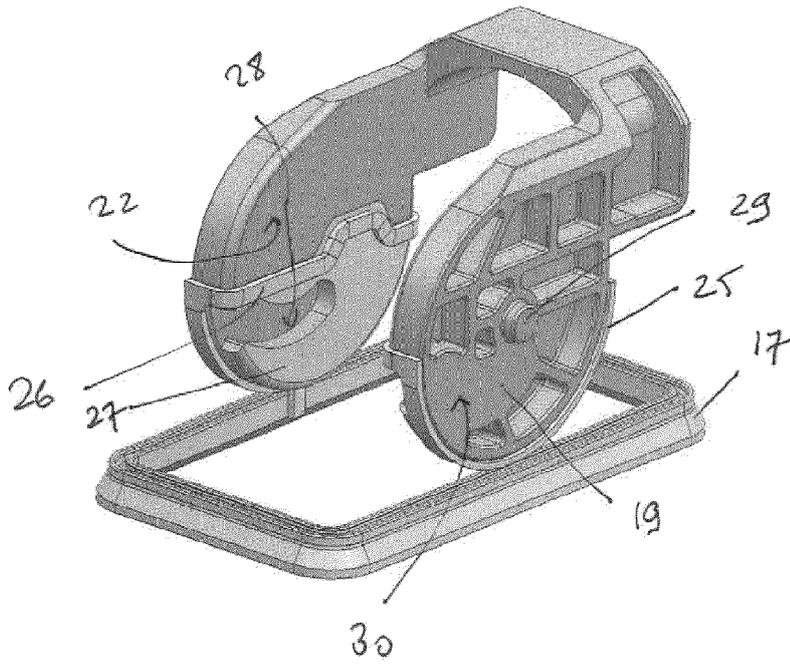


Fig. 7

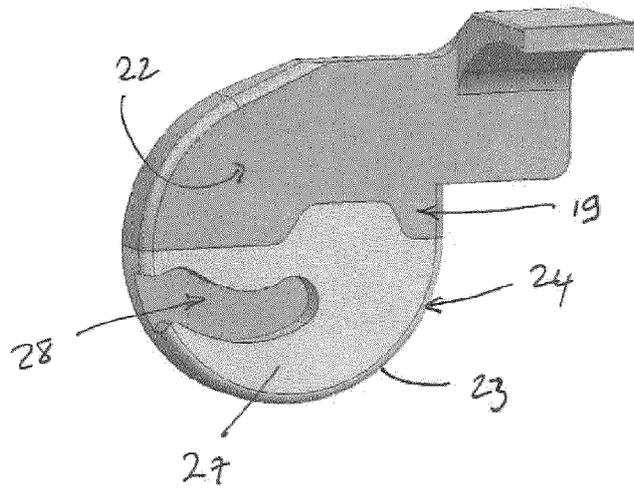


Fig. 8

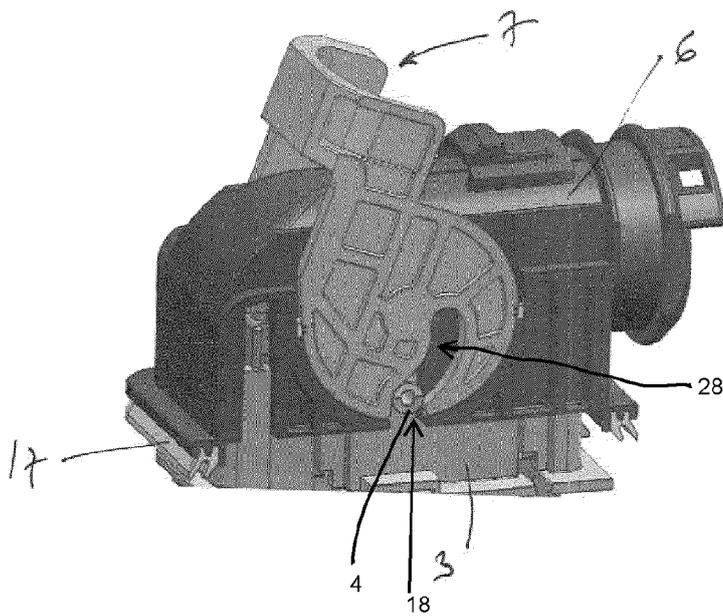


Fig. 9

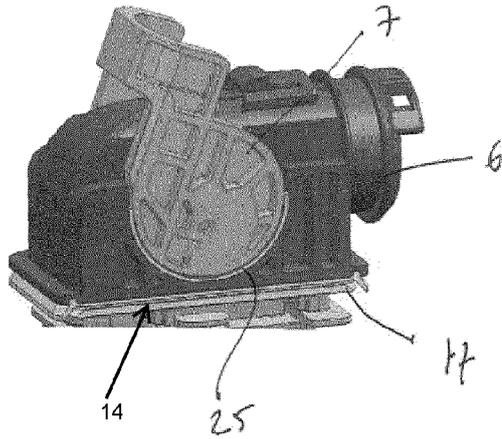


Fig. 10

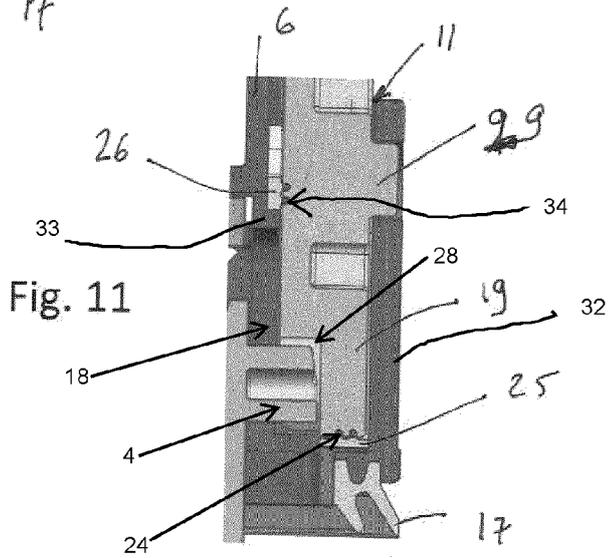


Fig. 11

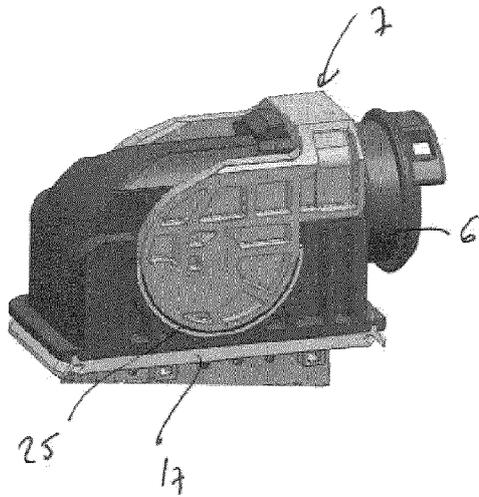


Fig. 12

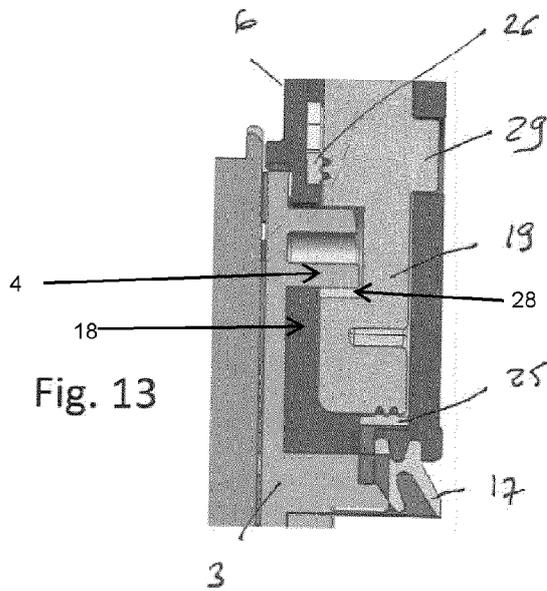


Fig. 13



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Application Number  
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DOCUMENTS CONSIDERED TO BE RELEVANT

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Place of search <b>The Hague</b>		Date of completion of the search <b>4 February 2025</b>	Examiner <b>Hugueny, Bertrand</b>
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