



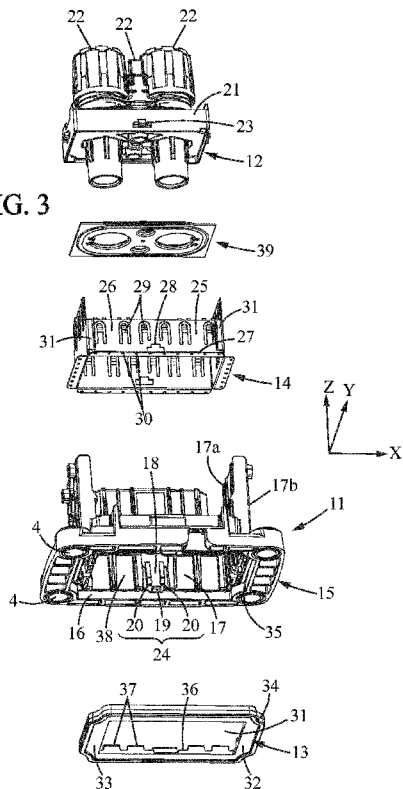
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(54) Title: AN ELECTRICAL CONNECTOR AND AN ELECTRICAL ASSEMBLY COMPRISING SUCH A CONNECTOR

FIG. 3



(57) Abstract: An electrical connector having: a housing (11,12) made of an electrically insulating material having a receptacle (22) to receive an electrical contact, a unitary seal (13) made of a flexible insulating material, the seal having a first portion (33) and a second portion (34) which protrudes with respect to the first portion, an electrical shielding system (14) comprising a first part (26) surrounding the receptacle, and a second part (27), wherein the second portion (34) of the seal protrudes with respect to the second part (27).

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AN ELECTRICAL CONNECTOR AND AN ELECTRICAL ASSEMBLY
COMPRISING SUCH A CONNECTOR.

5 FIELD OF THE INVENTION

The instant invention relates to electrical connectors and electrical assemblies comprising such connectors.

BACKGROUND OF THE INVENTION

10 In particular, the instant invention is related to an electrical connector comprising a housing defining one or more receptacles to receive electrical contacts.

It is sometimes needed to provide a shield which surrounds the receptacle, and will be put in contact with a complementary piece of a mating connector to protect the
15 flowing current from electromagnetic interferences from the outer world.

It is also often provided a seal to seal the electrically conducting parts of the electrical assembly
20 from ingress of unwanted material such as dust or water.

The instant invention has notably for object to provide a compact solution to provide both efficient sealing and shielding.

SUMMARY OF THE INVENTION

25 To this aim, it is provided an electrical connector according to claim 1.

With these features, the second portion of the seal provides the sealing ability while its first portion, when compressed upon connection, biases the second part of the
30 electrical shielding system in contact with the complementary connector so as to guarantee efficient shielding continuity.

In some embodiments, one might also use one or more of the features defined in the dependant claims.

35

BRIEF DESCRIPTION OF THE DRAWINGS

Other characteristics and advantages of the invention will readily appear from the following description of one of its embodiments, provided as a non-limitative example, and of the accompanying drawings.

On the drawings:

- Fig. 1 is a perspective view of an electrical assembly,

- Fig. 2 is a first sectional view of one electrical connector of the assembly of Fig. 1, and a mating connector,

- Fig. 3 is a bottom exploded perspective view of the connector of Fig. 1,

- Fig. 4 is a partial perspective view of the connector of Fig. 3, and

- Fig. 5 is a partial sectional view of the connector of Fig. 2 along line V-V of Fig. 4.

On the different Figures, the same reference signs designate like or similar elements.

DETAILED DESCRIPTION

Fig. 1 schematically shows an electrical assembly 1 comprising an electrical device 2 having, fixed thereto, an electrical connector 3. The electrical device 2 has a face 2a which receives the electrical connector 3. In particular, this face 2a is planar where it receives the electrical connector 3.

The connector 3 is fixed to the face 2a of the electrical device, for example by screwing through bores 4 of the connector 3 and respective bores 5 of the electrical device 2, and bolted. As shown, the bores 5 are provided rather at the periphery of the area of the face 2a which is designed to receive the electrical connector 3. Inside this periphery, the electrical device 2 is provided with an electrical interface 6 for electrically interfacing with the electrical connector 3. The electrical interface 6 of

the electrical device 2 may for example comprise two large openings 7 and two small openings 8 through which electrical parts located inside the electrical device 2 are accessible. Any other suitable arrangement of openings can be provided as an electrical interface 6 of the electrical device 2. Further, in variant embodiments, electrical contacts may protrude outside of the electrical device 2 through such openings, for connection into the electrical connector 3.

10 The electrical connector 3 comprises a first electrical interface 9 for electrically interfacing with the electrical device 2, and an opposed second electrical interface 10. The second vertical interface 10 is designed to be electrically connected to yet another electrical appliance. For example, as shown on Fig. 2, an electrical connector 101 provided at the end of an electrical cable could be connected to the second electrical interface 10 of the connector 3. The mating electrical connector 101 has a plastic housing 102 defining a plurality of pathways 122 receiving electrical contacts, and a shield 125.

When it comes to the electrical connector 3, it is specifically fitted to be fixed to a planar surface of an electrical appliance, in particular for blind electrical connection inside this appliance.

25 As can be seen on Fig. 3, the electrical connector 3 comprises an outer body 11, an inner body 12, a seal 13 and an electrical shielding system 14.

In order to define the relative orientations of the parts, the X-Y plane is defined as a plane of the face 2a of the electrical device. Z is defined as the direction normal to this plane (direction of mating of the connector 3 to the electrical device 2). The first electrical interface 9 of the electrical connector comprises a row of two electrical contacts, which are arranged along the direction X. The direction Y is the direction of the X-Y

plane which is orthogonal to this direction X. In the present embodiment, the electrical connector 3 has two small contacts which are located between the two large contacts, and are arranged along the direction Y. The number and arrangement of contacts 11 is illustrative only.

The outer body 11 mainly comprises a plate 15 for the fixation of the connector 3 to the electrical device 2. The plate 15 is relatively thin along the Z direction, and comprises at each corner of its rectangular cross-section, the above-mentioned bores 4. A large cavity 16 is provided in the center of the plate 15, in order to receive the inner body 12 therein. The cavity 16 is delimited by four vertical walls 17 extending along the Z direction, and which surround the cavity 16.

A mechanical system is provided in order to lock together the outer body 11 and the inner body 12. For example, the wall 17 comprises a locking device 24 having a flexible lance 18 comprising a bottom stop 19, facing upward, and two top stops 20 facing downward, provided above the bottom stop 19 and on each side thereof. Each of the walls could be provided with such device. The outer face 17b of the walls 17 is shaped to provide the interface with the complementary connector 101, whereas the inner faces 17a thereof are shaped to interface with the inner body 12.

The inner body 12 comprises a rigid plastic body 21 defining a plurality of receptacles 22 shaped to receive electrical contacts therein.

The inner body 12 further comprises part of the locking system of the inner and outer bodies, and in particular a protrusion 23 shaped to cooperate with the locking device 24 of the outer body 11. Each lateral wall of the rigid body 21 may comprise such a protrusion 23. The protrusion 23 is shaped to be held between the bottom stop 19 and the top stop 20 of the locking device 24 of the

outer body. In the present embodiment, the inner body 12 may be assembled to the outer body 11 from the top, the protrusion 23 deflecting the lance 18 during this assembly until the lance 18 can spring back with the protrusion 23 caught between the stops 19 and 20.

The electrical connector 3 may be provided with an additional inner seal 39, which surrounds each of the pathways 22. The outer perimeter of the inner seal 39 sensibly corresponds to that of the inner body 12, so that the inner seal 39 can be assembled thereto.

The electrical shielding system 14 is provided as four separate electrically conducting parts which are assembled together so as to surround the receptacles 22. In particular, each electrically conductive part is made of a single metallic plate 25 associated with a respective side of each of the inner and outer bodies. The description of one of the sheet plate will be done herebelow. All of these plates can be provided identical or similar, depending on the dimensional requirements of the connector assembly as a whole.

Each sheet plate 25 has a sensibly L-shaped cross-section with a first vertical part 26 extending along the Z-direction and a second horizontal part 27 extending in the X-Y plane. Each sheet plate 25 is designed to be assembled to a respective side of the rigid body 21 of the inner body 12. For example, a cut-out 28 is formed in the vertical part 26, and is shaped to receive therein the protrusion 23. Hence, the sheet plate is assembled to the rigid body 21 by being placed on the lateral side of the rigid body 21, with the protrusion 23 protruding through the cut out 28. The sheet plate 25 is mounted to the rigid body 21 with some level of play along the Z-direction.

Further, the vertical part 26 is provided with metallic flexible tongues 29, which are provided to protrude slightly with respect to the plane of the vertical

part 26.

The horizontal part 27 extends sensibly continuously and in the plane X-Y. It may comprise contact protrusions 30 protruding downwards.

5 The various sheet plates 25 may also be assembled to one another. For example, two opposed sheet plates 25 comprise lateral extensions 31 (one of the extension of both small sheet plates 25 are shown on Fig. 3) which are folded by 90° in the vertical plane of the neighbour sheet
10 plate 25, and covering its ends. They may then be welded together.

The electrical connector 3 is further provided with the seal 13. The seal 13 has a roughly polygonal cross-section corresponding to the periphery of the plate 15 and
15 a through opening 31 which sensibly corresponds to the outer shape of the rigid body 21 of the inner body 12.

On the bottom face 32, the seal 13 is provided with a peripheral recess 33 which is surrounded by a peripheral protrusion or wall 34 protruding downwardly with respect to
20 the recess 33.

The outer body 11 is provided with a seat 35 surrounding the cavity 16, and shaped to receive an upper face, opposed to the bottom face 32, of the seal 13.

The system which has just been described is
25 assembled as described below.

The electrical shielding system 14 is provided with the sheet plates 25 straight, i.e. the second parts 27 are not yet folded with respect to the vertical parts 26, and extend vertically, continuously thereto.

30 The sheet plates 25 are assembled to the inner body 12 as explained above, and to one another, if necessary.

The inner seal 39 is assembled to the bottom of the inner body 12.

The seal 13 is assembled to the outer body from the
35 bottom, to be received in the seat 35 of the outer body.

The top face 36 of the seal 13 opposed to the bottom face 32 may comprise protrusions 37 which are received in complementary recesses 38 of the walls 17 of the outer body 11.

5 The assembly comprising the inner body 12 and the straight metal sheet plates 25 is inserted in the outer body 11, until the inner body 12 is locked in the outer body 11 by the locking system which has been described above. In this position, the second parts 27 of the metal
10 sheet plate 25 protrude below the plane defined by the bottom face of the recess 33 of the seal 13. The top edge 41 of the lateral metal sheet plates abuts on bottom stops 42 provided in the corresponding later walls 17 of the outer body 11.

15 The second part 27 are then folded in the horizontal plane, so that the sheet plates each assume their L-shape, the horizontal parts 27 being received in the respective recesses 33 of the seal 13.

 It should be noted that the electrical shielding
20 system 14 can be provided with the second parts 27 folded beforehand, i.e. before being assembled to the inner body 12.

 These second parts 27 are received in this recess which is sufficiently deep such that the protrusion 34
25 still protrudes downward with respect to the bottom face of the horizontal part 27 of the sheet plates 25. Thus, the second part 27 is capable to move within the recess along the Z direction relative to both the outer and inner bodies 11,12.

30 The electrical connector 3 is assembled. It may be provided with electrical contacts in the various receptacles 22 at any suitable stage of the assembly. When the connector is assembled to the electrical device 2, as shown on Fig. 5, the fixation of the connector 3 to the
35 electrical device 2 will compress the protrusion 34, in

order to provide the peripheric sealing with the protrusion.

The horizontal part 27 will then be placed in electrical contact with the facing surface of the electrical device 2. If this surface is made of an electrically conducting material, this contact will be used to provide a continuous shielding of the receptacles of the electrical connector 3.

Depending on the level of compression due to the fixation of the electrical connector 3 to electrical device 2, the electrical shielding system 14 may even move slightly upward along direction Z with respect to the inner and outer bodies 12, 11, fixed to one another. This movement is made possible by the play provided between the metal sheet plate 25 and the inner body 12 along the Z direction during the assembly, as described above.

In use, the second part 27 of the sheet plate lies in between the seal and the top face 2a of the electrical device 2. Due to the elasticity of the horizontal part 27 of the electrical shielding system 14, which have a tendency to naturally spring back toward their original vertical condition, and due to the compression of the overlying seal, which tends to push the horizontal parts 27 downward, a good electrical continuity is ensured between the electrical device 2 and the electrical shielding system 14 of the connector 3.

When a complementary connector 101 is to be connected to the electrical connector 3, it is usually provided with a plastic housing 102 surrounding receptacles 122 to be placed in electrical communication with the receptacles 22 of the connector 3, and an electrical shielding system 125 which surrounds all these receptacles. The electrical shielding system of the complementary connector may be provided as a polygonal cage, having a cross-section similar to that of the electrical shielding

system 14 of the electrical connector, and which will be placed in electrical contact therewith upon connection. The tongues 29 of the electrical shielding system 14 serve to ensure this proper electrical contact between the electrical shielding systems of the respective connectors. 5 Thereby, the continuous shielding of the electrical lines can be provided.

The inner seal 39 is compressed upon assembly of the electrical connector 3 to the electrical device 2, as 10 the seal 13 is, as described above.

CLAIMS

1. An electrical connector having:
 - a housing (11,12) made of an electrically
5 insulating material having a receptacle (22) adapted to
receive an electrical contact,
 - a unitary seal (13) made of a flexible
insulating material, said seal being disposed on a part of
the housing, wherein the seal has a first portion (33) and
10 a second portion (34) protruding with respect to the first
portion,
 - an electrical shielding system (14) comprising a
first part (26) surrounding the receptacle, and a second
part (27) in electrical communication with the first part,
15 wherein the second part (27) is disposed on the
first portion of the seal and wherein the second portion
(34) of the seal protrudes with respect to the second part
(27).
2. Electrical connector according to claim 1,
20 wherein the receptacle extends along a mating axis (Z),
wherein the first part (26) of the electrical shielding
system surrounds the mating axis, wherein the second part
of the electrical shielding system extends in an assembly
plane (X-Y) transverse to the mating axis.
- 25 3. Electrical connector according to claim 1 or 2,
wherein the receptacle (22) extends along a mating axis
(Z), wherein the first part of the electrical shielding
system surrounds the mating axis, wherein the second part
of the electrical shielding system is movable along the
30 mating axis with respect to the housing (11,12).
4. Electrical connector according to any of claims
1 to 3, wherein the second part (27) comprises a plurality
of plates disposed along a polygonal path.
5. Electrical connector according to any of claims
35 1 to 4, further comprising an inner seal (39) provided

between the electrical shielding system (14) and the receptacles (22), and protruding with respect to the second part (27) of the electrical shielding system.

6. Electrical connector according to any of claims 5 1 to 5, wherein the second portion (34) of the seal surrounds the first portion (33).

7. An electrical connector having:

- a housing (11,12) made of a hard electrically insulating material having a receptacle (22) adapted to 10 receive an electrical contact,

- a unitary seal (13) made of a flexible insulating material, said seal being disposed on a part of the housing, wherein the seal has a first portion (33) and a second portion (34) which surrounds the first portion and 15 protrudes with respect to the first portion,

- an electrical shielding system (14) comprising a first part (26) surrounding the receptacle, and a second part (27) in electrical communication with the first part, wherein the second part is disposed on the first portion of 20 the seal, wherein the second portion (34) of the seal protrudes with respect to the second part (27),

- an inner seal (39) provided between the electrical shielding system (14) and the receptacles (22), and protruding with respect to the second part (27) of the 25 electrical shielding system.

8. An electrical assembly comprising:

- an electrical connector (3) according to any of claims 1 to 7,

- an electrical device (2) comprising a flat face 30 made of an electrically conductive material,

wherein the electrical connector and the electrical device are assembled to one another in an assembly condition wherein the flat face (2a) compresses the second portion (34) of the seal and is in contact with the second 35 part (27) of the electrical shielding system.

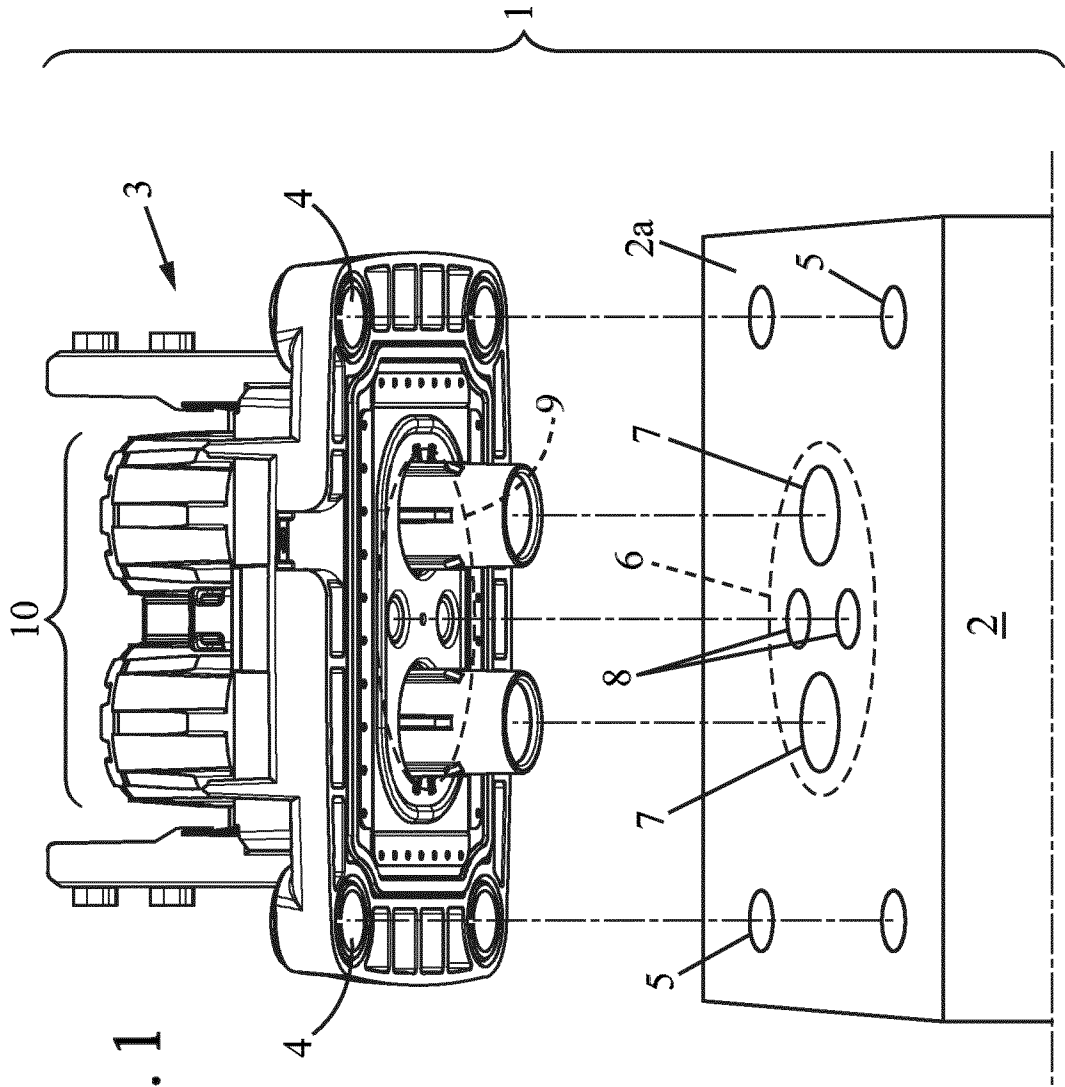


FIG. 1

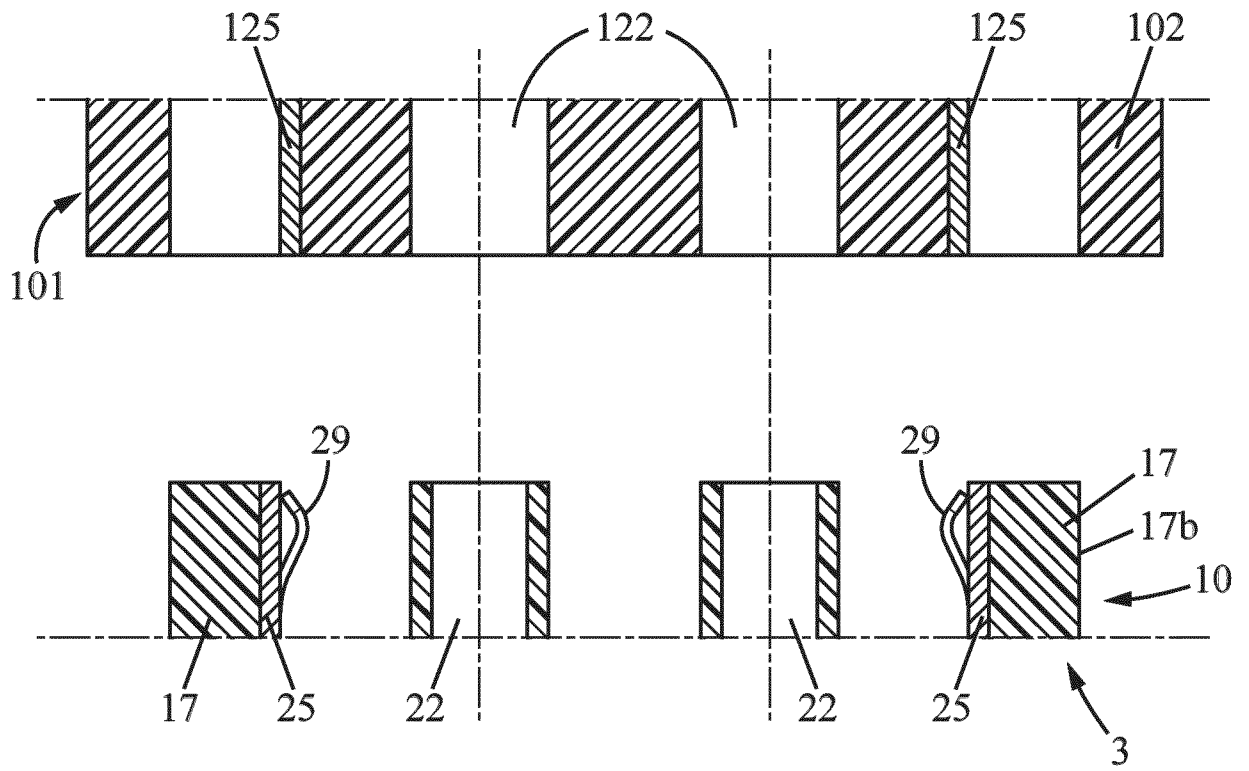


FIG. 2

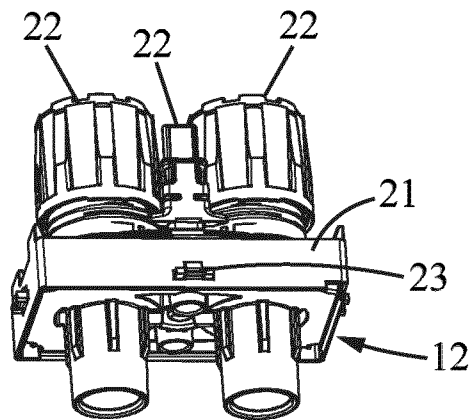
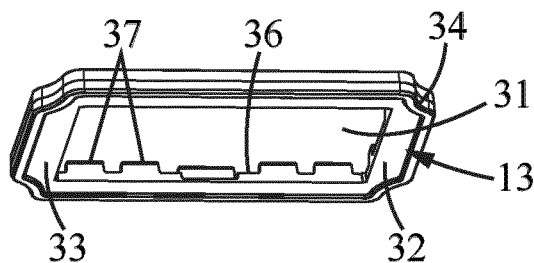
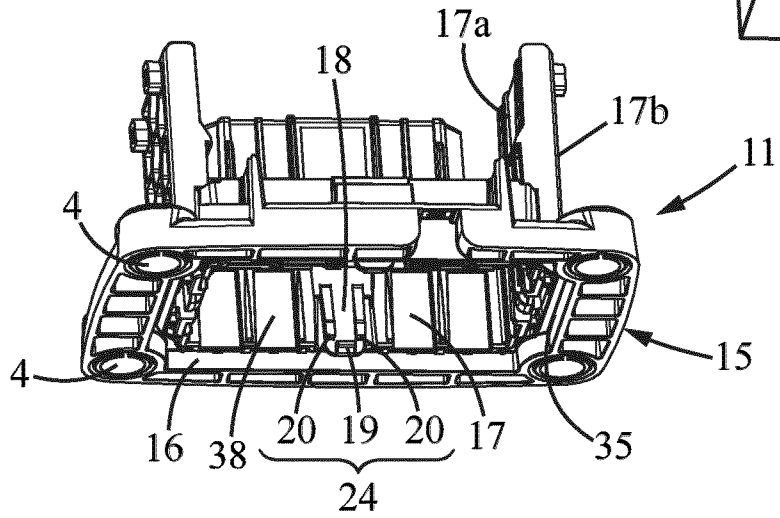
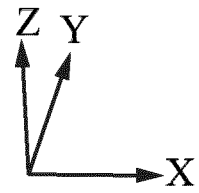
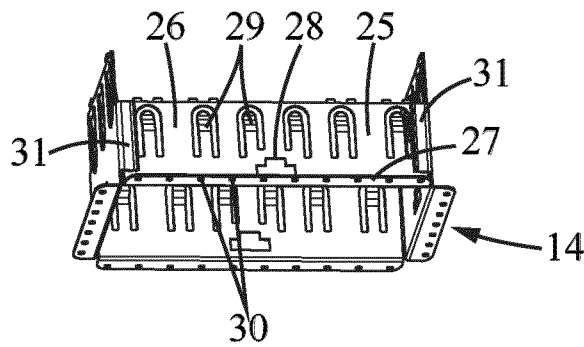
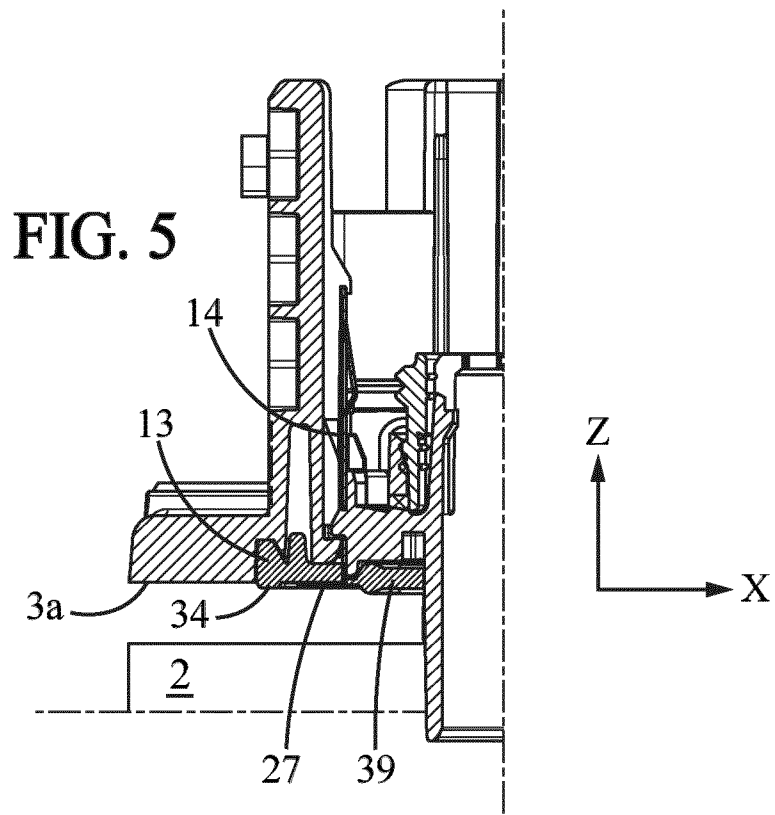
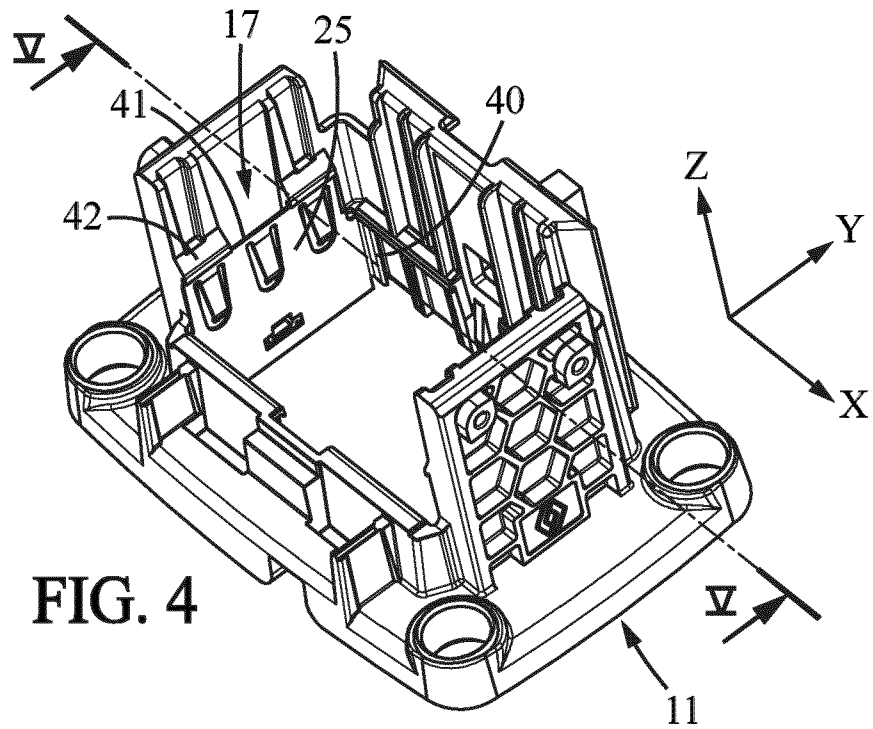


FIG. 3





INTERNATIONAL SEARCH REPORT

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| International application No PCT/EP2012/051382 |
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A. CLASSIFICATION OF SUBJECT MATTER
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 ADD. H01R13/73

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
 H01R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
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Further documents are listed in the continuation of Box C.

See patent family annex.

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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| International application No PCT/EP2012/051382 |
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| Patent document cited in search report | A1 | Publication date | Patent family member(s) | Publication date |
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