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(54) **Electrical connector housing**

(57) An electrical connector housing (10), comprising: a connector body (12) having a longitudinal mating axis (XX) and at least one electrical cavity (24) each arranged to receive an electrical contact, the connector body (12) comprising a peripheral wall (20) arranged to receive a mating peripheral wall of a mating connector body; and a peripheral seal (14) mounted on the peripheral wall (20) of the connector body (12). The peripheral seal (14) has a thickness less or equal to 2.53 mm and comprises a central portion having a sealing lip comprising a guiding part adapted to guide the mating connector body along the mating axis (XX), the guiding part presenting a curved profile pointing toward the peripheral wall (20) of the connector body (12), and the mean radius of curvature of the guiding part being comprised between 4.00 mm and 6.00 mm.

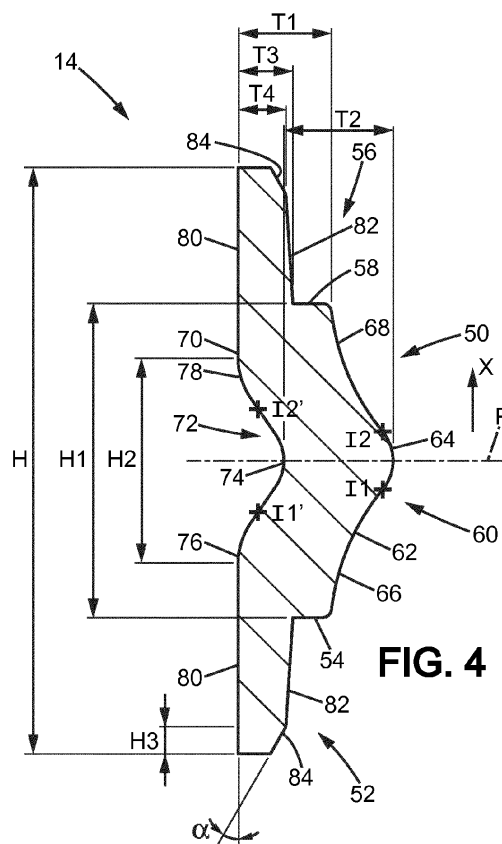


FIG. 4

Description

FIELD OF THE INVENTION

[0001] The instant invention relates to electrical connector housings, in particular to electrical connector housings used in electrical connector devices for vehicle electrical power charging systems.

BACKGROUND OF THE INVENTION

[0002] The electrical power charging systems used for charging an electrical power vehicle usually comprise an electrical power inlet which is attached to the vehicle. When a user wants to recharge the vehicle accumulators, an electrical power link is connected between the vehicle power inlet and an electrical power socket of an electrical power station.

[0003] The electrical connector housings used for the vehicle power inlet and for the station power socket usually comprise a connector body provided with cavities in which electrical contacts are received and protected against fingers introduction.

[0004] Since it is undesirable that foreign bodies, such as dust and liquids, penetrate the inside of the connector housings, it is preferable to seal them against such foreign bodies. It has been known to provide a so-called "interfacial" seal, i.e. a seal which is to be placed between the respective connector body and a plug of the electrical power link. Thus, unwanted ingress of material at the location of the interface between the connector body and the plug is prevented.

[0005] However, due to the large number of charging cycles it has to withstand, the seal is very likely to wear over time.

[0006] Therefore, maintaining an efficient sealing between the connector body and the plug is a challenge.

SUMMARY OF THE INVENTION

[0007] It is an object of the present invention to provide an electrical connector housing having a good sealing efficiency over time.

[0008] To this aim, it is provided an electrical connector housing, comprising:

- a connector body having a longitudinal mating axis and at least one electrical cavity each arranged to receive an electrical contact, the connector body comprising a peripheral wall arranged to receive a mating peripheral wall of a mating connector body along the mating axis; and
- a peripheral seal mounted on the peripheral wall of the connector body and arranged to cooperate with the mating peripheral wall of the mating connector body for providing a sealing between the connector body and the mating connector body.

[0009] The peripheral seal has a thickness less or equal to 2.53 mm.

[0010] The peripheral seal comprises a central portion having a sealing lip comprising a guiding part adapted to guide the mating connector body along the mating axis, the guiding part presenting a curved profile pointing toward the peripheral wall of the connector body, and the mean radius of curvature of the guiding part being comprised between 4.00 mm and 6.00 mm.

[0011] Faced with the problem relating to the wear of the seal, the person skilled in the art would naturally be led to increase the thickness of the seal in order to increase its mechanical strength.

[0012] However, such a rather stout seal would present a higher resistance to insertion of the plug, which would increase the friction forces exerted on the seal and consequently increase the risk of displacing and/or damaging the seal, thus impairing the sealing efficiency. Besides, increasing the quantity of material of the seal, usually made from an improved elastomeric material such as silicone, results in an increase of the cost of the whole connector housing.

[0013] Counter-intuitively, instead of increasing the thickness of the seal, the Applicant designed the seal with a specific shape which enables a smooth mating of the two connectors, thus limiting the friction forces exerted on the seal and reducing the risk of occurrence of a displacement and/or of a pinching/twisting of the seal.

[0014] In some embodiments of the invention, one might also use one or more of the features defined in the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] 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.

[0016] On the drawings:

- Fig. 1 is a perspective view of an electrical connector housing according to the invention;
- Fig. 2 is a vertical and longitudinal cross-sectional view along line II-II of Fig. 1 showing the electrical connector housing of Fig. 1 before assembling with a mated electrical connector housing;
- Fig. 3 is a perspective view of a peripheral seal of the electrical connector housing of Fig. 1;
- Fig. 4 is a cross-sectional view along line IV-IV of Fig. 3; and
- Figs. 5A and 5B are enlarged views of detail V of Fig. 2 showing a part of the electrical connector housing of Fig. 1 upon assembling with a mated electrical connector housing.

[0017] On the different Figures, the same reference signs designate like or similar elements.

DETAILED DESCRIPTION

[0018] Fig. 1 shows an electrical connector housing 10 according to the invention.

[0019] In the example described here, the electrical connector housing 10 is part of an electrical power inlet attached to an electrical power vehicle and intended to mate with a first plug provided at a first extremity of an electrical power link along a longitudinal mating axis XX.

[0020] The electrical power link comprises at a second extremity a second plug adapted to mate with an electrical power socket of an electrical power station.

[0021] The position and orientation terms used in the present description, such as "front", "rear", "axial", "radial", "longitudinal", "transverse", etc. are to be understood relative to the mating axis XX oriented as shown on Fig. 1.

[0022] The connector housing 10 comprises a connector body 12, a peripheral seal 14 and a seal holder 16.

[0023] The connector body 12 has a tubular shape and extends along the mating axis XX.

[0024] In the example described here, the connector body 12 has a substantially circular cross-section.

[0025] In a variant, the cross-section of the connector body 12 is square, rectangular, oval, etc.

[0026] The connector body 12 comprises a central plate 18 and a peripheral wall 20 on either side of the central plate 18.

[0027] The central plate 18 extends substantially radially relative to the mating axis XX and the peripheral wall 20 extends along the mating axis XX.

[0028] The connector body 12 comprises five cylindrical sleeves 22 defining five electrical cavities 24 each arranged to receive an electrical contact.

[0029] Each sleeve 22 extends forward from the central plate 18 along a respective axis parallel to the mating axis XX, the peripheral wall 20 surrounding the sleeves 22.

[0030] The sleeves 22 have a tubular shape with a substantially circular cross-section and enable to prevent a user finger from inadvertently touching an electrical contact accommodated therein.

[0031] In a variant, the connector body 12 comprises any number of sleeves 22.

[0032] In another variant, the cross-section of the sleeves 22 is square, rectangular, oval, etc.

[0033] The peripheral wall 20 is arranged to receive a mating peripheral wall of a mating connector body of the first plug along the mating axis XX.

[0034] As best seen on Fig. 2, the connector body 12 comprises a retaining skirt 26 adapted for retaining the peripheral seal 14 on the peripheral wall 20.

[0035] The retaining skirt 26 has an annular shape and protrudes forward from the central plate 18 along the mating axis XX.

[0036] The retaining skirt 26 is thus arranged concentrically and inwardly relative to the peripheral wall 20, and is radially spaced apart from the peripheral wall 20 by a retaining groove 28 having an annular shape.

[0037] The distance D taken along the mating axis XX between the edge of the retaining skirt 26 and the central plate 18 is about 5.50 ± 0.50 mm. This feature enables to position the peripheral seal 14 deep inside the connector body 12, adjacent to the central plate 18, thus limiting the risk of contaminating and damaging the seal.

[0038] Referring back to Fig. 1, the seal holder 16 presents a tubular shape with a cross-section corresponding to that of the connector body 12, i.e. circular in the example described here.

[0039] The seal holder 16 is mounted on the inner surface 30 of the peripheral wall 20 of the connector body 12.

[0040] For example, snap-fitting tabs 32 are provided on the seal holder 16 and cooperate with corresponding snap-fitting holes 34 provided on the peripheral wall 20 to attach the seal holder 16 on the connector body 12.

[0041] Complementary indexing elements 36 are also provided on the seal holder 16 and on the peripheral wall 20 to correctly orient the seal holder 16 relative to the connector body 12 upon assembling of these latter.

[0042] The seal holder 16 comprises a front end 38, a rear end 40, and a holding tongue 42 (Fig. 2).

[0043] The front end 38 is level with a front end 44 of the peripheral wall 20.

[0044] The holding tongue 42 has an annular shape and protrudes rearward from the rear end 40 of the seal holder 16 along the mating axis XX.

[0045] The holding tongue 42 is thus arranged concentrically and inwardly relative to the peripheral wall 20, and is radially spaced apart from the peripheral wall 20 by a holding recess 46 having an annular shape.

[0046] The holding tongue 42 is also longitudinally spaced apart from the retaining skirt 26 and substantially aligned with the retaining skirt 26 along the mating axis XX.

[0047] The inner surface 30 of the peripheral wall 20, the retaining skirt 26 and the holding tongue 42 thus delimit an accommodating space 48 for receiving the peripheral seal 14.

[0048] The accommodating space 48 has an annular shape with a substantially T-shape cross-section, the branches of the T being formed respectively by the retaining groove 28 and the holding recess 46.

[0049] The seal holder 16 is for example made from plastic material.

[0050] The peripheral seal 14 is mounted on the inner surface 30 of the peripheral wall 20 of the connector body 12 and is arranged to cooperate with the mating peripheral wall of the mating connector body of the first plug for providing a sealing between the connector body 12 and the mating connector body (Fig. 5B).

[0051] The peripheral seal 14 is substantially symmetric relative to a plane P perpendicular to the mating axis XX. This allows the peripheral seal 14 to be mounted on the connector body 12 indifferently in any of its two possible orientations.

[0052] The peripheral seal 14 will now be described in more detail by reference to Figs. 3 and 4. The present

description is that of the seal at rest before being mounted on the connector body 12.

[0053] As shown on Fig. 3, the peripheral seal 14 is designed as a profiled ring designed to be mounted on the inner surface 30 of the peripheral wall 20 of the connector body 12. Therefore, the ring has a substantially circular geometry corresponding to the cross-section of the connector body 12. By "profiled" it is meant that the cross-section taken transversal to the peripheral direction of the peripheral seal 14 is substantially identical all along this periphery.

[0054] The peripheral seal 14 is manufactured with an external diameter which substantially corresponds to the internal diameter of the peripheral wall 20 where it has to be mounted.

[0055] As best seen on Fig. 4, the peripheral seal 14 comprises a central portion 50 and, on either side of the central portion 50, a first end flange 52 forming with the central portion 50 a first shoulder 54, and a second end flange 56 forming with the central portion 50 a second shoulder 58.

[0056] The central portion 50 of the peripheral seal 14 comprises a sealing lip 60 having a wavy shape in cross-section and formed by an inner surface 62 of the peripheral seal 14.

[0057] The inner surface 62 comprises a central part 64 having a curved profile, and more precisely a cross-section with a convex arc of circle shape pointing radially internally, that is to say toward the mating axis XX and in a direction opposite from the peripheral wall 20 when the peripheral seal 14 is mounted on the connector body 12.

[0058] The mean radius of curvature of the central part 64 is comprised between 0.50 mm and 1.50 mm, for example substantially equal to 1.00 mm.

[0059] The "mean radius of curvature" has to be understood as the average of all the local radii of curvature of the surface to be considered, a local radius of curvature being the radius of curvature at a point on the surface. In the example described here, as the cross-section of the central part 64 has an arc of circle shape, the mean radius of curvature of the central part 64 equals to each of the local radii of curvature of the central part 64. In a variant, the cross-section of the central part 64 has a shape different from an arc of circle, for example an elliptic shape. Therefore, in this case, the mean radius of curvature of the central part 64 would not be necessarily equal to the local radii of curvature of the central part 64.

[0060] The inner surface 62 also comprises a first side part 66 and a second side part 68 extending on either side of the central part 64.

[0061] The first and second side parts 66, 68 have a curved profile, and more precisely a cross-section with a concave arc of circle shape pointing radially externally, that is to say toward the peripheral wall 20 and in a direction opposite from the mating axis XX when the peripheral seal 14 is mounted on the connector body 12.

[0062] In a variant, the cross-section of the first and

second side parts 66, 68 has a shape different from an arc of circle, for example an elliptic shape.

[0063] The mean radius of curvature of the first and second side parts 66, 68 is larger than that of the central part 64. The mean radius of curvature of the first and second side parts 66, 68 is comprised between 4.00 mm and 6.00 mm, for example substantially equal to 5.00 mm.

[0064] Therefore, the curvature of the inner surface 62 of the central portion 50 has a first and a second inflection point I1, I2 corresponding to the junction between the central part 64 and respectively the first and the second side part 66, 68.

[0065] The edges of the first and second side parts 66, 68 connected respectively to the first and second shoulders 54, 58 are slightly rounded.

[0066] The central portion 50 of the peripheral seal 14 comprises a substantially straight outer surface 70 opposite the inner surface 62.

[0067] The central portion 50 further comprises a depression 72 formed substantially centrally on the outer surface 70.

[0068] The depression 72 comprises a central part 74 having a curved profile, and more precisely a cross-section with a concave arc of circle shape pointing in the same direction as the central part 64 of the sealing lip 60.

[0069] In a variant, the cross-section of the central part 74 of the depression 72 has a shape different from an arc of circle, for example an elliptic shape.

[0070] The mean radii of curvature of the central parts 64, 74 are substantially equal to each other, for example about 1.00 mm.

[0071] The depression 72 also comprises a first side part 76 and a second side part 78 extending on either side of the central part 74.

[0072] The first and second side parts 76, 78 have a curved profile, and more precisely a cross-section with a convex arc of circle shape pointing in the same direction as the first and second side parts 66, 68 of the sealing lip 60.

[0073] In a variant, the cross-section of the first and second side parts 76, 78 has a shape different from an arc of circle, for example an elliptic shape.

[0074] The mean radius of curvature of the first and second side parts 76, 78 is larger than that of the central part 74 but smaller than that of the first and second side parts 66, 68 of the sealing lip 60. For example, the mean radius of curvature of the first and second side parts 76, 78 is substantially equal to 1.50 mm.

[0075] Therefore, the curvature of the outer surface 70 of the central portion 50 has a first and a second inflection point I1', I2' corresponding to the junction between the central part 74 and respectively the first and the second side part 76, 78.

[0076] The central portion 50 of the peripheral seal 14 is symmetric relative to the plane P, the plane P passing through the middle of the sealing lip 60 and through the middle of the depression 72.

[0077] The height H1, taken along the mating axis XX,

of the central portion 50 is about 6.90 ± 0.10 mm.

[0078] The height H2 of the depression 72 is about 4.50 ± 0.10 mm.

[0079] The thickness T1, taken in the plane P, of the central portion 50 between the inner and outer surfaces 62, 70 and at its edges is about 2.05 mm.

[0080] The thickness T2 of the central portion 50 taken between the inner and outer surfaces 62, 70 and at its middle is about 2.40 ± 0.13 mm. The thickness T2 is the largest thickness of the peripheral seal 14.

[0081] The first end flange 52 is adapted to be inserted into the retaining groove 28 such that the retaining skirt 26 longitudinally faces the first shoulder 54 (Fig. 2).

[0082] The second end flange 56 is adapted to be inserted into the holding recess 46 such that the holding tongue 42 longitudinally faces the second shoulder 58.

[0083] The first and second end flanges 52, 56 are symmetric relative to the plane P. Therefore, the first end flange 52 is also adapted to be inserted into the holding recess 46 such that the holding tongue 42 longitudinally faces the first shoulder 54, and the second end flange 56 is also adapted to be inserted into the retaining groove 28 such that the retaining skirt 26 longitudinally faces the second shoulder 58.

[0084] Referring back to Fig. 4, each end flange 52, 56 comprises a straight outer face 80 extending from the straight outer surface 70 of the central portion 50.

[0085] Each end flange 52, 56 comprises an inner face 82 opposite the outer face 80 and tilted toward the outer face 80 from the respective shoulder 54, 58.

[0086] A chamfer 84 is provided on the inner face 82 of each end flange 52, 56, at its respective edge opposite the respective shoulder 54, 58 to limit damaging thereof upon insertion into the retaining groove 28 and into the holding recess 46 respectively.

[0087] The edges of the inner face 82 of the end flanges 52, 56 connected to the respective chamfers 84 are slightly rounded.

[0088] The thickness T3 of the end flanges 52, 56 between the inner and outer faces 80, 82 and at the respective shoulder 54, 58 is about 1.20 mm.

[0089] The thickness T4 of the end flanges 52, 56 at the respective edge opposite the respective shoulder 54, 58 is about 1.05 mm.

[0090] The chamfers 84 make an angle α of about 30° with respect to the outer face 80 and have a height H3 of about 0.60 mm.

[0091] The total height H of the peripheral seal 14 is about 12.90 ± 0.10 mm.

[0092] The peripheral seal 14 is made from silicone material and has a hardness within a range from 32 to 40 Shore A, advantageously of about 36 Shore A. For example, the peripheral seal 14 can be made from a liquid silicone rubber manufactured under the reference Silopren® LSR 3596/35 by the company Momenite.

[0093] The peripheral seal 14 is firstly manufactured separately from the connector body 12. Secondly, the first end flange 52 of the peripheral seal 14 is inserted

into the retaining groove 28. Thirdly, the seal holder 16 is attached to the peripheral wall 20, the second end flange 56 being inserted into the holding recess 46.

[0094] Thanks to the above particular construction, the assembly method of the connector housing is fast and the fixation and retention of the peripheral seal on the connector body is improved.

[0095] As seen on Fig. 5A, upon mating the electrical connector housing 10 with the first plug 86 of the electrical power link, this latter is first introduced inside and guided along the seal holder 16. Then, thanks to the curved profile of the second side part 68 of the central portion 50 of the peripheral seal 14, the guiding of the first plug 86 continues in a smooth manner until it reaches the central plate 18. The second side part 68 thus forms a guiding part adapted to guide the first plug 86 along the mating axis XX.

[0096] In the mated position of the two connectors (Fig. 5B), the first plug 86 is in contact only with the apex of the central part 64 of the central portion 50 of the peripheral seal 14 such that this apex is slightly deformed, thus providing a little contact area A sufficient to provide an efficient seal.

[0097] Due to its elasticity and to its symmetry, along with the deformation of the apex, the rest of the seal slightly compresses radially outward and elongates longitudinally in the holding recess 46, but the whole seal is not significantly compressed.

[0098] The smooth guiding of the first plug by the seal holder and the peripheral seal enables to minimize the friction forces and the tilting of the first plug relative to the connector housing. This enables to reduce pinching/twisting and displacement of the seal when the connectors are being mated, a maximum tilting angle of about 2.80° being tolerated between the connectors upon mating.

[0099] Besides, as the peripheral seal is not overcompressed upon mating, the seal has a long lifetime with a good mechanical strength to withstand many charging cycles while allowing a low mating force and thus limiting the risk of twisting the seal when assembling the connectors, and to guarantee an efficient sealing until 50 kPa. In a variant, the peripheral seal and the seal holder are mounted on an outer surface of the peripheral wall of a connector body.

[0100] In another variant, the electrical connector housing is part of the electrical power socket of the electrical power station.

Claims

1. An electrical connector housing (10), comprising:

- a connector body (12) having a longitudinal mating axis (XX) and at least one electrical cavity (24) each arranged to receive an electrical contact, the connector body (12) comprising a

peripheral wall (20) arranged to receive a mating peripheral wall of a mating connector body (86) along the mating axis (XX); and

- a peripheral seal (14) mounted on the peripheral wall (20) of the connector body (12) and arranged to cooperate with the mating peripheral wall of the mating connector body (86) for providing a sealing between the connector body (12) and the mating connector body (86), wherein the peripheral seal (14) has a thickness less or equal to 2.53 mm, and

wherein the peripheral seal (14) comprises a central portion (50) having a sealing lip (60) comprising a guiding part (68) adapted to guide the mating connector body (86) along the mating axis (XX), the guiding part (68) presenting a curved profile pointing toward the peripheral wall (20) of the connector body (12), and the mean radius of curvature of the guiding part (68) being comprised between 4.00 mm and 6.00 mm.

2. An electrical connector housing (10) according to claim 1, wherein the sealing lip (60) comprises a central part (64) adapted to be in contact with the mating peripheral wall of the mating connector body (86), the central part (64) presenting a curved profile pointing in a direction opposite from the peripheral wall (20) of the connector body (12), and the guiding part (68) being arranged on one side of the central part (64).

3. An electrical connector housing (10) according to claim 2, wherein the mean radius of curvature of the central part (64) of the sealing lip (60) is comprised between 0.50 mm and 1.50 mm.

4. An electrical connector housing (10) according to claim 2 or 3, wherein the sealing lip (60) comprises two side parts (66, 68) arranged on either side of the central part (64), each side part (66, 68) presenting a curved profile pointing toward the peripheral wall (20) of the connector body (12), and one (68) of the side parts (66, 68) forming the guiding part.

5. An electrical connector housing (10) according to any of claims 2 to 4, wherein the central portion (50) of the peripheral seal (14) comprises a depression (72) opposite to the sealing lip (60), the depression (72) having a central part (74) presenting a curved profile pointing in the same direction as the central part (64) of the sealing lip (60).

6. An electrical connector housing (10) according to claim 5, wherein the mean radius of curvature of the central part (74) of the depression (72) is substantially equal to the mean radius of curvature of the central part (64) of the sealing lip (60).

7. An electrical connector housing (10) according to any of claims 1 to 6, wherein the connector body (12) comprises a retaining skirt (26) for retaining the peripheral seal (14) on the peripheral wall (20), the retaining skirt (26) being substantially concentric relative to the peripheral wall (20) and spaced apart from the peripheral wall (20) by a retaining groove (28), and

wherein the peripheral seal (14) comprises a first end flange (52) and a first shoulder (54) connecting the central portion (50) and the first end flange (52), the first end flange (52) being inserted into the retaining groove (28) such that the retaining skirt (26) faces the first shoulder (54).

8. An electrical connector housing (10) according to any of claims 1 to 7, further comprising a seal holder (16) mounted on the peripheral wall (20) of the connector body (12), the seal holder (16) comprising a holding tongue (42) substantially concentric relative to the peripheral wall (20) and spaced apart from the peripheral wall (20) by a holding recess (46).

9. An electrical connector housing (10) according to claims 7 and 8, wherein the peripheral seal (14) comprises a second end flange (56) opposite to the first end flange (52) and connected to the central portion (50) by a second shoulder (58), the second end flange (56) being inserted into the holding recess (46) such that the holding tongue (42) faces the second shoulder (58).

10. An electrical connector housing (10) according to any of claims 1 to 9, wherein the peripheral seal (14) is substantially symmetric relative to a plane (P) perpendicular to the mating axis (XX).

11. An electrical connector housing (10) according to any of claims 1 to 10, wherein the peripheral seal (14) is made from silicone material.

12. An electrical connector housing (10) according to any of claims 1 to 11, wherein the peripheral seal (14) has a hardness within a range from 32 to 40 Shore A.

13. An electrical connector housing according to any of claims 1 to 12, wherein the peripheral seal (14) is mounted on an inner surface (30) of the peripheral wall (20) of the connector body (12).

14. An electrical connector device, comprising:

- at least one electrical contact; and
- an electrical connector housing (10) according to any of claims 1 to 13,

wherein each electrical contact is received in the re-

spective electrical cavity (24) of the connector body (12).

15. An electrical power charging system for a vehicle, comprising:

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- an electrical power inlet adapted to be attached to the vehicle;
- an electrical power station provided with an electrical power socket; and
- an electrical power link provided at a first extremity with a first plug (86) adapted to mate with the electrical power inlet and at a second extremity with a second plug adapted to mate with the electrical power socket,

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wherein at least one device taken in the group including the electrical power inlet and the electrical power socket comprises an electrical connector housing (10) according to any of claims 1 to 13.

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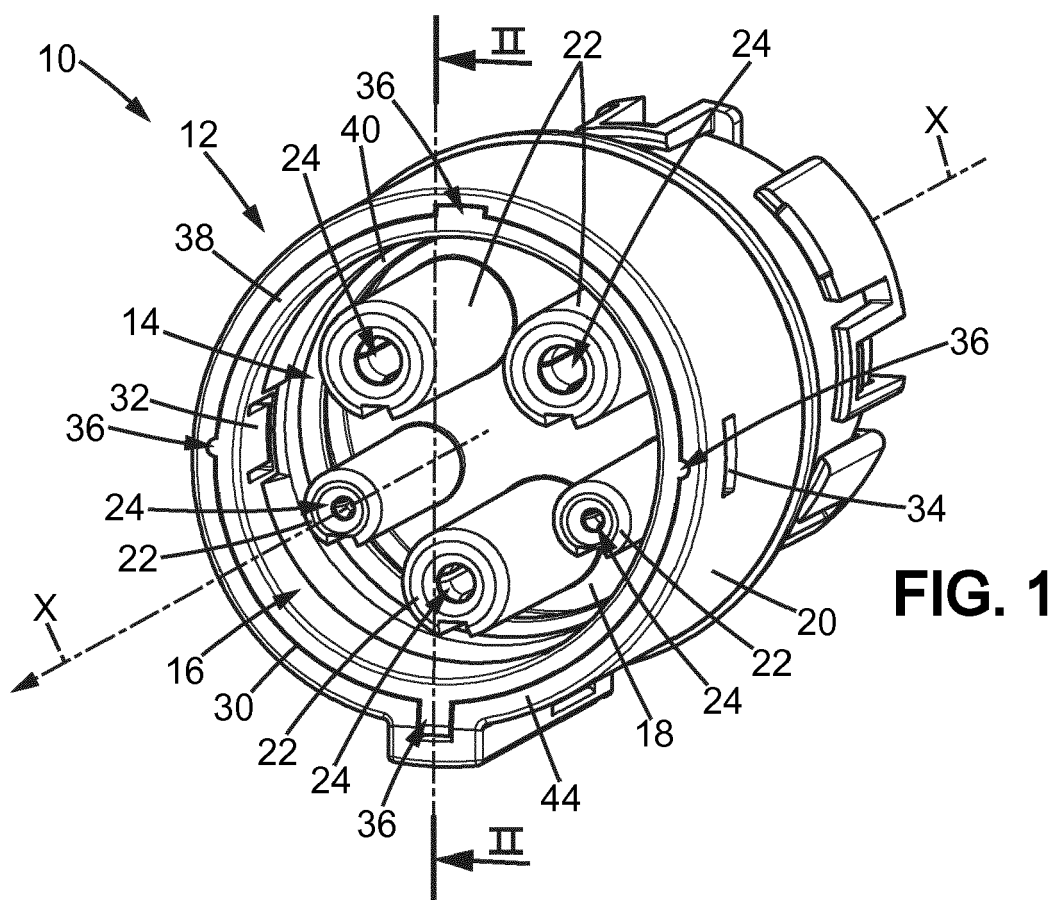
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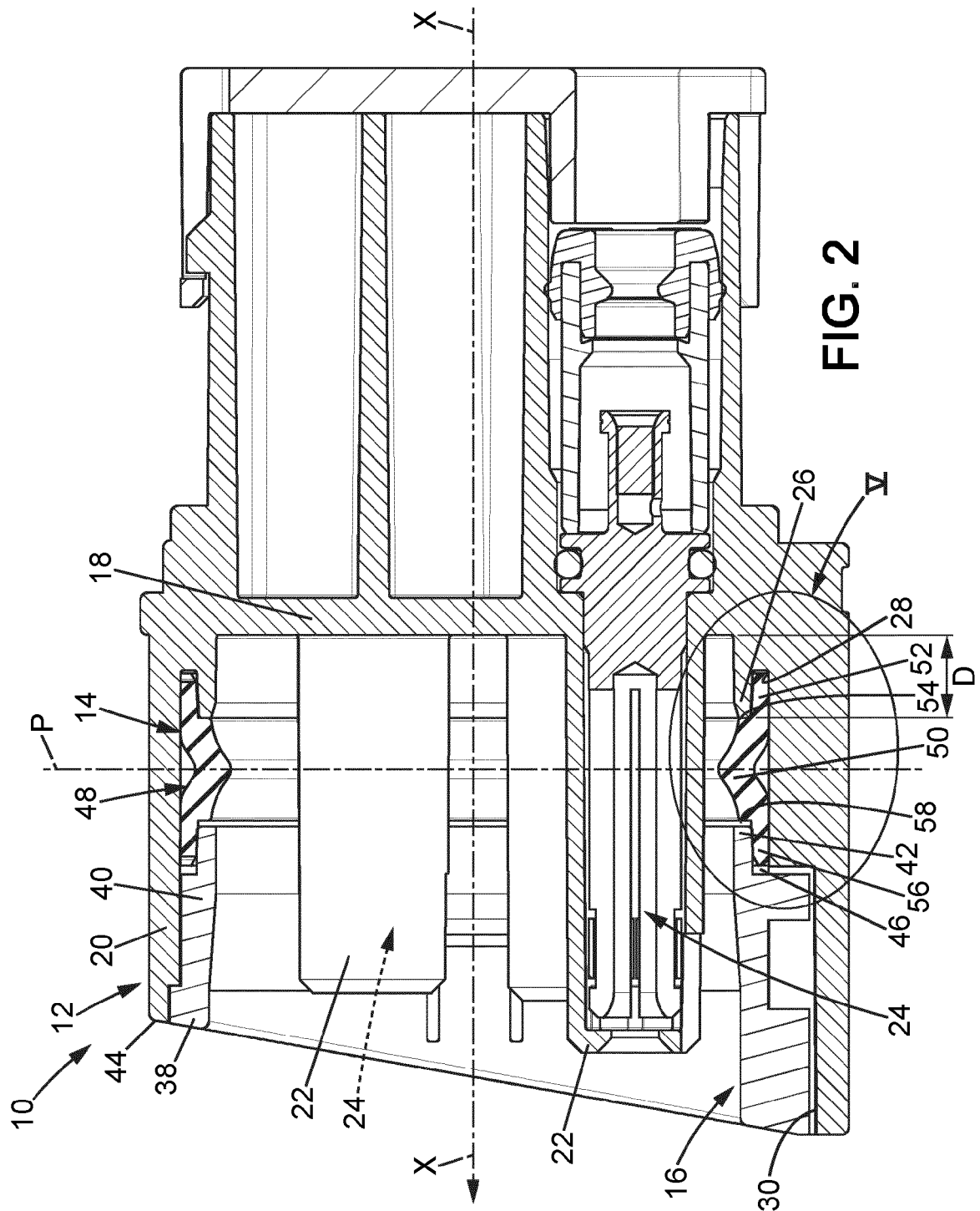
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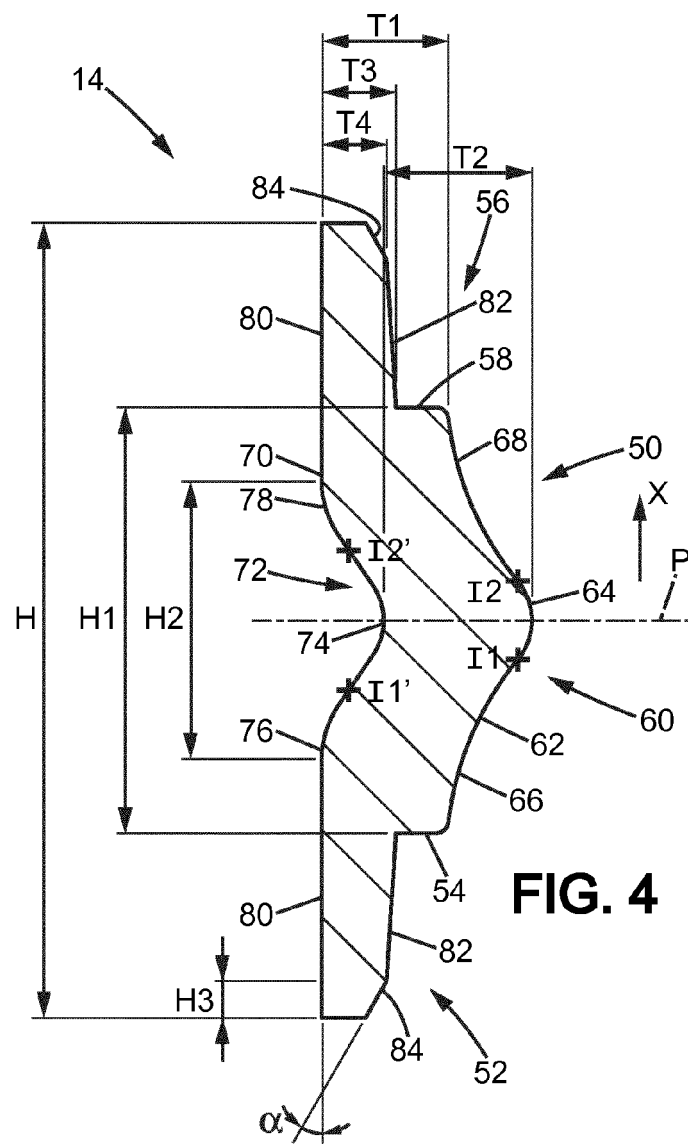
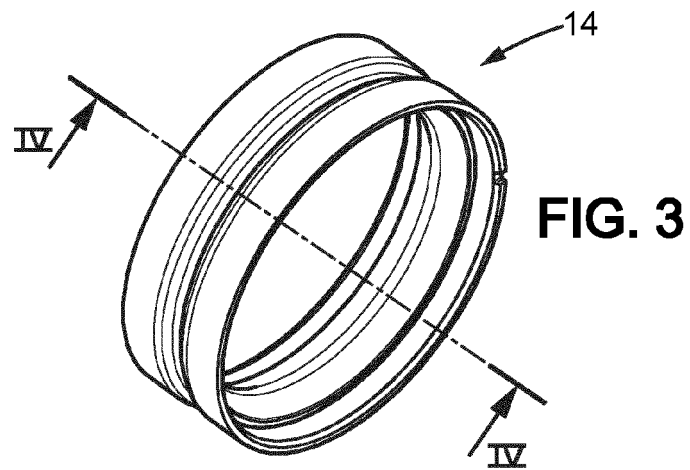
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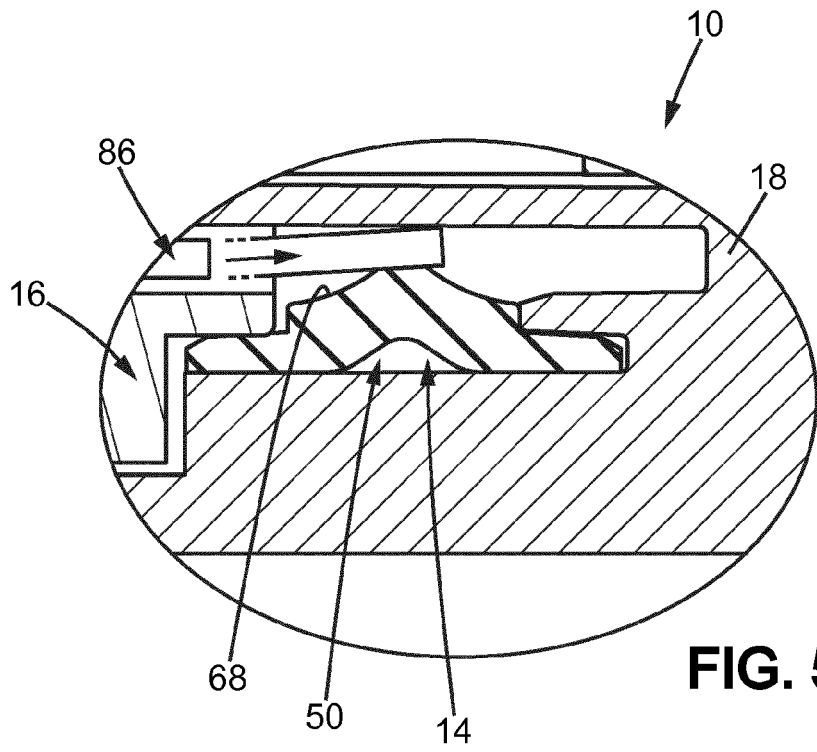


FIG. 5A

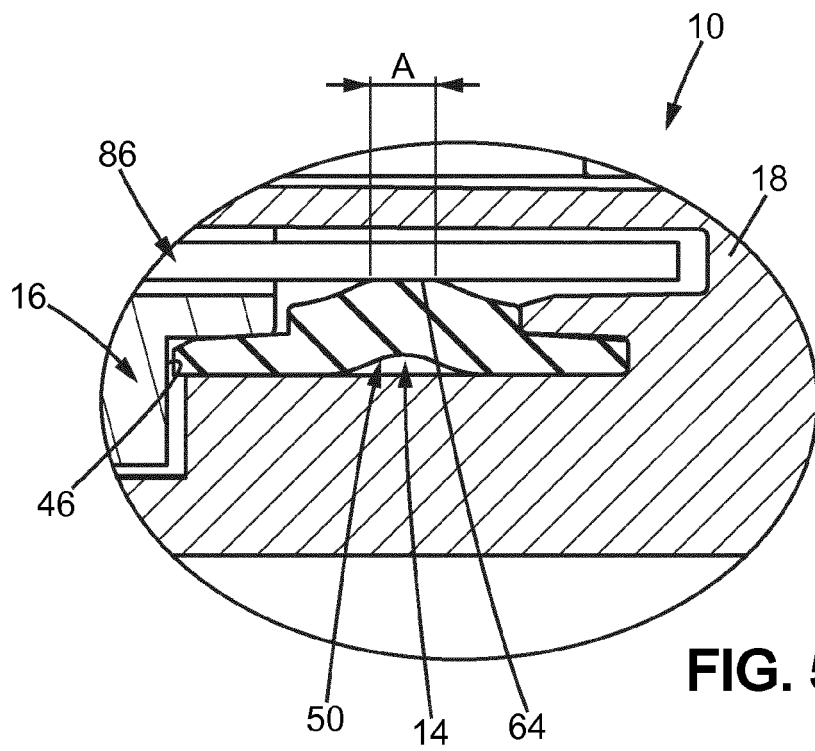


FIG. 5B



EUROPEAN SEARCH REPORT

Application Number
EP 13 30 5258

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 2002/052143 A1 (HARA TERUFUMI [JP] ET AL) 2 May 2002 (2002-05-02) * abstract; figure 4 *	1	INV. H01R13/52
A	WO 2012/163736 A1 (FCI AUTOMOTIVE HOLDING [FR]; DUQUESNE ARNAUD [FR]; MULOT GERARD [FR];) 6 December 2012 (2012-12-06) * figures 5,5a *	1	
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			TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 2 August 2013	Examiner Corrales, Daniel
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1503 03.82 (P04C01)

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

EP 13 30 5258

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