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(54) **Seal retention arrangement for electrical plug-in connectors**

Dichtungshalteanordnung für elektrische Steckverbinder

Dispositif de retenue de joint pour connecteurs enfichables électriques

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Description

[0001] The invention relates to a receptacle housing for a plug element and mating plug element of an electrical plug-in connector in a plug-in direction of the plug-in connector, comprising a sealing section adapted to hold a sealing element for sealing up between the plug element and the mating plug element, wherein the sealing section comprises at least one counter retention element adapted to engage with a retention element formed at the sealing element in order to secure the sealing element against movements in parallel to the plug-in direction, wherein the at least one counter retention element is resiliently deflectable.

[0002] Further, the present invention relates to a sealing element for sealing up between a plug element and a mating plug element of an electrical plug-in connector, an axial direction of the sealing element running essentially in parallel to a plug-in direction for mating the plug element and the mating plug element, wherein the sealing element further comprises at least one retention element adapted to engage with a counter retention element formed at a receptacle housing according to the present invention of at least one of the plug element and/or the mating plug element in order to secure the sealing element against movements in the axial direction and/or plug-in direction, and wherein the at least one retention element is formed as a recess.

[0003] Moreover, the present invention relates to an electrical plug-in connector, comprising a receptacle housing for a plug element and/or mating plug element of an electrical plug-in connector in a plug-in direction of the plug-in connector, comprising a sealing section adapted to hold a sealing element for sealing up between the plug element and the mating plug element, wherein the sealing section comprises at least one counter retention element adapted to engage with a retention element formed at the sealing element in order to secure the sealing element against movements in parallel to the plug-in direction, wherein the at least one counter retention element is resiliently deflectable, and comprising a sealing element for sealing up between a plug element and a mating plug element of an electrical plug-in connector, an axial direction of the sealing element running essentially in parallel to a plug-in direction for mating the plug element and the mating plug element, wherein the sealing element further comprises at least one retention element adapted to engage with a counter retention element formed at a receptacle housing according to the present invention of at least one of the plug element and/or the mating plug element in order to secure the sealing element against movements in the axial direction and/or plug-in direction, and wherein the at least one retention element is formed as a recess.

[0004] Sealing elements, receptacle housings and electrical plug-in connectors mentioned above are known. The plug-in connectors comprising the housings and the sealing elements are often used in hostile envi-

ronments as they may be applied in vehicles for example. In these hostile environments, the plug-in connectors are exposed to vibrations, moisture, dirt, dust and possibly chemical aggressive substances. When aggressive, corroding or electrically conductive substances would get into a connection area between mating contact elements of a connector, they could cause interruptions of the power supply or false circuits. Hence, the connectors have to be provided with sealings which prevent any harmful substances from entering the connector and affecting the contact elements arranged therein. It is desired to hermetically seal the connector. An overall sealing should at least be liquid-tight and optimally gas-tight.

[0005] A sealed electrical connector according to the prior art is described in the US patent specification US 7,540, 775 B2 for example which shows a sealed electrical plug-in connector. A plug seal of this connector is arranged between a header shroud and a receptacle housing. A flange formed at the seal and radially extending therefrom is jammed between the bottom formed at the receptacle housing and a rim of the header shroud.

[0006] US patent specification US 5,389,005 A describes a waterproof electric connector seal member, including an elastic seal element fitted around the outer periphery of a housing portion within a hood of a male electric connector housing. Flexible arms on the hood latch behind tongues radially protruding from an outer periphery of a flange portion of the seal member.

[0007] European patent application EP 0 091 770 A2 relates to a sealed electrical connector assembly comprising two housings and a sealing element arranged therebetween, wherein a header shroud of one housing is received within a cavity between the sealing element and an outer wall of the other housing, while ribs on the inner wall of the first housing jut into a groove formed at the inner circumference of the sealing.

[0008] More connector assemblies which each comprise a sealing element between two housings are described in European patent application EP 2 390 964 A1 and in Japanese patent application JP 2006 147,474. A header shroud of one housing is received within a cavity between the sealing element and an outer wall of the other housing. The outer wall comprises a projection which projects into the direction of the seal. In a mated state, the header shroud is arranged between the outer wall and the projection on one side and outer lips of the sealing element on the other side.

[0009] Known connectors as mentioned above and described in the prior art suffer from the disadvantages that their sealings may deform, fold or wrinkle while mating the connector which could lead to an insufficient abutment of the sealing to the housing and/or header shroud, whereby harmful substances could enter the connector. Further, known sealings suffer from the disadvantage that the sealings may be pulled off or out of the connector when un-mating the connector making it cumbersome to re-mate the connector properly.

[0010] In view of the disadvantages of the prior art men-

tioned above, an object underlying the invention is to provide an electrical plug-in connector which is sealable and reliable, yet easy to use and to assemble.

[0011] This object is achieved according to the invention for the receptacle housing disclosed in independent claim 1 and mentioned in the beginning of the description in that a cavity for at least partially receiving a header shroud of the plug element or the mating plug element is formed between the counter retention element and a wall of the receptacle housing.

[0012] For the sealing element disclosed in independent claim 4 and mentioned at the beginning of the description, the above-mentioned problems are solved in that the sealing element comprises a sealing portion and a latching portion attached to the sealing portion and providing the at least one retention element, wherein the sealing portion and the latching portion have an essentially planar side on a side of the sealing element lying opposite the retention element.

[0013] For the electrical plug-in connector mentioned in the beginning of the description, the above-mentioned problems are solved in that the plug-in connector comprises at least one sealing element and a receptacle housing according to the present invention.

[0014] These simple solutions provide that the sealing element may be properly retained in its mounted position at the plug element and/or the mating plug element. It may thereby not be deformed, folded or wrinkled while mating the plug element and the mating plug element. Further, the sealing element may not get pulled out of its mounted position so easily when un-mating the plug element and the mating plug element. The plug element may be a first connector element and the mating plug element may be a second connector element of an electrical plug-in connector, wherein the first connector element in the second connector element may have complementary shapes in order to be brought into engagement with each other when mating. During mating and un-mating the sealing element may be accurately kept in place while bringing the plug element and the mating plug element into engagement with each other.

[0015] The cavity may accommodate the header shroud in a fully mated state of the plug element and the mating plug element. The sealing element and/or the counter retention element may thereby be immobilized between the header shroud and the wall of the receptacle housing, such that the sealing element and/or the counter retention element may not move in a radial direction or a direction running essentially perpendicularly to the plug-in direction. Hence, the retention element and the counter retention element may be held in a retention position and/or mounted position, respectively. The sealing function may be assigned to the sealing portion and the retention function may be assigned to the retention portion. Hence, the sealing portion may be designed for optimal sealing characteristics and the retention portion may be designed for optimal retention characteristics. The counter retention element may protrude into the re-

tion element for blocking and/or latching the sealing element in its mounted position.

[0016] The solutions according to the invention can be combined as desired and further improved by the following further embodiments that are advantageous on their own in each case:

According to a first further embodiment of a receptacle housing according to the present invention it may be provided that the at least one counter retention element is resiliently deflectable in a direction extending essentially perpendicularly to the plug-in direction. The counter retention element may be formed as snap-in tongue at least partially extending in parallel to the plug-in direction. Thereby, the counter retention element may have spring characteristics in a direction extending essentially perpendicularly to the plug-in direction whereby the counter retention element may snap into the retention element and thereby may be easily brought into engagement with the retention element.

[0017] According to a further embodiment of the sealing element, the at least one retention element may at least partially extend in a radial direction of the sealing element, wherein the radial direction is extending essentially perpendicularly to the axial direction. Thereby, the retention element may be brought into engagement with the counter retention element in such a way that movements of the sealing elements in parallel to the axial direction and/or plug-in direction may be blocked and the sealing element securely immobilized.

[0018] The at least one retention element may be formed as a groove which at least partially extends along a circumference of the sealing element. Thereby, the counter retention element may interact with the retention element along the circumference of the sealing element in order to secure the sealing element along its circumference and prevent even a partial folding or wrinkling as well as partial displacement of the sealing element with respect to its mounted position.

[0019] On the planar side, the sealing portion and the latching portion may be aligned with respect to each other, at least in parallel to the axial direction. Any sealing protrusions such as lamellas on a sideline opposite to the planar side may provide a structured side of the sealing element. Hence, the sealing element may be brought into flush abutment with its planar side to the plug element and/or mating plug element which enhances sealing up the electrical connector while on the other side, the retention element may be easily accessed.

[0020] The retention element may provide an engagement surface in form of a bevel which is at least partially slanted with respect to the axial direction. Thereby, the counter retention element may easily be brought into engagement with the retention element in that the counter retention element may slip into the retention element along the bevelled engagement surface.

[0021] The sealing element may at least partially have a ring-like cross-section. Thereby, it may be elastically deformable in a radial direction. Thus, it may be elastically tensioned when wrapped around a plug portion for example in order to enhance sealing characteristics.

[0022] The sealing element may generally have a tubular shape. Hence, the sealing element may provide a tubular inner circumference as well as a tubular outer circumference which may be brought into flush abutment with the plug element and/or the mating plug element.

[0023] According to a further possible embodiment of an electrical plug-in connector according to the present invention it may be provided that the plug-in connector comprises at least one plug element and a mating plug element, wherein a fully mated state of at least one plug element and the at least one mating plug element, the retention element and the counter retention element are blocked in a retention position. Thereby, accidentally disengaging the retention element and the counter element may be prevented. The retention element and the counter retention element may be adapted for engagement with each other in the mounted position and/or locked or retained position of the sealing element.

[0024] In the fully mated state, the retention element and the counter retention element may overlap with the plug element and the mating plug element in a direction perpendicular to the plug-in direction. Thereby, for example in a radial direction of the plug-in connector, any displacement of the retention element and the counter retention element is omitted which helps in securely immobilizing the sealing element in its mounted position.

[0025] The invention will be described in more detail by way of example hereinafter using advantageous embodiments and with reference to the drawings. The described embodiments are only possible configurations in which the individual features may however, as described above, be implemented independently of each other or may be omitted. Equal elements illustrated in the drawings are provided with equal reference signs. Redundant parts of the description relating to equal elements illustrated in different drawings are left out.

[0026] In the drawings:

Fig. 1 shows a schematic perspective view of a plug element and a sealing element according to an embodiment of the present invention, wherein the sealing element is in a pre-mounted position;

Fig. 2 is a schematic bottom view of the plug element shown in Fig. 1;

Fig. 3 is a schematic side view of the plug element shown in Figs. 1 and 2;

Fig. 4 is a schematic top view of the plug element shown in Figs. 1 to 3 with the sealing element in the mounted position;

Fig. 5 is a schematic cross-sectional view of the plug element shown in Figs. 1 to 4 with the sealing element in the mounted position along the cross-sectional line A-A illustrated in Fig. 3;

Fig. 6 is a schematic cross-sectional view along the middle axis of another embodiment of a plug element and a sealing element according to the present invention;

Fig. 7 is a schematic cross-sectional view along the middle axis of an embodiment of a plug element and a sealing element not belonging to the present invention;

Fig. 8 is a schematic cross-sectional view along the middle axis of an embodiment of a plug element and a sealing element not belonging to the present invention; and

Fig. 9 is a front view of a detail of a retention arrangement for affixing a sealing element in an electrical plug-in connector shown in Fig. 8.

[0027] A construction of a plug element 1 according to the invention will first be described in the following with reference to Fig. 1, which shows a schematic perspective view of the plug element 1. The plug element 1 comprises a housing 2 and a sealing element 3.

[0028] The housing 2 has a plug portion 2a and a terminal portion 2b. The plug portion 2a is adapted to be mated with a mating plug connector (not yet shown) in a plug direction P of the plug element 1 running in parallel to a height direction Z of the plug element 1. In other words, the plug element 1 may be plugged into the mating plug element in the plug direction P. The mating plug element may be plugged into the plug element 1 in the mating plug direction P'. In the plug portion 2a, an outer shell 4 of the housing 2 has an upper rim 4a and an inner circumference 4b. The outer shell 4 surrounds a plug 5 of the plug element 1 formed by an inner shell. The plug 5 has a front side 5a facing into the plug direction P and an outer circumference 5b.

[0029] A receptacle 6 of the plug element 1 is formed between the inner circumference 4b of the outer shell 4 and the outer circumference 5b of the plug 5. A bottom 6a of the receptacle 6 faces into the plug direction P. At the front side 5a of the plug 5, contact receptacles 7 of the plug element 1 have an opening 7a through which a mating contact (not shown) may be mated with an electrical contact (not shown), e.g. a terminal, socket and/or pin may be plugged into the contact receptacles 7 in the mating plug direction P'. The contact receptacles 7 are arranged in two rows of contact receptacles 7. In each row, the opening 7a of the contact receptacles 7 are aligned in a lateral direction X of the plug element 1. The lateral direction X extends perpendicularly to the height direction Z. The rows of contact receptacles 7 are ar-

ranged next to each other in a cross direction Y of the contact element 1. The cross direction Y extends perpendicularly to the lateral direction X and the height direction Z.

[0030] The outer shell 4, the plug 5 and the receptacle 6 are arranged essentially concentrically with respect to a middle axis M_1 of the plug element 1 and a middle axis M_2 of the housing 2. Hence, the inner circumference 4b of the outer shell 4 and the outer circumference 5b of the plug 5 are extending essentially in parallel to each other in the plug direction P. Further, the housing 2 is provided with a latching element 9a for latching the plug element 1 and the mating plug element in a fully mated state B (not yet shown). The latching element 9 comprises a guidance 9a and a latch 9b. The guidance 9a extends essentially in parallel to the plug direction P. The latch 9b extends almost in parallel to the plug direction P and is slightly slanted with respect to the plug direction P in order to exert a spring force acting perpendicularly to the plug direction P when interacting with a mating latching element (not shown) of a mating plug element. A plug face 10 of the plug element 1 faces into the plug direction P and is formed by the respective shapes and contours of the plug portion 2a, i.e. the outer shell 4, the plug 5, the receptacle 6, the contact receptacles 7 and the latching element 9 in a projection in parallel to the plug direction P.

[0031] The sealing element 3 comprises a ring member 30 and two retention elements 31a. An outer circumference 32 of the ring member 30 is provided with lamellas 32a extending along the outer circumference 32. An inner circumference 33 of the ring member 30 is also provided with lamella 33a extending in parallel to each other along the inner circumference 33. The ring member 30 forms a passage 34 with its inner circumference 33. The passage 34 extends in an axial direction Q of the ring member 30 extending essentially in parallel to a middle axis M_3 of the ring member 30 and the sealing element 1 from a front face 30a of the ring member to a rear face 30b of the ring member. The rear face 30b of the ring member 30 faces into an insertion direction I of the sealing element 3, in which insertion direction I the sealing element 3 is adapted to be inserted into the receptacle 6 of the housing 2. A retention element 31a of the sealing element 3 is arranged at the outer circumference 32 of the ring member 30 in the vicinity of a rear face 30b of the ring member. The retention element 31 a protrudes from the outer circumference 32 of the ring member 30 in a second radial direction R_2 .

[0032] Fig. 2 shows a schematic bottom view of the plug element 1. Here it becomes apparent that the contact receptacles 7 extend through the plug element 1 in parallel to the plug direction P. Hence, at a rear face 4c of the outer shell 4, the contact receptacles 7 have rear openings 7b opening towards the plug direction P. Fig. 3 shows a schematic side view of the plug element 1.

[0033] Fig. 4 is a schematic front view of the plug element 1 in a pre-mated state A with the sealing element 3 in the mounted position S. The sealing element 3 is

inserted into the housing 2 in the mounted position S and captively held in a retention position T of the retention element 31a. The sealing element is arranged within the receptacle 6 so that the inner circumference 33 of the sealing element 3 snugly encloses the outer circumference 5b of the plug 5. The outer circumference 32 of the sealing element 3 is distanced from the inner circumference 4b of the outer shell 4 such that a clearance 6b for accommodating a header shroud (not yet shown) of a mating plug element (not yet shown) extends between the inner circumference 4b of the outer shell 4 and the outer circumference 5b of the plug in the radial directions R_1 and R_2 .

[0034] Fig. 5 shows a schematic cross-sectional view of the plug element 1 along the cross-section line A-A illustrated in Fig. 3. Here the plug element 1 is in the pre-mated state A and ready to be brought into engagement with a mating plug element (not yet shown) in the plug direction P. The sealing element 3 is inserted into the receptacle 6 parallel to the insertion direction I.

[0035] The sealing element 3 comprises a sealing portion 3a and a retention portion 3b. The sealing portion 3a is arranged above the retention portion 3b, i.e. before the retention portion 3b in the insertion direction I or against the plug direction P. The inner circumference 33 of the sealing element 3 in the region of the retention portion 3a abuts the plug 5. The inner circumference 33 snugly encompasses a wall portion 5c of the plug 5, in particular an outer circumference 5d of the wall portion 5c. The rear face 30b formed at the retention portion 3b of the plug element 1 abuts the bottom 6a of the receptacle 6. Hence, the sealing element 3 is supported with its rear face 30b at the bottom 6a of the receptacle 6 such that forces acting in the insertion direction I and/or against the plug direction P may be absorbed at the bottom 6a of the receptacle 6.

[0036] A retention element 31b in the form of a recess or groove extends along the inner circumference 33 of the sealing element 3. A counter retention element 11 formed at the outer circumference 5b of the plug 5 engages with the retention element 31 b. Thereby, pulling out the sealing element 3 of the receptacle 6 in a direction opposite to the insertion direction I is prevented. The counter retention element 11 comprises a detent 11a in the form of a latching nose, a spring element 11b and a spring section 11 c. The detent 11 a is formed at the spring element 11b and protrudes therefrom in the radial direction R, R_2 . The spring element 11 b extends essentially in parallel to the plug direction P and/or insertion direction I. The spring element 11b may have the form of a lamella or latching tongue which may be connected to the housing 2 via the spring section 11c which may render the spring element 11b resiliently deflectable. The spring section 11c may comprise a recess or attenuation section where the material of the housing 2, e.g. of a wall of the housing 2, e.g. of the plug 5, may be weakened such that an elasticity of the spring section 11c is higher than an elasticity of the spring element 11b and/or the

housing 2, in particular of their walls. Hence, the spring element 11 b and therewith the detent 11 a may be at least slightly resiliently pivotable about the spring section 11c. In order to facilitate an insertion of a header shroud (not yet shown) of a mating plug element (not yet shown) into the clearance 6b in the mating plug direction P', the sealing element is provided with a front bevel 37.

[0037] Fig. 6 shows a schematic cross-sectional view of an electrical plug-in connector 200 comprising a plug element 1' and a mating element plug element 100 in a fully mated state B with the sealing element 3 in the mounted position S and/or retention element 31 c retention position T according to another embodiment of the present invention. The plug element 1' comprises a housing 2' with an outer shell 4' and a plug 5'. A header shroud 101 of the mating plug element 100 is inserted into the clearance 6b between the inner circumference 4b of the outer shell 4' and the outer circumference 32 of the sealing element 3' in the region of the sealing portion 3a. In the region of the retention portion 3b, a tip 101 a of the header shroud 101 is arranged in the vicinity of the bottom 6a of the receptacle 6. The outer circumference 101b of the header shroud 101 faces the inner circumference 4b of the outer shell 4'. An inner circumference 101 c of the header shroud 100 faces a counter retention element 11' formed at the plug element 1'.

[0038] The counter retention element 11' comprises a detent 11 a in the form of a snap-in nose formed at a spring element 11 b in the form of a latching tongue extending in the plug direction P. The spring element 11b is attached to the outer shell 4' via a spring section 11c about which the spring element 11b is resiliently deflectable such that the detent 11 a may be displaced in the radial direction R₁, i.e. in a direction extending perpendicularly to the insertion direction I such that the detent 11 a may be displaced by the rear face 30b while inserting the sealing element 3 into a clearance between the outer circumference 5b of the plug 5' and the retention element 11 a. Displacement of the retention element 11' perpendicularly to the insertion direction I is facilitated in that the rear face 30b of the spring element 3' is provided with a bevel 30d and accordingly, the detent is also provided with a bevel 11d.

[0039] In the retention position T of the retention element 11' shown in Fig. 6, the header shroud 101 and in particular the inner circumference 101c of the header shroud 101 blocks any movement of the counter retention element 11' in the radial direction R₁ and thereby prevents disengaging the detent 11 a and the retention element 31c. The plug 5', the retention portion 3b, the counter retention element 11', the header shroud 101 and the outer shell 4', in particular the inner circumference 4b of the outer shell 4' overlap in a projection along the radial direction R₁, thereby securing the counter retention element 11' in the retention position T.

[0040] Fig. 7 shows an embodiment of a plug-in connector 200' comprising a plug element 1" and the counter plug element 100 not belonging to the present invention.

The plug element 1" comprises a housing 2" with an outer shell 4". The outer shell 4" is provided with a counter retention element 11" having a spring element 11b in the form of a latching tongue extending in the insertion direction I. In the retention position T shown in Fig. 7, the retention portion 3b of the sealing element 3" is arranged between the counter retention element 11" and the outer circumference 5b of a plug 5" of the plug element 1". The header shroud 101 sits snugly between the inner circumference 4b of the outer shell 4" and the sealing portion 3a of the sealing element 3".

[0041] Fig. 8 shows another embodiment of a plug-in connector 200" comprising a plug element 1"" and a mating plug element 100 in the fully mated state B with a sealing element 3"" in the mounted position S not belonging to the present invention. A counter retention element 11"" is formed as a latching tongue attached to an outer shell 4"" and extending perpendicularly to the insertion direction I and in parallel to the radial direction R₁ and/or the radial direction R₂, the detent 11 a formed at the counter retention element 11"" juts into the retention element 31c. The retention portion 3b of the sealing element 3"" is jammed between the outer circumference 5b of a plug 5"" and the detent 11a. The retention portion 3b juts beyond the detent 11a in the insertion direction I with an annex 30e in the form of a detent.

[0042] Fig. 9 is a schematic front view of a region of the plug-in connector 200" shown in Fig. 8, where the counter retention element 11"" with its nose or detent 11a juts into the retention element 31 c in the form of a recess within the retention portion 3b in order to latch an embodiment of a sealing element 3 according to the present invention in the mounted position S of the sealing element and the retention position T of the counter retention element 31c and/or 31d and the counter retention element 11"".

[0043] A plug-in connector 200, 200', 200" may be provided with plug elements 1, 1', 1", 1"" and mating plug elements 100 in whatever form and shape required for mating electrical elements or terminals while transferring the plug-in connector from a pre-mated state A into a fully mated state B, bringing a sealing element 3, 3', 3", 3"" from a pre-mounted position into a mounted position S and retaining the sealing element 3, 3', 3", 3"" by an interaction of a retention element 31, 31a, 31 b, 31 c to interact with a counter retention element 11, 11', 11", 11"" in the retention position, such that the sealing element 3, 3', 3", 3"" may not or may at least not get easily pulled out of the receptacle 6 or pulled off the plug 5, 5', 5", 5"" in a direction against the insertion direction I. The plug element 1, 1', 1", 1"" may comprise housings 2, 2', 2", 2"" and sealing elements 3, 3', 3", 3"" in whatever number and form required by a desired application.

[0044] The housing 2, 2', 2", 2"" may have a plug portion 2a and terminal portion 2b formed by an outer shell 4, 4', 4", 4"" having an upper rim 4a, an inner circumference 4b and a rear face 4c as well as a plug 5, 5', 5", 5"" with a front side 5a and an outer circumference 5b in order to

form a receptacle 6 with a bottom 6a, a clearance 6b, contact receptacles 7, front openings 7a and rear openings 7b of the contact receptacles in any number, form, shape and arrangement required by the desired application. Furthermore, the plug element 1, 1', 1'', 1''' may have latching elements 9 with guidances 9a and latches 9b in whatever number and form required. The plug face 10 of the plug element 1, 1', 1'', 1''' may be designed as a standardised and/or customised plug face 10 according to any specific requirements of a certain application in order to be mated with a mating plug face comprising a header shroud 101 of a mating plug element 100.

[0045] The sealing element 3, 3', 3'', 3''' may be provided with a sealing portion 3a, a retention portion 3b, a ring member 30, a front face 30a, a rear face 30b, an outer circumference 32 with lamellas 32a, an inner circumference 33 with lamellas 33a, a through-hole 34, a retention element 35, a socket 36 and a front bevel 37 in whatever form, shape and number required for securely sealing up between the plug element 1, 1', 1'', 1''' and the mating plug element 100. The retention elements 31a to 31c may be provided with bevels 30d and annexes 30e in any form, number and shape required by a certain application in order to interact with a counter retention element 11, 11', 11'', 11''' formed at the plug element 1, 1', 1'', 1''' and/or the mating plug element 100 and having a spring element 11 b, a spring section 11c and/or a bevel 11 d in whatever number, form and shape required for secure engagement and/or prevention of unwanted deformation and pulling off of the counter retention element 11, 11', 11'', 11''' as well as possibly enabling a visual and/or tactile inspection of a correct position, i.e. a correct mounted position S of the sealing element 3, 3', 3'', 3''' and/or retention position T of the retention element 31 a-c, 35 and/or the counter retention elements 11, 11', 11'', 11''' preferably without additional components or processes.

Claims

1. Receptacle housing (2, 2') for a plug element (1, 1') and a mating plug element (100) of an electrical plug-in connector (200) in a plug-in direction (P) of the plug-in connector (200), with a sealing section adapted to hold a sealing element (3, 3') for sealing up between the plug element (1, 1') and the mating plug element (100), wherein the sealing section comprises at least one counter retention element (11, 11') adapted to engage with a retention element (31 a, 31 b, 31 c) formed at the sealing element (3, 3') in order to secure the sealing element (3, 3') against movements in parallel to the plug-in direction (P), and wherein the counter retention element (11, 11') is resiliently deflectable, **characterised in that** a cavity for at least partially receiving a header shroud (101) of the plug element (1, 1') or the mating plug element (100) is formed between the counter reten-

tion element (11, 11') and a wall of an outer shell (4) of the receptacle housing (2, 2').

2. Receptacle housing (2, 2') according to claim 1, **characterised in that** the at least one counter retention element (11, 11') is resiliently deflectable in a direction extending essentially perpendicularly to the plug-in direction (P).
3. Receptacle housing (2, 2') according to claim 1 or 2, **characterised in that** the counter retention element (11, 11') is formed as a snap-in tongue at least partially extending in parallel to the plug-in direction (P).
4. Sealing element (3, 3') for sealing up between a plug element (1, 1') and a mating plug element (100) of an electrical plug-in connector (200), an axial direction (Q) of the sealing element (3, 3') running essentially in parallel to a plug-in direction (P) for mating the plug element (1, 1') and the mating plug element (100), wherein the sealing element (3, 3') further comprises at least one retention element (31 a, 31 b, 31c) adapted to engage with a counter retention element (11, 11') formed at a receptacle housing (2, 2') according to at least one of claims 1 to 3 above of at least one of the plug element (1, 1') and the mating plug-element (100), in order to secure the sealing element (3, 3') against movements in the axial direction (Q), and wherein the at least one retention element (31a, 31 b, 31c) is formed as a recess, **characterised in that** the sealing element (3, 3') comprises a sealing portion (3a) and a latching portion (3b) attached to the sealing portion (3a) and providing the at least one retention element (31a, 31b, 31c), wherein the sealing portion (3a) and the latching portion (3b) have an essentially planar side (33) on a side of the sealing element (3, 3') lying opposite to the retention element (31a, 31b, 31c).
5. Sealing element (3, 3') according to claim 4, **characterised in that** the at least one retention element (31a, 31b, 31c) at least partially extends in a radial direction (R_1 , R_2) of the sealing element (3, 3'), wherein the radial direction (R_1 , R_2) is extending essentially perpendicularly to the axial direction (Q).
6. Sealing element (3, 3') according to claim 4 or 5, **characterised in that** the at least one retention element (31a, 31b, 31c) is formed as a groove at least partially extending along a circumference (32, 33) of the sealing element (3, 3').
7. Sealing element (3, 3') according to at least one of claims 4 to 6, **characterised in that** the retention element (31a, 31b, 31c) provides an engagement surface which is at least partially bevelled with respect to the axial direction (Q).

8. Sealing element (3, 3') according to at least one of claims 4 to 7, **characterised in that** the sealing element (3, 3') at least partially has a ring-like cross-section.
9. Sealing element (3, 3') according to at least one of claims 4 to 8, **characterised in that** the sealing element (3, 3') generally has a tubular shape.
10. Electrical plug-in connector (200) comprising a receptacle housing (2, 2') according to any of claims 1 to 3 and at least one sealing element (3, 3') according to any of claims 4 to 9, **characterised in that** the plug-in connector (200) comprises at least one plug element (1, 1') and a mating plug element (100), wherein in a fully mated state (B) of the at least one plug element (1, 1') and the at least one mating plug element (100), the retention element (31a, 31b, 31c) and the counter retention element (11, 11') are blocked in a retention position (T).
11. Electrical plug-in connector (200) according to claim 10, **characterised in that** in the fully mated state (B) the retention element (31a, 31b, 31c) and the counter retention element (11, 11") overlap with the plug element (1, 1') and the mating plug element (100) in a direction perpendicular to the plug-in direction (P).

Patentansprüche

1. Buchsengehäuse (2, 2') für ein Steckerelement (1, 1') und ein Gegen-Steckerelement (100) eines elektrischen Einsteckverbinders (200) in einer Einsteck-Richtung (P) des Einsteckverbinders (200) mit einem Dichtungsabschnitt, der so eingerichtet ist, dass er ein Dichtungselement (3, 3') hält, mit dem zwischen dem Steckerelement (1, 1') und dem Gegen-Steckerelement (100) abgedichtet wird, wobei der Dichtungsabschnitt wenigstens ein Gegenhalteelement (11, 11') umfasst, das so eingerichtet ist, dass es mit einem Halteelement (31a, 31b, 31c) in Eingriff kommt, das an dem Dichtungselement (3, 3') ausgebildet ist, um das Dichtungselement (3, 3') gegen Bewegungen parallel zu der Einsteck-Richtung (P) zu sichern, und das Gegenhalteelement (11, 11') elastisch durchgebogen werden kann, **dadurch gekennzeichnet, dass** ein Hohlraum, in dem eine vordere Abdeckung (101) des Steckerelementes (1, 1') oder des Gegen-Steckerelementes (100) wenigstens teilweise aufgenommen ist, zwischen dem Gegenhalteelement (11, 11') und einer Wand einer äußeren Ummantelung (4) des Buchsengehäuses (2, 2') ausgebildet ist.
2. Buchsengehäuse (2, 2') nach Anspruch 1, **dadurch gekennzeichnet, dass** das wenigstens eine Gegenhalteelement (11, 11') in einer Richtung, die im

Wesentlichen senkrecht zu der Einsteck-Richtung (P) verläuft, elastisch durchgebogen werden kann.

3. Buchsengehäuse (2, 2') nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** das Gegenhalteelement (11, 11') als eine Einrastzunge ausgebildet ist, die sich wenigstens teilweise parallel zu der Einsteck-Richtung (P) erstreckt.
4. Dichtungselement (3, 3') zum Abdichten zwischen einem Steckerelement (1, 1') und einem Gegen-Steckerelement (100) eines elektrischen Einsteckverbinders (200), wobei eine axiale Richtung (Q) des Dichtungselementes (3, 3') im Wesentlichen parallel zu einer Einsteck-Richtung (P) zum Ineinandereinstecken des Steckerelementes (1, 1') und des Gegen-Steckerelementes (100) verläuft, das Dichtungselement (3, 3') des Weiteren wenigstens ein Halteelement (31a, 31b, 31c) umfasst, das so eingerichtet ist, dass es mit einem Gegenhalteelement (11, 11') in Eingriff kommt, das an einem Buchsengehäuse (2, 2') nach wenigstens einem der Ansprüche 1 bis 3 des Steckerelementes (1, 1') oder/und des Gegen-Steckerelementes (100) ausgebildet ist, um das Dichtungselement (3, 3') gegen Bewegungen in der axialen Richtung (Q) zu sichern, und das wenigstens eine Halteelement (31a, 31b, 31c) als eine Aussparung ausgebildet ist, **dadurch gekennzeichnet, dass** das Dichtungselement (3, 3') einen Dichtungsabschnitt (3a) und einen Arretierabschnitt (3b) umfasst, der an dem Dichtungsabschnitt (3a) angebracht ist und das wenigstens eine Halteelement (31a, 31b, 31c) aufweist, wobei der Dichtungsabschnitt (3a) und der Arretierabschnitt (3b) eine im Wesentlichen plane Seite (33) an einer Seite des Dichtungselementes (3, 3') haben, die dem Halteelement (31a, 31b, 31c) gegenüberliegt.
5. Dichtungselement (3, 3') nach Anspruch 4, **dadurch gekennzeichnet, dass** sich das wenigstens eine Halteelement (31a, 31b, 31c) wenigstens teilweise in einer radialen Richtung (R_1 , R_2) des Dichtungselementes (3, 3') erstreckt, wobei die radiale Richtung (R_1 , R_2) im Wesentlichen senkrecht zu der axialen Richtung (Q) verläuft.
6. Dichtungselement (3, 3') nach Anspruch 4 oder 5, **dadurch gekennzeichnet, dass** das wenigstens eine Halteelement (31a, 31b, 31c) als eine Nut ausgebildet ist, die wenigstens teilweise an einem Umfang (32, 33) des Dichtungselementes (3, 3') entlang verläuft.
7. Dichtungselement (3, 3') nach wenigstens einem der Ansprüche 4 bis 6, **dadurch gekennzeichnet, dass** das Halteelement (31a, 31b, 31c) eine Eingriffsfläche aufweist, die in Bezug auf die axiale Richtung (Q) wenigstens teilweise abgeschrägt ist.

8. Dichtungselement (3, 3') nach wenigstens einem der Ansprüche 4 bis 7, **dadurch gekennzeichnet, dass** das Dichtungselement (3, 3') wenigstens teilweise einen ringartigen Querschnitt hat.
9. Dichtungselement (3, 3') nach wenigstens einem der Ansprüche 4 bis 8, **dadurch gekennzeichnet, dass** das Dichtungselement (3, 3') im Allgemeinen eine Röhrenform hat.
10. Elektrischer Einsteckverbinder (200), der ein Buchsengehäuse (2, 2') nach einem der Ansprüche 1 bis 3 und wenigstens ein Dichtungselement (3, 3') nach einem der Ansprüche 4 bis 9 umfasst, **dadurch gekennzeichnet, dass** der Einsteckverbinder (200) wenigstens ein Steckerelement (1, 1') und ein Gegen-Steckerelement (100) umfasst, wobei in einem vollständig ineinandergesteckten Zustand (B) des wenigstens einen Steckerelementes (1, 1') und des wenigstens einen Gegen-Steckerelementes (100) das Halteelement (31a, 31b, 31c) und das Gegenhalteelement (11, 11') in einer HaltePosition (T) arretiert sind.
11. Elektrischer Einsteckverbinder (200) nach Anspruch 10, **dadurch gekennzeichnet, dass** in dem vollständig ineinandergesteckten Zustand (B) sich das Halteelement (31a, 31b, 31c) und das Gegenhalteelement (11, 11') mit dem Steckerelement (1, 1') und dem Gegen-Steckerelement (100) in einer Richtung senkrecht zu der Einsteck-Richtung (P) überlappen.

Revendications

1. Logement femelle (2, 2') pour élément de prise (1, 1') et élément de prise d'accouplement (100) d'un connecteur enfichable électrique (200) dans une direction d'enfichage (P) du connecteur enfichable (200), avec une section d'étanchéité conçue pour contenir un élément d'étanchéité (3, 3') afin d'assurer une étanchéité entre l'élément de prise (1, 1') et l'élément de prise d'accouplement (100), dans lequel la section d'étanchéité comprend au moins un élément de retenue antagoniste (11, 11') conçu pour se mettre en prise avec un élément de retenue (31a, 31b, 31c) formé au niveau de l'élément d'étanchéité (3, 3') afin d'empêcher des mouvements de l'élément d'étanchéité (3, 3') parallèlement à la direction d'enfichage (P), et dans lequel l'élément de retenue antagoniste (11, 11') peut être dévié élastiquement, **caractérisé en ce qu'**une cavité destinée à recevoir, au moins partiellement, une coiffe d'embase (101) de l'élément de prise (1, 1') ou de l'élément de prise d'accouplement (100) est formée entre l'élément de retenue antagoniste (11, 11') et une paroi d'une enveloppe extérieure (4) du logement femelle (2, 2').

2. Logement femelle (2, 2') selon la revendication 1, **caractérisé en ce que** l'au moins un élément de retenue antagoniste (11, 11') peut être dévié élastiquement dans une direction s'étendant de manière essentiellement perpendiculaire à la direction d'enfichage (P).
3. Logement femelle (2, 2') selon la revendication 1 ou 2, **caractérisé en ce que** l'élément de retenue antagoniste (11, 11') est formé en tant que languette encliquetable s'étendant, au moins partiellement, parallèlement à la direction d'enfichage (P).
4. Élément d'étanchéité (3, 3') destiné à assurer une étanchéité entre un élément de prise (1, 1') et un élément de prise d'accouplement (100) d'un connecteur enfichable électrique (200), une direction axiale (Q) de l'élément d'étanchéité (3, 3') étant essentiellement parallèle à une direction d'enfichage (P) pour l'accouplement de l'élément de prise (1, 1') et de l'élément de prise d'accouplement (100), dans lequel l'élément d'étanchéité (3, 3') comprend, en outre, au moins un élément de retenue (31a, 31b, 31c) conçu pour se mettre en prise avec un élément de retenue antagoniste (11, 11') formé au niveau d'un logement femelle (2, 2') selon au moins une des revendications 1 à 3 ci-dessus d'au moins l'un de l'élément de prise (1, 1') et de l'élément de prise d'accouplement (100) afin d'empêcher des mouvements de l'élément d'étanchéité (3, 3') dans la direction axiale (Q), et dans lequel l'au moins un élément de retenue (31a, 31b, 31c) est formé en tant qu'évidement, **caractérisé en ce que** l'élément d'étanchéité (3, 3') comprend une partie d'étanchéité (3a) et une partie de verrouillage (3b) reliée à la partie d'étanchéité (3a) et fournissant l'au moins un élément de retenue (31a, 31b, 31c), dans lequel la partie d'étanchéité (3a) et la partie de verrouillage (3b) ont un côté (33) essentiellement plan sur un côté de l'élément d'étanchéité (3, 3') opposé à l'élément de retenue (31a, 31b, 31c).
5. Élément d'étanchéité (3, 3') selon la revendication 4, **caractérisé en ce que** l'au moins un élément de retenue (31a, 31b, 31c) s'étend au moins partiellement dans une direction radiale (R_1, R_2) de l'élément d'étanchéité (3, 3'), dans lequel la direction radiale (R_1, R_2) s'étend de manière essentiellement perpendiculaire à la direction axiale (Q).
6. Élément d'étanchéité (3, 3') selon la revendication 4 ou 5, **caractérisé en ce que** l'au moins un élément de retenue (31a, 31b, 31c) est formé en tant que rainure s'étendant au moins partiellement le long d'une circonférence (32, 33) de l'élément d'étanchéité (3, 3').
7. Élément d'étanchéité (3, 3') selon au moins une des

revendications 4 à 6, **caractérisé en ce que** l'élément de retenue (31a, 31b, 31c) fournit une surface de mise en prise qui est au moins en partie biseautée par rapport à la direction axiale (Q).

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8. Élément d'étanchéité (3, 3') selon au moins une des revendications 4 à 7, **caractérisé en ce que** l'élément d'étanchéité (3, 3') possède, au moins en partie, une section transversale annulaire.

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9. Élément d'étanchéité (3, 3') selon au moins une des revendications 4 à 8, **caractérisé en ce que** l'élément d'étanchéité (3, 3') a globalement une forme tubulaire.

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10. Connecteur enfichable électrique (200) comprenant un logement femelle (2, 2') selon l'une quelconque des revendications 1 à 3 et au moins un élément d'étanchéité (3, 3') selon l'une quelconque des revendications 4 à 9, **caractérisé en ce que** le connecteur enfichable (200) comprend au moins un élément de prise (1, 1') et un élément de prise d'accouplement (100), dans lequel, dans un état complètement accouplé (B) de l'au moins un élément de prise (1, 1') et l'au moins un élément de prise d'accouplement (100), l'élément de retenue (31a, 31b, 31c) et l'élément de retenue antagoniste (11, 11') sont bloqués dans une position de retenue (T).

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11. Connecteur enfichable électrique (200) selon la revendication 10, **caractérisé en ce que**, dans l'état complètement accouplé (B), l'élément de retenue (31a, 31b, 31c) et l'élément de retenue antagoniste (11, 11 ") chevauchent l'élément de prise (1, 1') et l'élément de prise d'accouplement (100) dans une direction perpendiculaire à la direction d'enfichage (P).

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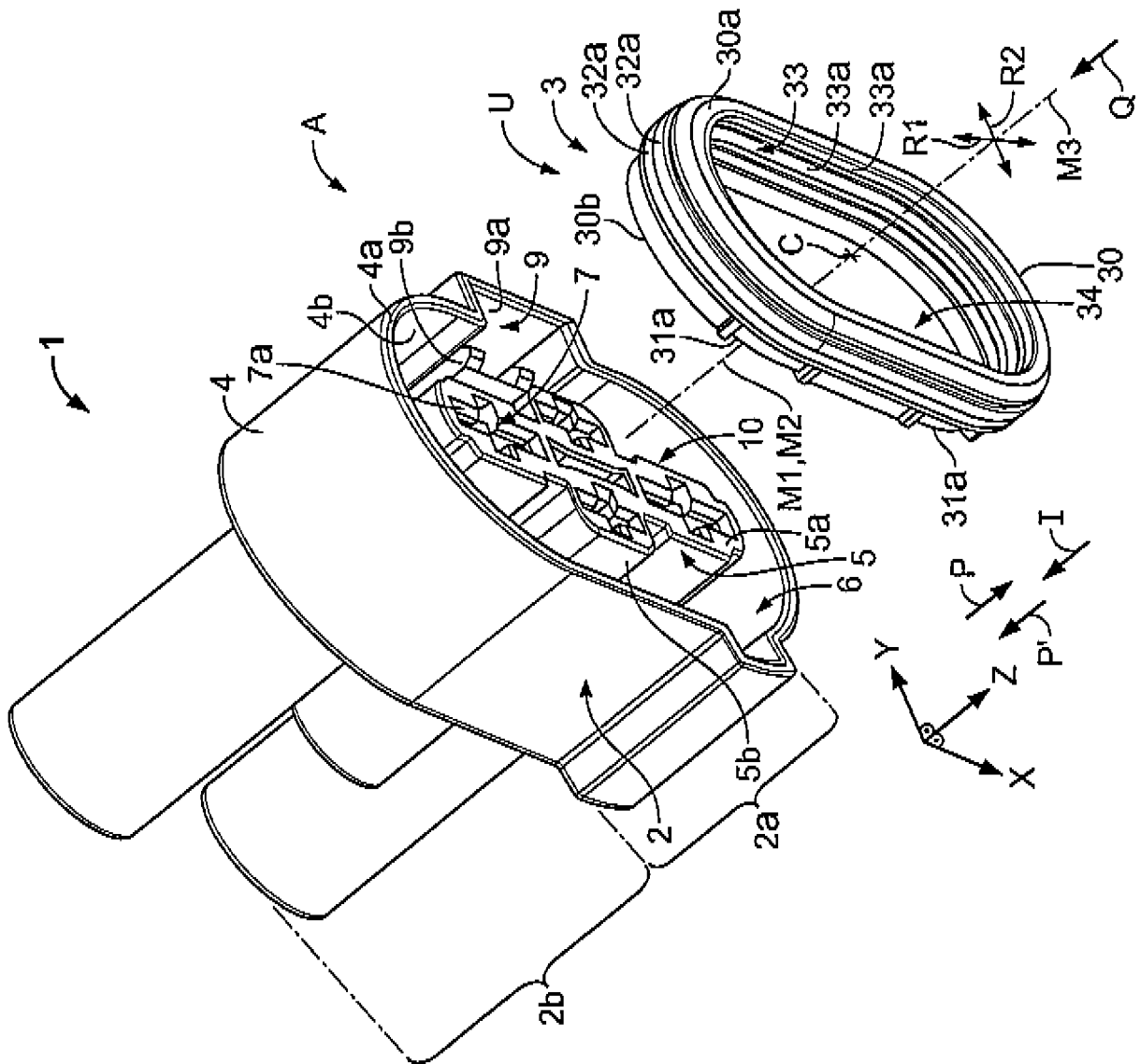


Fig. 1

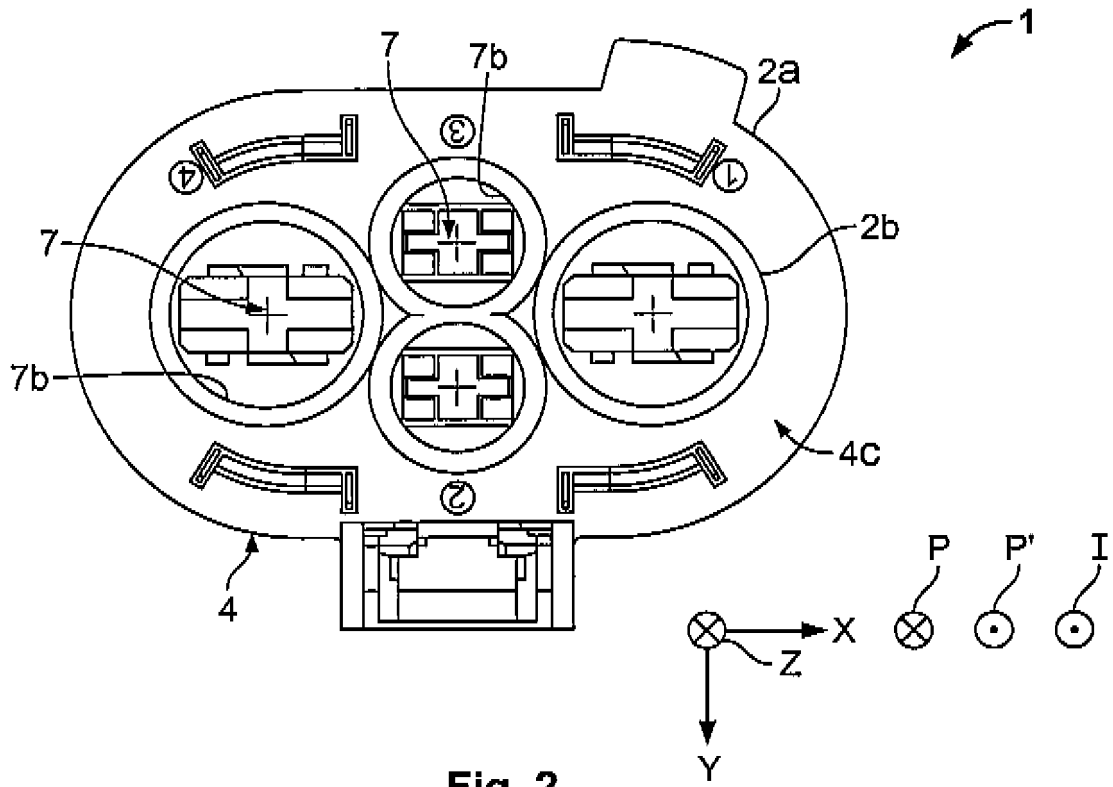


Fig. 2

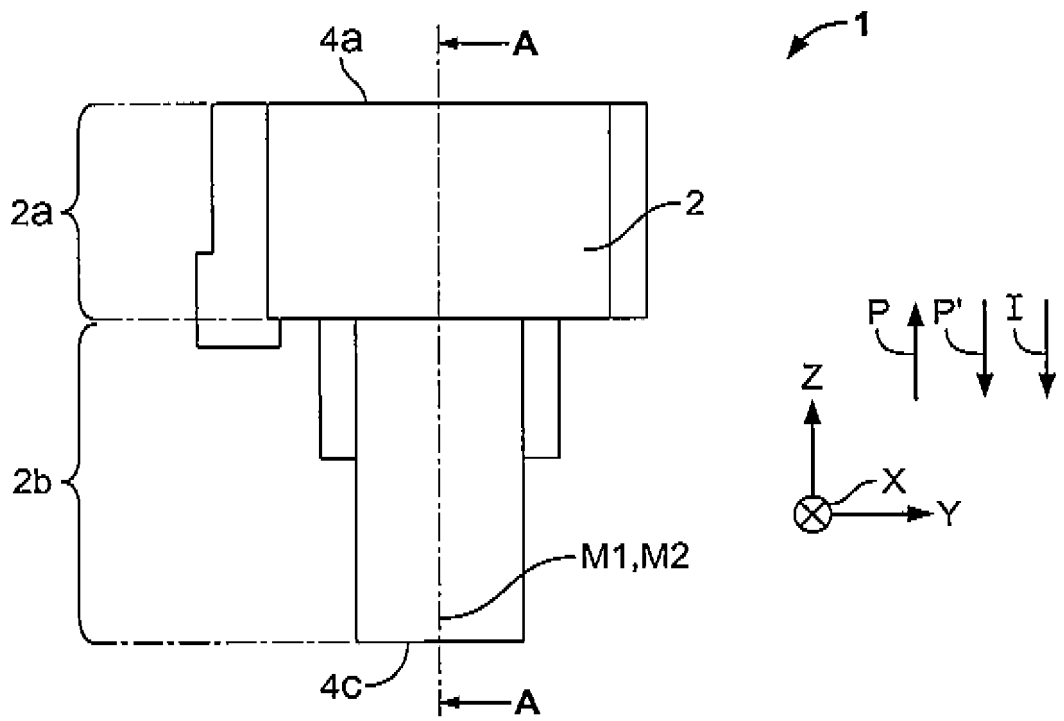


Fig. 3

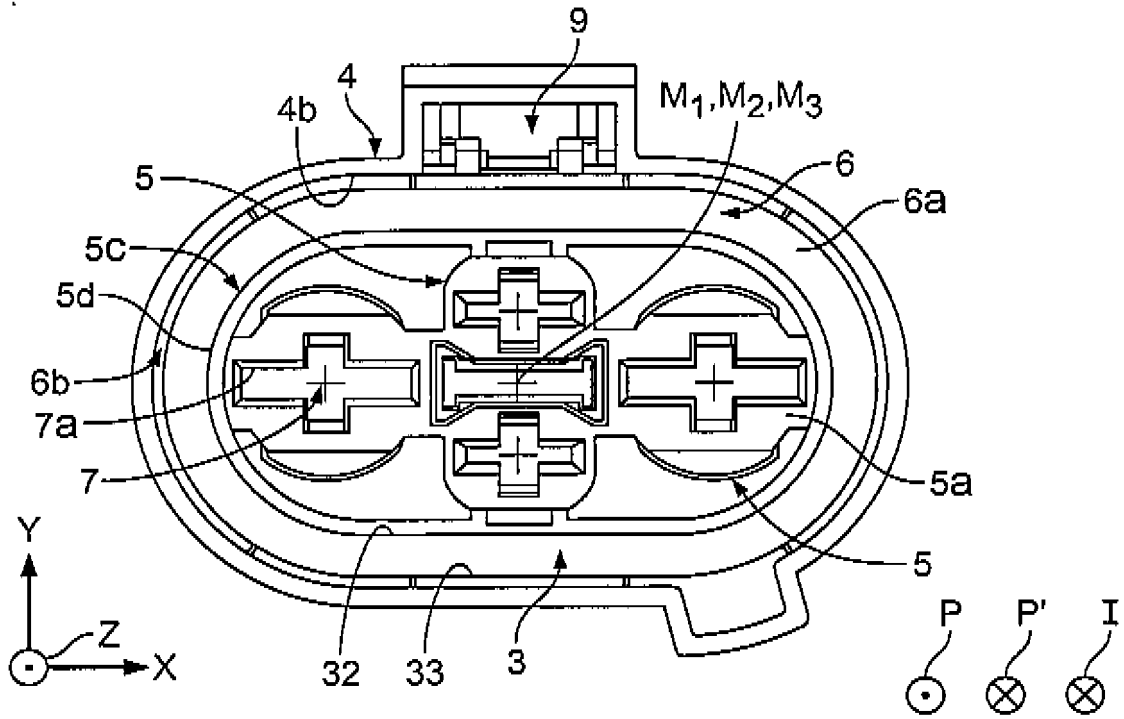


Fig. 4

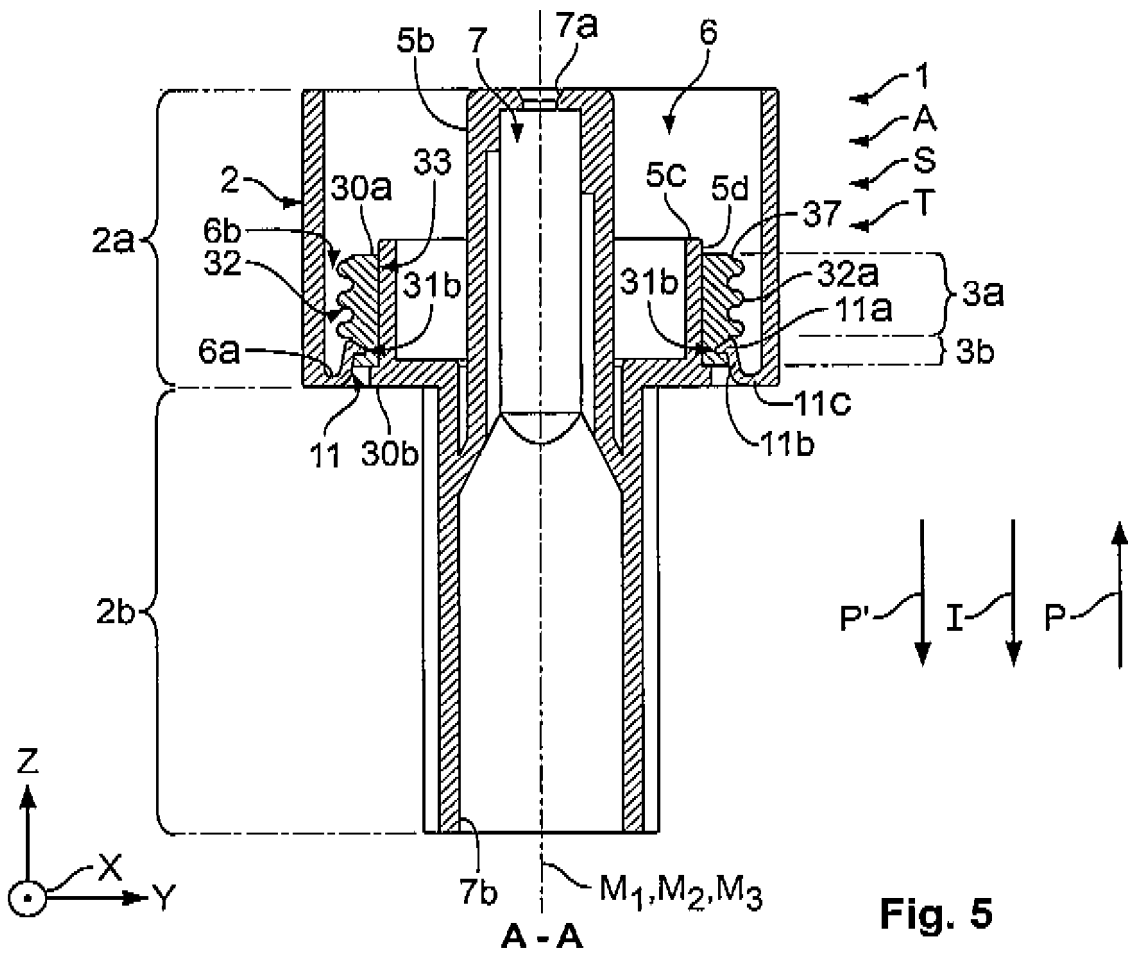


Fig. 5

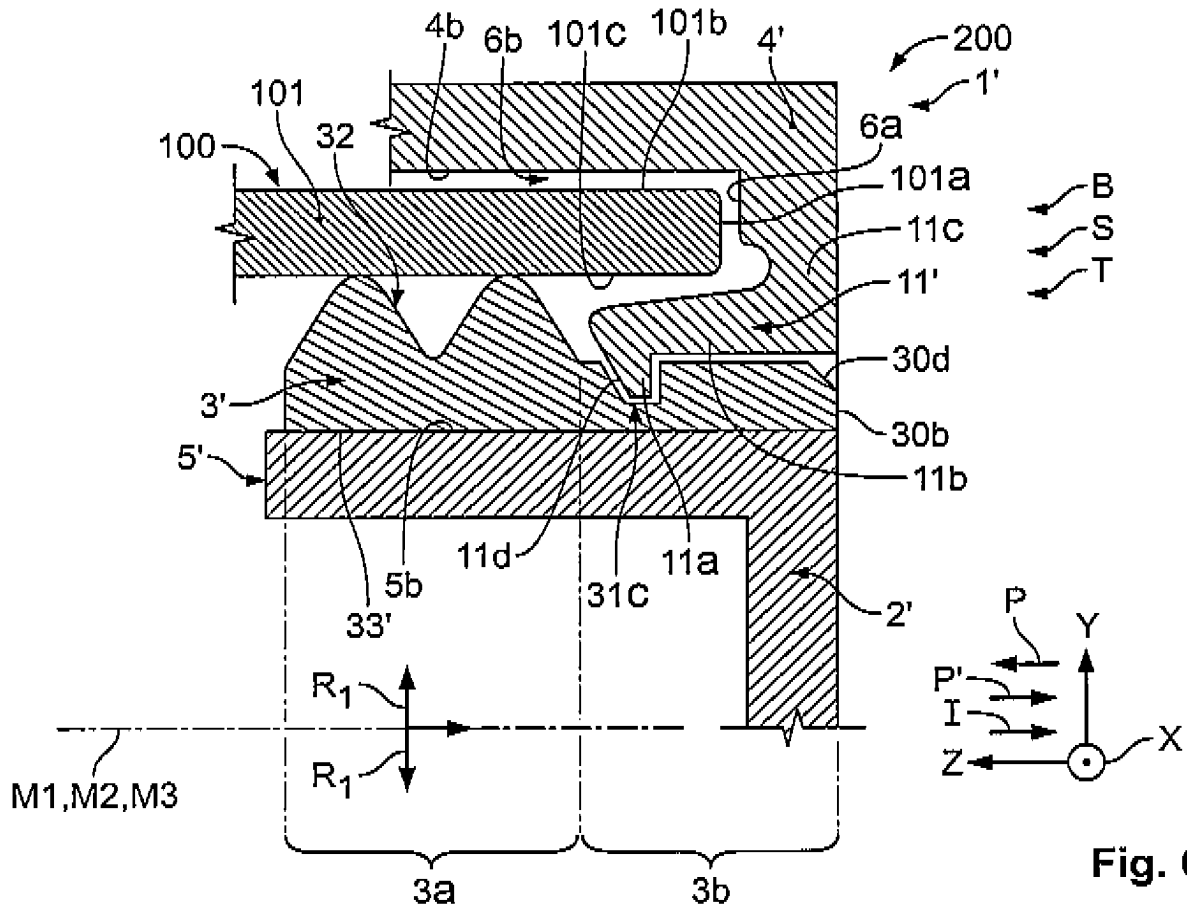


Fig. 6

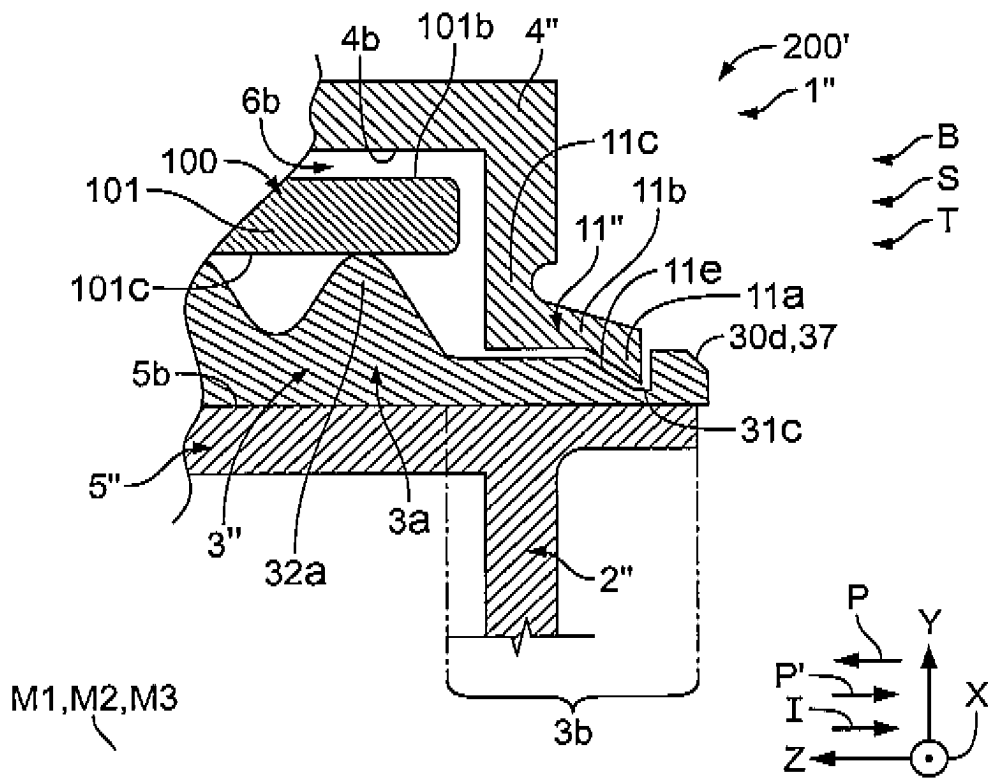


Fig. 7

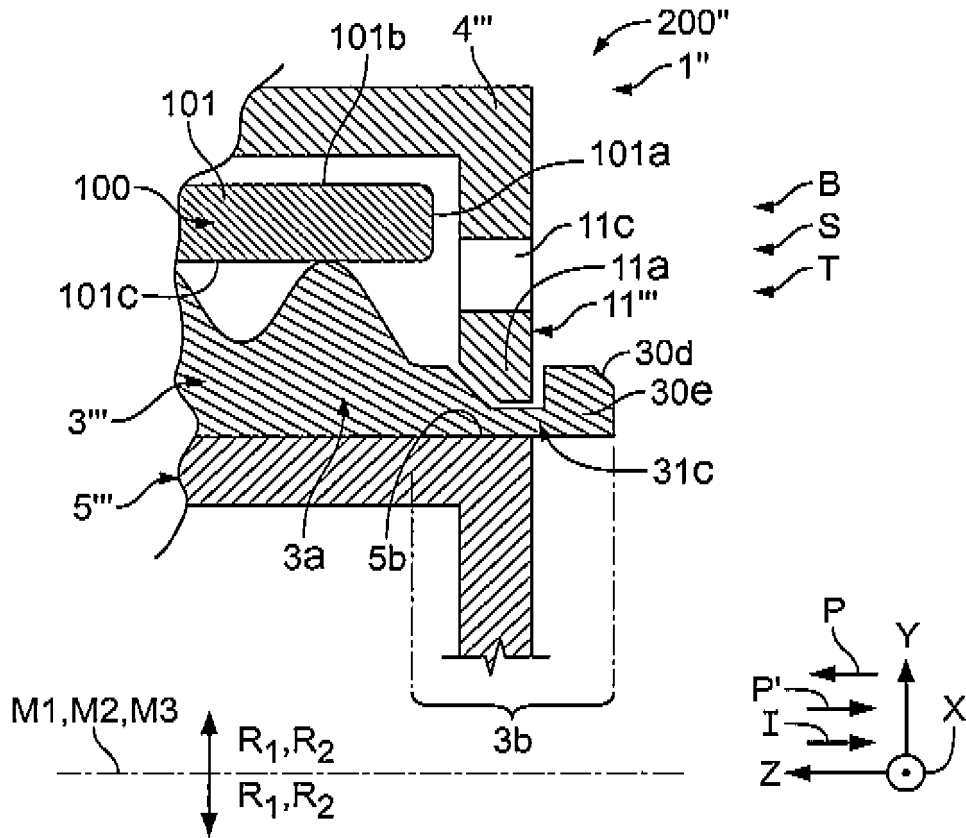


Fig. 8

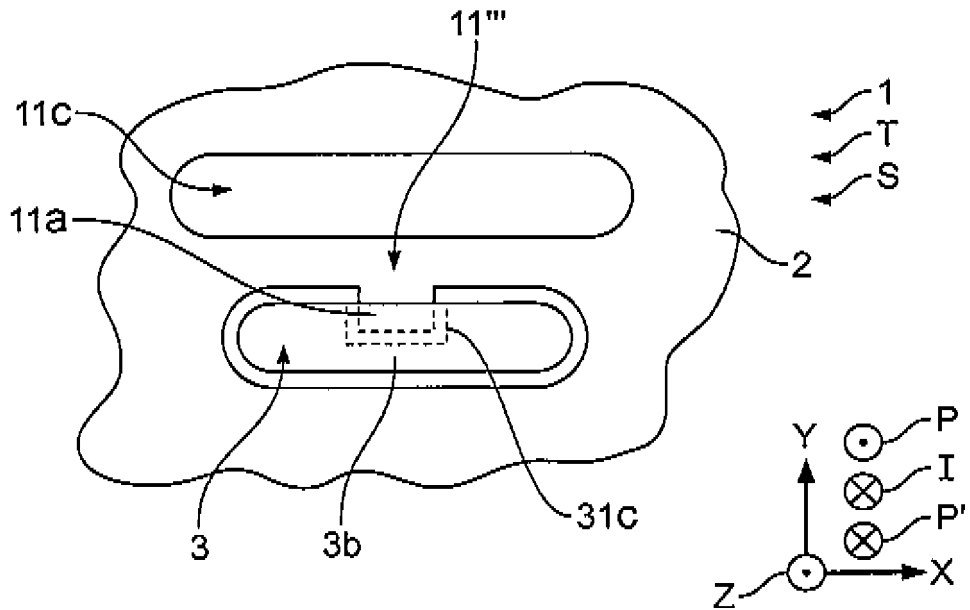


Fig. 9

REFERENCES CITED IN THE DESCRIPTION

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