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(54) **PLUG CONNECTOR HOUSING WITH A FIXING FOR AN ELECTRIC CONTACT ELEMENT AND A CABLE**

STECKVERBINDERGEHÄUSE MIT EINER FIXIERUNG FÜR EIN ELEKTRISCHES
KONTAKTELEMENT UND EINE ELEKTRISCHE LEITUNG

BOÎTIER DE FICHE DE CONNEXION AVEC UNE FIXATION POUR UN ÉLÉMENT DE CONTACT
ÉLECTRIQUE ET UN CÂBLE

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(72) Inventor: **GIMBEL, Markus**

85107 Baar-Ebenhausen (DE)

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(74) Representative: **Patentanwaltskanzlei WILHELM
& BECK**

**Prinzenstraße 13
80639 München (DE)**

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(73) Proprietor: **TE Connectivity Germany GmbH
64625 Bensheim (DE)**

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Description

[0001] The invention relates to a plug connector housing, i.e. a socket or pin connector housing for an electric plug connector of an air bag, in particular an air bag of a motor vehicle. The invention further relates to an electric plug connector or a mating electric plug connector, and also to an electrical plug-in connection, in particular for an electrical clock spring connection or an electrical coupling, to a plug connector housing according to the invention or an electric plug connector according to the invention and a mating plug connector housing corresponding thereto or a mating electric plug connector corresponding thereto.

[0002] Electric plug connectors or plug-in connections for a releasable, mechanical, electrical connection for electric cables and terminals are known in a large number of embodiments. In the case of plug connectors, the cables are usually mechanically and electrically connected to electric contact elements (socket or pin contact) by crimping and/or compacting-welding, the electric contact elements usually being arranged and locked in contact chambers of a plug connector housing.

[0003] Electric plug connectors are subject to the requirement that loading of the cables, such as for example cable movements and/or cable vibrations resulting from rough environmental conditions, for example in a motor vehicle, should be transferred neither to the electrical connection between the cable and the electric contact element nor to the electrical connection between two contact elements of a plug-in connection. Although mechanical loads acting on the electric plug connector or the plug-in connection can be kept at bay by a separate member, arranged after the electric plug connector or before and after the plug-in connection, for intercepting the cables connected to the electric contact elements, this disadvantageously increases the number of parts, the costs and the complexity of assembly.

[0004] DE 4015793 A1 discloses an electric plug connector which is protected from pressurised or hose water and in which an external cable mount provided with cable insertion slots is provided for holding an electric cable provided with a seal, and also a further seal which is configured as a cap and can be attached to the cable mount from the outside. Electric contact elements of the electric plug connector are arrested in a conventional manner and not by the cable mount.

[0005] US 4200350 discloses an electric plug connector comprising a substantially L-shaped, pivotable lid which is configured in one piece with a plug connector housing, apertures, which form together with corresponding apertures on the housing when the lid is closed a respective conduit for an electric cable, being provided at a free end of the lid. The intermediate portions, separating the apertures, of the lid and the housing secure the electric contact elements provided in the electric plug connector in a translatable direction. The cables are however not fixed by the electric plug connector when the lid

is closed.

[0006] FR 2 821 493 describes an electric connector with a clamp body. The connector comprises a body with an opening through which a cable can be inserted to be connected to an electric contact element. The connector further comprises a cover with first and second means for fixating the cable in the connector. The cover further comprises a means for locking the contact element inside the connector.

[0007] US 5,871,374 discloses a connector housing for an electrical terminal. The housing includes a base member and a top member having two discrete segments. One of the segments engages the base member so as to retain an electrical terminal to which an electrical connection can be made. A second segment of the top member engages the base member so as to enclose the electrical connection made to the terminal.

[0008] US 2002/0025713 A1 describes a connector that comprises a housing into which a metal terminal is inserted. A wire cable is connected with the metal terminal and is led to a location outside the housing. A wire cable cover is mountable onto the housing and fastened portions of the wire cable. A lock is formed in the housing that allows the housing to be locked with a mating housing.

[0009] US 5,624,273 discloses an electrical contact assembly for terminating at least one electrical wire. The connector assembly includes a housing with a recess for receiving an electrical contact therein. The electrical contact comprises an insulation displacement contact section and a wire strain relief section.

[0010] EP 1 204 172 A1 describes an electrical connector that can be connected to at least one conductive wire. The connector comprises a housing with a recess for receiving an electrical contact element through a service opening. The electrical contact element can be fixated in the housing. The housing further comprises a cover that is designed to cap the service opening.

[0011] It is an object of the invention to disclose an improved plug connector housing for an electric plug connector or an improved electric plug connector. In particular, it is an object of the invention to provide, while keeping down the number of parts, the costs and the complexity of assembly, a fixing of an electric contact element and a cable in/on the plug connector housing. Preferably, this should be achieved by a single fixing element. Furthermore, it is an object of the invention to disclose an electrical plug-in connection to an electric plug connector according to the invention and a mating electric plug connector corresponding thereto.

[0012] The object of the invention is achieved by a plug connector housing according to claim 1, an electric plug connector according to claim 9 and an electrical plug-in connection according to claim 10.

[0013] The plug connector housing according to the invention has a single fixing element made of one or more parts for securing an electric contact element and for securing a cable in/on the plug connector housing. In this

case, the fixing element allows the electric contact element to be arrested in the plug connector housing and at the same time the cable to be secured on the plug connector housing.

[0014] In a preferred embodiment of the invention, the fixing element has a locking member for securing the electric contact element and a clamping member for securing the cable. This allows the electric contact element to be secured in the plug connector housing in a locked position of the fixing element or the locking member. Furthermore, the cable can be arrested on the plug connector housing in a clamped position of the fixing element or the clamping member.

[0015] In preferred embodiments of the invention, the fixing element or only the locking member or only the clamping member or the locking and the clamping member are connected in one piece, in particular materially in one piece, to the plug connector housing. In the latter embodiment, it is possible to configure the respective locking and clamping member directly (materially) in one piece with the plug connector housing, or to provide the clamping member (materially) in one piece with the locking member which is then configured in one piece with the plug connector housing.

[0016] The plug connector housing according to the invention is distinguished by simple and rapid manufacture. Additionally, the plug connector housing according to the invention requires just a single injection mould, a low overall height and a compact design. It is, in particular, advantageous that the designing of the plug connector housing comprising electric contact elements requires no additional parts such as cable ties or a winding strip in order to secure on the one hand the electric contact element in the plug connector housing and on the other hand the cable on the plug connector housing. This provides the advantage of simple processability by manufacturer and also, owing to the construction, of free access wherein equipping the plug connector housing with contact elements. Furthermore, the cable fixing according to the invention serves also as an additional strain relief member.

[0017] The invention can readily be implemented in a socket and/or in a plug of the electrical plug-in connection, thus advantageously providing a cable fixing according to the invention on both sides of the plug-in connection, for example a floating electrical coupling.

[0018] In a preferred embodiment of the invention, the fixing element pivots with respect to the plug connector housing via a first hinge, preferably a film hinge. In this case, it is preferable if the locking member and the clamping member of the fixing element are joined together via a second hinge, preferably a film hinge. In this case, it is again preferable if the locking member is connected to the plug connector housing via the first hinge, preferably a film hinge, and the clamping member is connected to the locking member again via the second hinge, preferably a film hinge. In other words, the clamping member connects mechanically to the locking member. Clamping

and locking member form the fixing element according to the invention, the locking member of which is articulated to the plug connector housing.

[0019] Preferably, the locking and the clamping member are each configured as substantially right parallelepiped tabs which can be placed against one another or on one another on the plug connector housing, wherein the locking and the clamping member assume, when placed against one another, its locked position and its clamped position respectively.

[0020] If both the locking member and the clamping member are in their respective open position (the locking member is not in the locked position and the clamping member is not in the clamped position), the clamping member and the locking member have, when viewed from the side, together with an adjoining wall of the plug connector housing an approximately S-shaped configuration. In this case, the clamping member merges with the locking member in an arc, preferably an approximately 180 degree arc (U-shaped), and the locking member merges with a wall of the electric plug connector in an arc, preferably likewise an approximately 180 degree arc (U-shaped). Preferably, the respective hinge is in this case configured as a film hinge and in each case connects directly to an arc. In other words, the film hinge of the locking member is itself preferably a portion of the locking member, and the film hinge of the clamping member is itself preferably a portion of the clamping member.

[0021] In the case of an electric plug connector according to the invention (plug connector housing comprising at least one electric contact element received therein and preferably a cable connected electrically thereto), the locking member engages at least one contact element. In this case, a projection of the locking member preferably protrudes into a recess in the electric contact element.

[0022] Preferably, the locking member is arranged on an outside of the plug connector housing, the projection of the locking member partly protruding in the locked position through a through-recess in a contact chamber wall. This portion of the projection serves to engage the electric contact element. Furthermore, this preferably allows engagement of the locking member on the plug connector housing, an edge of the projection engaging on an edge of the through-recess. In addition, further locking and/or positional fixing of the locking member with the plug connector housing can be provided.

[0023] The clamping member according to the invention, which is preferably articulated to the locking member, has a device for clamping the cable. In this case, the clamping device is preferably configured as a comb having at least one clamping groove. Furthermore, it is possible for the clamping member to interact in the clamped position with a portion of the plug connector housing and thus to clamp or secure the cable on the clamping member or the plug connector housing.

[0024] In a preferred embodiment of the invention, the actual clamping device protrudes from the tab of the clamping member substantially at a right angle. In the

clamped position, the protruding clamping device overlaps a region for accessing one or more contact chambers of the plug connector housing in which the electric contact elements are received. This overlapping according to the invention allows the clamping device to enter the region of the cables. In the clamped position, the clamping member is located, preferably at least in part, directly adjacent to the locking member resting preferably against the plug connector housing. In this case, the clamping device overlaps a portion of the locking member that is articulated to the plug connector housing.

[0025] In one embodiment of the invention, the clamping member is locked or secured in the clamped position, preferably by the clamping device, to a portion of the plug connector housing. This allows the clamping member to be secured to the plug connector housing, thus preventing movements of the cable from propagating into the fixing element as a whole. The clamping member, which is preferably rigid in its configuration, thus secures the cables to the plug connector housing, thus preventing movements of the cable from propagating into the electric contact element. Furthermore, the clamping member can be secured to the plug connector housing and/or to the locking member, for example by locking.

[0026] In preferred embodiments of the invention, the clamping device has at least one clamping groove in which a cable can be clamped. In this case, the clamping groove is configured in such a way that it can reliably clamp the cable or electrical insulation of the cable. This is achieved either as a result of the fact that the width of the groove is configured so as to be slightly less than a diameter of the cable or by a tapering groove into which the cable is inserted with a certain degree of force.

[0027] In a preferred embodiment of the invention, the clamping device is configured in the manner of a comb with alternating clamping grooves and fingers, the fingers preferably being partly resilient. Resilient fingers allow effective clamping of a cable in a groove. Furthermore, it is possible to provide on the fingers projections, which protrude inward in the direction of the groove, in such a way that these projections on the one hand clamp the cable and on the other hand prevent the cable from leaving the groove. Furthermore, locking recesses can be provided at the edges of the groove, i.e. in the fingers, recesses being provided in two directly adjacent fingers in such a way that they at least partly accommodate a cable and thus clamp the cable. Furthermore, another form of engagement, for example by a slide on the clamping device, can additionally be used. In addition, it is possible to make the cable thinner in a region to be clamped in the clamping device, wherein on the one hand the grooves or the fingers are adapted thereto in such a way that they continue to clamp the cable (see above) and on the other hand the thinning of the cable causes it to be clamped on the fingers in a direction perpendicular thereto (direction in which the electric contact elements are inserted during manufacture).

[0028] Additional embodiments of the invention

emerge from the remaining dependent claims.

[0029] The invention will be described hereinafter based on exemplary embodiments and with reference to the appended drawings, in which:

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Fig. 1 is an exploded perspective view of an electric plug connector showing a plug connector housing and a connector position assurance member according to the invention;

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Fig. 2 is a plan view of the plug connector housing from Fig. 1;

Fig. 3 is a sectional side view of the plug connector housing provided with an electric contact element received therein;

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Fig. 4 is a perspective view of the electric plug connector prior to mating with a mating electric plug connector;

Fig. 5 is a sectional perspective view of the electric plug connector during mating with the mating electric plug connector;

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Fig. 6 is a sectional perspective view of the electric plug connector in a pre-locked position on the mating electric plug connector; and

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Fig. 7 is a sectional perspective view of the electric plug connector in a final locked position on the mating electric plug connector.

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[0030] The invention will be described in greater detail hereinafter based on a plug connector housing 101 for a 4-pin electric plug connector 100, four electric contact elements 10 in the form of socket contacts being received in the electric plug connector 100. The electric plug connector 100 according to the invention is in this case configured in such a way that it is suitable for electrical connection of an air bag to a steering column or to a clock spring of a motor vehicle, or for electrical coupling of an air bag.

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[0031] The invention shall however not be limited to such embodiments but rather relate quite broadly to plug or mating plug connector housings or electric plug or mating electric plug connectors. It is thus possible to provide, instead of socket contacts, pin contacts in the plug connector housing 101 according to the invention. Furthermore, the number of the electric contact elements 10 within the plug connector housing 101 can vary. In addition, it is possible to omit from the mating electric plug connector 200 a connector position assurance member 300, which will be described hereinafter with reference to Figs. 4 to 7, of the electric plug connector 100. In principle, the invention can be applied in all cases in which a movement of a cable 30 is to be kept at bay from the electric contact elements 10 fastened thereto.

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[0032] The drawings, see in particular Figs. 1, 3 and 4, show an embodiment of a plug connector housing 101 according to the invention for an electric plug connector 100 according to the invention (see Figs. 3 and 7). In this case, the electric plug connector 100 comprises the plug connector housing 101 and at least one electric contact

element 10 received therein (see Fig. 3) and also preferably a cable 30 which is electrically connected to the electric contact element 10.

[0033] In the present embodiment of the invention, the electric plug connector 100 is configured as a 4-pin plug connector for an electrical clock spring connection of an air bag. It is however possible to equip the electric plug connector 100 with any desired number of the electric contact elements 10, a further preferred embodiment of the invention being a 5-pin plug connector for electrical coupling of an air bag.

[0034] The plug connector housing 101 has on a longitudinal side (with respect to a longitudinal axis L of the plug connector housing 101) a receptacle 130 for a connector position assurance member 300. The connector position assurance member 300 serves to engage the electric plug connector 100 on a mating electric plug connector 200 (see Figs. 4 to 7).

[0035] Furthermore, the plug connector housing 101 has a collar 140 which, together with the mating electric plug connector 200, facilitates a secure fit of the electric plug connector 100 to the mating electric plug connector 200. For this purpose, the collar 140 and a mating plug connector housing 201 (see Fig. 4) have mutually corresponding projections and grooves or the like. In the present example, the collar 140 is provided, opposing the receptacle 130 for the connector position assurance member 300, on a longitudinal side of the plug connector housing 101. In this case, the collar 140 extends upward from an underside 103 of the plug connector housing 101, up to approximately one third to one half of a total height of the plug connector housing 101, and thus runs at least 90-180 degrees around the plug connector housing 101 (see Fig. 2). In other embodiments of the invention, it is preferable to provide the collar 140 so as to encircle, as far as possible, all of the plug connector housing 101. In other words, the collar 140 can in this case also extend around the receptacle 130 arranged laterally on the plug connector housing 101.

[0036] A fixing element 110 according to the invention, which serves to fix the electric contact element 10 that is configured as a socket contact and at the same time a cable 30 electrically connected to the electric contact element 10, can be arranged on the plug connector housing 101. In other words, the fixing element 110 according to the invention allows on the one hand the electric contact element 10 to be secured within the plug connector housing 101 and on the other hand the cable 30, which is connected to the electric contact element 10, to be secured to the plug connector housing 101.

[0037] Figs. 1 to 3 show the fixing element 110 according to the invention in first and second open positions, whereas Figs. 4 to 7 show the fixing element 110 according to the invention in a fixed position (locked position and clamped position, see below).

[0038] As shown in Fig. 3, the fixing element 110 is configured integrally, i.e. materially in one piece with the plug connector housing 101. It is however possible to

produce the fixing element 110 as an external part and then to arrange this external part accordingly on the plug connector housing 101 for fixing the electric contact element 10 and the cable 30. Thus, it is for example possible to provide the fixing element 110 in such a way that it is able to pivot with respect to the plug connector housing 101, for example by bearings.

[0039] In the present exemplary embodiment, the fixing element 110 is connected to the plug connector housing 101 by a first hinge 112 which is preferably configured as a film hinge. The first hinge 112 mounts a locking member 114 configured as a locking tab of the fixing element 110 on the plug connector housing 101. In this case, the bearings are preferably configured on an upper side 102 of the plug connector housing 101.

[0040] The locking member 114 of the fixing element 110 serves to engage the electric contact element 10 in a contact chamber 150 of the plug connector housing 101 (see Fig. 3). For this purpose, the locking member 114 has a locking lug 118 which can engage with a recess 18 in a locking surface corresponding thereto in the electric contact element 10. In other words, in the locked position of the locking member 114 or the fixing element 110, the locking lug 118 locks the electric contact element 10 in the contact chamber 150 or in the plug connector housing 101. In order to allow the locking lug 118 to be advanced up to the recess 18 in the locking surface in the electric contact element 10, a respective portion of the plug connector housing 101 has a through-recess 158 in a region of a wall 152 of the contact chamber 150. Through the through-recess 158, a free longitudinal end portion of the locking lug 118 protrudes into the contact chamber 150, thus enabling the locking lug 118 to engage the electric contact element 10 in the contact chamber 150.

[0041] The locking member 114 is in this case preferably tab-like in its configuration, the locking lug 118 extending preferably along the entire width B (see Fig. 1) of the locking member 114. In this case, the locking lug 118 protrudes from a plane of the locking member 114 preferably as a catch, the locking lug 118 being located preferably at a longitudinal end of the locking member 114.

[0042] In order to prevent accidental sliding of the locking lug 118 out of the contact chamber 150, and thus disengagement of the electric contact element 10, the locking lug 118 has an edge 119 formed thereon that locks with an edge 159 of the contact chamber 150. In this case, at least part of the edge 159 is configured as an inner portion of the wall 152 (see Figs. 3 and 5) of the contact chamber 150. In other words, according to the invention, the locking lug 118 engages the contact chamber wall 152 of the contact chamber 150 and thus at the same time also engages the electric contact element 10 in the plug connector housing 101. Furthermore, the edge 159 continues in the plug connector housing 101 between the contact chambers 150 that are adjacent to each other.

[0043] The locking member 114 can have a projection 116 which preferably extends over the entire width B (see Fig. 1) of the locking member 114 and can engage with a recess 106 in a locking surface corresponding thereto in the plug connector housing 101. Obviously, the converse situation is also possible wherein the projection 116 is arranged on the plug connector housing 101 and the recess 106 is arranged within the locking member 114. In this case, the projection 116 and the recess 106 serve to place the locking member 114 in such a way that it is prevented from rotating in the locked position and is secured to the plug connector housing 101 at least in the longitudinal direction L. In this case, the projection 116 and an edge of the recess 106 can engage one on the other.

[0044] Furthermore, the fixing element 110 according to the invention has, in addition to the locking member 114, a clamping member 122. In this case, the clamping member 122 according to the invention is able to pivot with respect to the locking member 114 and configured as a clamping tab. This takes place preferably via a second hinge 120 which is likewise preferably configured as a film hinge. It is however also possible to configure the clamping member 122 separately from the locking member 114 and to provide the clamping member 122 on the locking member 114 in such a way that it can pivot via the bearings.

[0045] Preferably, the mounting of the clamping member 122 on the locking member 114 is provided on a side of the locking member 114 that opposes the locking lug 118. This can be carried out at any desired portion of the surface of the locking member 114 that opposes the locking lug 118. Preferably, the clamping member 122 is however linked to one end of the locking member 114, the locking lug 118 being provided on an opposing side (in relation to a cross section shown in Fig. 3) of the locking member 114. In this case, the clamping member 122 connects to the end of the locking member 114, preferably materially in one piece via a U-shaped portion. The second hinge 120 is part of this U-shaped portion. The clamping member 122 connects to the second hinge 120. At one end of the clamping member 122, opposing the second hinge 120, the clamping member 122 has a clamping device 126.

[0046] In the embodiment illustrated in the drawings of the invention, the clamping member 122 forms a free end portion and the locking member 114 a bound end portion of the fixing element 110, although it is also possible to invert this. In this case, the clamping member 122 is connected, preferably materially in one piece, to the plug connector housing 101 via the first hinge 112; and the locking member 114, which then acts as a free end portion of the fixing element 110, is connected to the clamping member 122, again preferably materially in one piece via the second hinge 120.

[0047] The clamping device 126 according to the invention allows the cable 30 (see Fig. 7) of the electric contact elements 10 to be secured to the plug connector

housing 101, as a result of which movements of the cables 30 are intercepted and can no longer propagate into the electric contact element 10. In this case, forces from the cable 30 are guided into the plug connector housing 101 via the clamping device 126 and into the plug connector housing 101 via the clamping member 122 and the locking member 114. For the former case the clamping device 126 is locked directly to the plug connector housing 101 by projection 109 on the plug connector housing 101 and projection 129 on the clamping device 126 and for the latter case the forces are guided into the plug connector housing 101 via the projection 116 of the locking member 114 and via a delimitation of the locking surface 106 in the plug connector housing 101.

[0048] The clamping device 126 is configured in such a way that it secures the cable 30. This can be carried out, for example, by clamping of the cable 30 by the clamping device 126 and a corresponding portion on the plug connector housing 101. It is also possible to configure the clamping device 126 in the manner of a comb having fingers 128 and grooves 127, wherein the cables 30 can be clamped in the grooves 127.

[0049] In this case, each of the grooves 127 is configured in such a way that the cable 30 or insulation of the cable 30 can be reliably clamped in the groove 127. For this purpose, a width of the groove 127 is, for example, slightly less than an outer diameter of the cable 30. Furthermore, it is possible to configure the groove 127 in a V-shaped manner and thus to clamp the cable 30 tightly therein by insertion into the groove 127. Furthermore, projections (not shown), after which the cable 30 can be clamped, can be provided laterally on the fingers 128. This can, for example, be carried out also by recesses (not shown) provided on the fingers 128. If projections (not shown) or recesses (not shown) are present on the fingers 128, the projections (not shown) or recesses (not shown) are located directly opposing one another in a transverse direction of the plug connector housing 101 (width direction of the groove 127).

[0050] The clamping device 126 of the clamping member 122 protrudes preferably at an approximate 90 degree angle from one end of the tab of the clamping member 122 and overlaps in the clamped position (see Figs. 4 to 7) a mounting of the locking member 114 on the plug connector housing 101. Furthermore, in the clamped position and the locked position of the fixing element 110, the clamping member 122 rests directly against the locking member 114 which, for its part, rests directly against the plug connector housing 101. According to the invention, both the locking member 114 and the clamping member 122 are in this case each configured as folding lids which can be folded together, on the one hand one on top of the other and on the other hand on the plug connector housing 101.

[0051] In the open position of the locking member 114 and the clamping member 122, which may be seen most clearly in Figs. 1 and 3, the clamping device 126, the clamping member 122, the second hinge 120, the locking

member 114, the first hinge 112 and a portion of the plug connector housing 101 that connects to the first hinge 112 have in cross section, along the longitudinal axis L of the plug connector housing 101 (see Fig. 3), approximately the shape of an S. As a result of the zigzag-shaped configuration of the fixing element 110, a single handle allows both the electric contact element 10 to be locked in the plug connector housing 101 and at the same time the cable 30 to be clamped tight on the plug connector housing 101. In this case, force is merely exerted on one end of the locking member 114 and one end of the clamping member 122. For simple handling of the clamping member 122, the clamping member 122 can have an actuating device 124, in the form of a catch protruding therefrom, wherein the actuating device 124 can serve as a stop of the plug connector housing 101 on the mating plug connector housing 201 (see Fig. 7).

[0052] In the clamped position of the clamping member 122, and thus preferably also in the locked position of the locking member 114, the clamping device 126 locks preferably to the upper side 102 of the plug connector housing 101. This is carried out preferably via the projection 129 which is preferably configured integrally on the clamping device 126 and can come to rest against a shoulder or the projection 109 of the plug connector housing 101 and thus secures the clamping device 126 additionally to the plug connector housing 101. Via this connection, which is preferably configured as a clamp, forces from movements of the cables 30 are guided directly into the plug connector housing 101. The projection 109 and the projection 129, which interact in the securing of the clamping device 126 to the plug connector housing 101, may be seen clearly in Fig. 2 in a non-interlocked position.

[0053] Furthermore, the plug connector housing 101 can have on the upper side 102 projections 108 which are configured as teeth, wherein a longitudinal end or a longitudinal end portion of the finger 128 can be arranged between two of the projections 108 that are directly adjacent to each other (see in particular Figs. 1 and 4). The projections 108 can in this case perform the task of positioning the fingers 128 and also clamp the fingers 128. In other words, the projections 108 that are directly adjacent to each other are set apart by a distance such that the finger 128 can be clamped therein. In this case, mutually corresponding locking projections or locking recesses can again be provided on the finger 128 or the projections 108. This ensures an effective introduction of force from cable movements via the fingers 128 into the projections 108 and thus into the plug connector housing 101.

[0054] Joining of the electric plug connector 100 according to the invention to the mating electric plug connector 200 will be described in greater detail hereinafter with reference to Figs. 4 to 7. In this case, the electric plug connector 100 has four socket contacts (not shown) received therein and the cable 30 (see Fig. 7) which is electrically connected to the electric contact element 10 formed as a socket contact. The cable 30 is in this case

connected mechanically via an insulation crimp 12 (see Fig. 3) and electrically, for example via welding, soldering or crimping, to an electric contact region 14 (see Fig. 3) of the electric contact element 10. In this case, the fixing element 110, which is constructed from the locking member 114 and the clamping member 122, is both in the locked position and in the clamped position. As a result, the electric contact elements 10 are locked in the plug connector housing 101 by the locking member 114 and the cables 30 are secured to the plug connector housing 101 by the clamping member 122 which is pivoted by the first hinge 112.

[0055] The mating plug connector housing 201 of the mating electric plug connector 200 corresponds in its construction to the plug connector housing 101 of the electric plug connector 100, the electric plug connector 100 and the mating electric plug connector 200 jointly forming an electrical plug-in connection 1 according to the invention. The mating plug connector housing 201 can likewise have a fixing element 110 according to the invention. Electric contact elements 20 configured as pin contacts (see Figs. 5 to 7) are received in the mating plug connector housing 201 in a manner corresponding to the electric contact elements 10 of the electric plug connector 100.

[0056] Fig. 4 shows a starting position in which the electric plug connector 100 is moved toward the mating electric plug connector 200. In this case, the connector position assurance member 300 is received in a pre-locked position in the receptacle 130 or partly inserted therein (see also Figs. 5 and 6). It is however also possible to position the connector position assurance member 300 in the receptacle 130 only once the electric plug connector 100 has been joined to the mating electric plug connector 200.

[0057] Fig. 5 shows the electric plug connector 100 which is attached partly to the mating electric plug connector 200, the electric contact elements 10, 20 not yet being in mechanical contact with one another. Furthermore, Fig. 5 clearly shows the locking of the locking lug 118 in the contact chamber 150. In this case, the edges 119, 159 of the locking lug 118 and the through-recess 158 or contact chamber wall 152 abut one another.

[0058] Fig. 6 shows the electric plug connector 100 in a pre-locked position on the mating electric plug connector 200 (the connector position assurance member 300 is in this case likewise still in its pre-locked position), wherein the electric contact elements 20 can already be in electrical contact with the electric contact elements 10. In this case, a catch 160, which is arranged so as to be laterally movable within the receptacle 130, of the receptacle 130 or the plug connector housing 101 rests against a projection 260 of the mating plug connector housing 201. The catch 160 is preferably resilient in its configuration and, as shown in Figs. 5 to 7, in its rest position. Furthermore, a securing projection 362 of a securing tab 360 of the connector position assurance member 300 rests against the catch 160 in the pre-locked position.

[0059] The primary purpose of the connector position assurance member 300 when inserted and locked is to ensure that the electric plug connector 100 and the mating electric plug connector 200 are correctly interlocked, since only in this case is it possible to bring the connector position assurance member 300 out of its pre-locked position (see Figs. 5 and 6) into its final locked position (see Fig. 7). In the pre-locked position, the securing tabs 360, preferably with the securing projection 362, and the catch 160 are interlocked in such a way that this locking can be released only if the electric plug connector 100 is in the correct plug-in position on the mating electric plug connector 200 and can lead to complete insertion of the connector position assurance member 300 into the receptacle 130; the locked position of the connector position assurance member 300 in the receptacle 130 being established by mutually supplementary surfaces 262, 162 of the projection 260 and the catch 160. In the pre-locked position, on the other hand, the securing projection 362 and the catch 160 abut one another at mutually corresponding securing surfaces 363, 163 and block one another in the direction in which the connector position assurance member 300 is inserted into the receptacle 130.

[0060] The securing projection 362 is configured on a free longitudinal end portion of a securing tab 360 of the connector position assurance member 300 and in addition prevents, in the plug-in position shown in Fig. 7 of the electric plug connector 100 on the mating electric plug connector 200, the catch 160, and thus also the plug connector housing 101, from moving into the open position in which the electric plug connector 100 might become detached from the mating electric plug connector 200.

[0061] During joining of the electric plug connector 100 to the mating electric plug connector 200 (transition from Fig. 6 to Fig. 7), the catch 160 of the plug connector housing 101 first slides along the supplementary surface 262 of the projection 260 on the mating plug connector housing 201, passes the projection 260 completely and (see below with reference to Figs. 6 and 7) returns to its rest position. The securing projection 362 of the securing tab 360 and also a longitudinal end portion of the securing tab 360 also jointly perform this movement. Only once it has passed the projection 260 is it possible for the securing projection 362 to slide on the supplementary surface 162 of the catch 160. The projection 260 and the snapping-back of the catch 160 after the projection 260 lift the securing surface 363 onto the catch 160, thus allowing the securing surface 363 to slide on the supplementary surface 162 of the catch 160; this is facilitated by the fact that the catch 160 and the projection 260 are at substantially the same height on a "common" surface or at a joint between the two. Once it has passed the catch 160, the securing projection 362 snaps after (see below with reference to Fig. 7) the catch 160 into its locked position.

[0062] In this position, the connector position assur-

ance member 300 is in its final locked position in the receptacle 130 and the electric plug connector 100 can no longer become detached from the mating electric plug connector 200. In this position, the connector position assurance member 300 locks, for example by a locking lug 332, on a shoulder 132 on/in the receptacle 130. In the pre-locked position, the connector position assurance member 300 locks, preferably by locking hooks 310 shown in Fig. 1, within the receptacle 130. As a result of these two lockings (332, 132; 310, 130) of the connector position assurance member 300 in the receptacle 130, the connector position assurance member 300 is on the one hand protected, in its pre-locked position, from falling out of the receptacle 130 and on the other hand engaged in its locked position.

[0063] In order to facilitate insertion or removal of the connector position assurance member 300 into or out of the receptacle 130 of the plug connector housing 101, arcs 312, which are configured integrally with the locking hooks 310, (see Fig. 1) are not connected to the securing tab 360 but rather set apart therefrom, i.e. the tab 360 is movable in relation to the locking hooks 310. If the tab 360 is then raised, it leaves a position of engagement with the arcs 312, which can now be moved toward one another, thus allowing release of the engagement of the connector position assurance member 300 in the receptacle 130.

[0064] The connector position assurance member 300 additionally makes it difficult to detach the electric plug connector 100 from the mating electric plug connector 200. If it is desirable to do so, the connector position assurance member 300 is moved back into the position shown in Figs. 4 to 6. Firstly, in this case, the engagement of the connector position assurance member 300 with the receptacle 130 is disengaged, the securing projection 362 of the securing tab 360 subsequently being moved away via the catch 160 of the plug connector housing 101. In this case, the mechanical contact of the securing projection 362 and the catch 160 is configured preferably not as a genuine locking connection but rather as an abutment of two oblique surfaces (configured in the longitudinal direction L of the electrical plug-in connection 1). Subsequently, in the pre-locked position of the connector position assurance member 300, the locking hook 310 re-engages with a projection (not shown) or a contact surface of a recess (not shown) on/in the receptacle 130. Subsequently, the catch 160 becomes disengaged from the projection 260 of the mating plug connector housing 210. Preferably, the connector position assurance member 300 is not removed from the receptacle 130 but rather remains in its pre-locked position (4.5mm).

[0065] A lateral pressure (perpendicular to the longitudinal axis L of the electrical plug-in connection 1) acting on the plug connector housing 101 and/or the receptacle 130 and/or a portion of the connector position assurance member 300 that protrudes from the receptacle 130 allows the engagement between the catch 160 and the projection 260 to be released and the electric plug con-

necter 100 thus to be detached from the mating electric plug connector 200. For this purpose, the catch 160 is connected, preferably materially in one piece, to the plug connector housing 101 and/or the receptacle 130 by at least one torsion bar (not shown). As a result of the lateral pressure, the catch 160 and the free end portion of the securing tab 360 (securing projection 362) are moved away via preferably two torsion bars via the projection 260 of the mating electric plug connector 200.

[0066] The invention has a large number of locking elements or locking surfaces (18, 106, 108, 109, 116, 118, 119, 129, 132, 158, 159, 160, 163, 260, 310, 332, 362) which interact with corresponding locking elements or locking surfaces (118, 116, 128, 129, 106, 18, 159, 109, 332, 118, 119, 260, 363, 160, 130, 132, 160), thus configuring or establishing an arresting, locked position, clamped position, engagement according to the invention and the like. Obviously, it is possible to use locking elements or locking surfaces (18, 106, 108, 109, 116, 118, 119, 129, 132, 158, 159, 160, 163, 260, 310, 332, 362, 363) or combinations of locking elements or locking member or locking surfaces (18/118, 106/116, 108/128, 109/129, 109/108/128, 110/101, 114/101, 119/159, 122/101, 126/30, 127/30, 128/30, 132/332, 158/118, 160/260, 160/362, 163/363, 300/130, 300/101, 300/201, 310/130, 332/132, 360/130, 360/312, 360/310) other than those respectively applied. In particular, it is possible kinematically to reverse the respective locking. In other words, for example, from a locking projection a locking recess and accordingly from a locking recess a locking projection is, or shoulders which can be locked together are, swapped over.

[0067] Embodiments of the invention with or without the connector position assurance member 300 are also possible, it being preferable in the latter embodiment for the plug connector housing 101 to not have the receptacle 130 and preferably, in addition, for the collar 140 to encircle substantially all of the plug connector housing 101.

Claims

1. Plug connector housing (101) for an electric plug connector (100), in particular a 4 or 5-pin electric plug connector (100) for an air bag, comprising a fixing element (110) for fixing an electric contact element (10) and a cable (30) in/on the plug connector housing (101), wherein the electric contact element (10) can be secured in the plug connector housing (101) by the fixing element (110) and the cable (30) can be clamped on the plug connector housing (101) by the fixing element (110), wherein the fixing element (110) has a locking member (114) by which the electric contact element (10) can be locked, in a locked position of the fixing element (110), in the plug connector housing (101), and

the fixing element (110) has a clamping member (122) by which the cable (30) can be fixed, in a clamped position of the fixing element (110), on the plug connector housing (101),

wherein the locking member (114) of the fixing element (110) has a locking lug (118), wherein

the electric contact element (10) can be locked by the locking lug (118) in the locked position of the locking member (114), **characterized in that** the locking lug (118) can be inserted through a through-recess (158) in a wall (152) of a contact chamber (150) for the electric contact element (10) of the plug connector housing (101), in order to engage with a recess (18) in the electric contact element (10), and **in that**

the locking lug (118) has an edge (119) formed thereon that locks with an edge (159) of the contact chamber (150).

2. Plug connector housing (101) according to claim 1, wherein the fixing element (110) is configured in one piece, preferably materially in one piece, with the plug connector housing (101).
3. Plug connector housing (101) according to any one of claims 1 or 2, wherein the locking member (114) is connected to the plug connector housing (101) via a first hinge (112), preferably a film hinge, and the clamping member (122) is connected to the plug connector housing (101) via a second hinge (120), preferably a film hinge, and wherein the clamping member (122) is connected to the locking member (114) preferably via the second hinge (120) and the locking member (114) is connected to the plug connector housing (101) by the first hinge (112).
4. Plug connector housing (101) according to any one of claims 1 to 3, wherein the clamping member (122) of the fixing element (110) has a clamping device (126) by which the cable (30) can be fixed, wherein for this purpose the clamping device (126) of the clamping member (122) preferably has a groove (127) in which the cable (30) can be clamped.
5. Plug connector housing (101) according to claim 4, wherein the clamping device (126) interacts with a portion of the plug connector housing (101) for clamping the cable (30).
6. Plug connector housing (101) according to any one of claims 1 to 5, wherein the locking member (114) of the fixing element (110) and the clamping member (122) of the fixing element (110) are arranged one above the other on the plug connector housing (101) in their respective closed position.
7. Plug connector housing (101) according to any one

of claims 1 to 6, wherein the clamping member (122) of the fixing element (110) is connected to the locking member (114) of the fixing element (110) so as to be substantially u-shaped in cross section, and preferably also the locking member (114) of the fixing element (110) is connected to a wall (152) of the plug connector housing (101) so as to be substantially u-shaped in cross section.

8. Plug connector housing (101) according to claim 3, wherein the first hinge (112) is a portion of the locking member (114) of the fixing element (110), and/or the second hinge (120) is a portion of the clamping member (122) of the fixing element (110).

9. Electric plug connector (100), comprising an electric contact element (10), preferably a socket contact, comprising a cable (30) which is electrically connected to the electric contact element (10), and a plug connector housing (101) according to any one of claims 1 to 8.

10. Electrical plug-in connection (1) for a clock spring connection or a coupling of an air bag, in particular an air bag of a motor vehicle, comprising an electric plug connector (100) according to claim 9 and a mating electric plug connector (200) corresponding thereto.

Patentansprüche

1. Steckverbindergehäuse (101) für einen elektrischen Steckverbinder (100), insbesondere einen elektrischen Vier- oder Fünf-Stift-Steckverbinder (100) für einen Airbag, umfassend:

ein Fixierelement (110) zum Fixieren eines elektrischen Kontaktelements (10) und eines Kabels (30) in/an dem Steckverbindergehäuse (101), wobei

das elektrische Kontaktelement (10) durch das Fixierelement (110) in dem Steckverbindergehäuse (101) gesichert werden kann und das Kabel (30) durch das Fixierelement (110) auf dem Steckverbindergehäuse (101) festgeklemmt werden kann, wobei

das Fixierelement (110) ein Verriegelungsglied (114) besitzt, durch das das elektrische Kontaktelement (10) in einer verriegelten Position des Fixierelements (110) im Steckverbindergehäuse (101) verriegelt werden kann, und

das Fixierelement (110) ein Klemmglied (122) besitzt, durch das das Kabel (30) in einer geklemmten Position des Fixierelements (110) an dem Steckverbindergehäuse (101) fixiert werden kann,

wobei das Verriegelungsglied (114) des Fixier-

elements (110) eine Verriegelungsnase (118) besitzt,

wobei

das elektrische Kontaktelement (10) durch die Verriegelungsnase (118) in der verriegelten Position des Verriegelungsglieds (114) verriegelt werden kann,

dadurch gekennzeichnet, dass

die Verriegelungsnase (118) durch eine Durchgangsausnehmung (158) in einer Wand (152) einer Kontaktkammer (150) für das elektrische Kontaktelement (10) des Steckverbindergehäuses (101) eingesetzt werden kann, um eine Ausnehmung (18) in dem elektrischen Kontaktelement (10) in Eingriff zu nehmen, und dass die Verriegelungsnase (118) einen daran ausgebildeten Rand (119) besitzt, der mit einem Rand (159) der Kontaktkammer (150) verriegelt.

2. Steckverbindergehäuse (101) nach Anspruch 1, wobei das Fixierelement (110) in einem Stück, bevorzugt materiell in einem Stück, mit dem Steckverbindergehäuse (101) konfiguriert ist.

3. Steckverbindergehäuse (101) nach einem der Ansprüche 1 oder 2, wobei das Verriegelungsglied (114) über ein erstes Scharnier (112), bevorzugt ein Filmscharnier, mit dem Steckverbindergehäuse (101) verbunden ist und das Klemmglied (122) über ein zweites Scharnier (120), bevorzugt ein Filmscharnier, mit dem Steckverbindergehäuse (101) verbunden ist und wobei das Klemmglied (122) bevorzugt über das zweite Scharnier (120) mit dem Verriegelungsglied (114) verbunden ist und das Verriegelungsglied (114) durch das erste Scharnier (112) mit dem Steckverbindergehäuse (101) verbunden ist.

4. Steckverbindergehäuse (101) nach einem der Ansprüche 1 bis 3, wobei das Klemmglied (122) des Fixierelements (110) eine Klemmeinrichtung (126) besitzt, durch die das Kabel (30) fixiert werden kann, wobei zu diesem Zweck die Klemmeinrichtung (126) des Klemmglieds (122) bevorzugt eine Nut (127) besitzt, in der das Kabel (30) festgeklemmt werden kann.

5. Steckverbindergehäuse (101) nach Anspruch 4, wobei die Klemmeinrichtung (126) mit einem Abschnitt des Steckverbindergehäuses (101) zum Festklemmen des Kabels (30) interagiert.

6. Steckverbindergehäuse (101) nach einem der Ansprüche 1 bis 5, wobei das Verriegelungsglied (114) des Fixierelements (110) und das Klemmglied (122) des Fixierelements (110) in ihrer jeweiligen geschlossenen Position übereinander auf dem Steckverbindergehäuse (101) angeordnet sind.

7. Steckverbindergehäuse (101) nach einem der Ansprüche 1 bis 6, wobei das Klemmglied (122) des Fixierelements (110) so mit dem Verriegelungsglied (114) des Fixierelements (110) verbunden ist, dass es im Wesentlichen im Querschnitt u-förmig ist, und bevorzugt auch das Verriegelungsglied (114) des Fixierelements (110) so mit einer Wand (152) des Steckverbindergehäuses (101) verbunden ist, dass es im Querschnitt im Wesentlichen u-förmig ist. 5
8. Steckverbindergehäuse (101) nach Anspruch 3, wobei das erste Scharnier (112) ein Abschnitt des Verriegelungsglieds (114) des Fixierelements (110) ist und/oder das zweite Scharnier (120) ein Abschnitt des Klemmglieds (122) des Fixierelements (110) ist. 10
9. Elektrischer Steckverbinder (100), umfassend ein elektrisches Kontaktelement (10), bevorzugt ein Buchsenkontakt, umfassend ein Kabel (30), das mit dem elektrischen Kontaktelement (10) elektrisch verbunden ist, und ein Steckverbindergehäuse (101) nach einem der Ansprüche 1 bis 8. 15
10. Elektrische Steckverbindung (1) für eine Uhrfeder- 20
verbindung oder eine Kopplung eines Airbags, insbesondere eines Airbags eines Kraftfahrzeugs, umfassend einen elektrischen Steckverbinder (100) nach Anspruch 9 und einen dementsprechenden passenden elektrischen Steckverbinder (200). 25

Revendications

1. Boîtier de fiche de connexion (101) pour une fiche de connexion électrique (100), en particulier une fiche de connexion électrique à 4 ou 5 broches (100) pour un coussin de sécurité gonflable, comprenant : 35
- un élément de fixation (110) pour fixer un élément de contact électrique (10) et un câble (30) dans/sur le boîtier de fiche de connexion (101), où 40
- l'élément de contact électrique (10) peut être fixé dans le boîtier de fiche de connexion (101) par l'élément de fixation (110), et le câble (30) peut être coincé sur le boîtier de fiche de connexion (101) par l'élément de fixation (110), où 45
- l'élément de fixation (110) a un élément de verrouillage (114) au moyen duquel l'élément de contact électrique (10) peut être verrouillé, dans une position verrouillée de l'élément de fixation (110), dans le boîtier de fiche de connexion (101), et 50
- l'élément de fixation (110) a un élément de serrage (122) au moyen duquel le câble (30) peut être fixé, dans une position coincée de l'élément de fixation (110), sur le boîtier de fiche de connexion (101), 55

où l'élément de verrouillage (114) de l'élément de fixation (110) a un ergot de verrouillage (118), où l'élément de contact électrique (10) peut être verrouillé par l'ergot de verrouillage (118) dans la position verrouillée de l'élément de verrouillage (114), **caractérisé en ce que** l'ergot de verrouillage (118) peut être inséré dans un logement traversant (158) dans une paroi (152) d'une chambre de contact (150) pour l'élément de contact électrique (10) du boîtier de fiche de connexion (101) de manière à s'engager dans un logement (18) dans l'élément de contact électrique (10), et **en ce que** l'ergot de verrouillage (118) a un bord (119) y étant formé qui se verrouille avec un bord (159) de la chambre de contact (150).

2. Boîtier de fiche de connexion (101) selon la revendication 1, dans lequel l'élément de fixation (110) est configuré d'un seul tenant, de préférence matériellement d'un seul tenant, avec le boîtier de fiche de connexion (101).
3. Boîtier de fiche de connexion (101) selon l'une quelconque des revendications 1 ou 2, dans lequel l'élément de verrouillage (114) est connecté au boîtier de fiche de connexion (101) par l'intermédiaire d'une première charnière (112), de préférence une charnière à film, et l'élément de serrage (122) est connecté au boîtier de fiche de connexion (101) par l'intermédiaire d'une seconde charnière (120), de préférence une charnière à film, et dans lequel l'élément de serrage (122) est connecté à l'élément de verrouillage (114) de préférence par l'intermédiaire de la seconde charnière (120), et l'élément de verrouillage (114) est connecté au boîtier de fiche de connexion (101) par la première charnière (112).
4. Boîtier de fiche de connexion (101) selon l'une quelconque des revendications 1 à 3, dans lequel l'élément de serrage (122) de l'élément de fixation (110) a un dispositif de serrage (126) au moyen duquel le câble (30) peut être fixé, où, à cet effet, le dispositif de serrage (126) de l'élément de serrage (122) comprend de préférence une rainure (127) dans laquelle le câble (30) peut être coincé.
5. Boîtier de fiche de connexion (101) selon la revendication 4, dans lequel le dispositif de serrage (126) interagit avec une partie du boîtier de fiche de connexion (101) pour coincer le câble (30).
6. Boîtier de fiche de connexion (101) selon l'une quelconque des revendications 1 à 5, dans lequel l'élément de verrouillage (114) de l'élément de fixation (110) et l'élément de serrage (122) de l'élément de fixation (110) sont agencés l'un au-dessus de l'autre sur le boîtier de fiche de connexion (101) dans leur

position fermée respective.

7. Boîtier de fiche de connexion (101) selon l'une quelconque des revendications 1 à 6, dans lequel l'élément de serrage (122) de l'élément de fixation (110) est connecté à l'élément de verrouillage (114) de l'élément de fixation (110) de manière à présenter une coupe transversale sensiblement en forme de U, et également de préférence l'élément de verrouillage (114) de l'élément de fixation (110) est connecté à une paroi (152) du boîtier de fiche de connexion (101) de manière à présenter une coupe transversale sensiblement en forme de U.

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8. Boîtier de fiche de connexion (101) selon la revendication 3, dans lequel la première charnière (112) est une partie de l'élément de verrouillage (114) de l'élément de fixation (110) et/ou la seconde charnière (120) est une partie de l'élément de serrage (122) de l'élément de fixation (110).

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9. Fiche de connexion électrique (100), comprenant un élément de contact électrique (10), de préférence une douille de contact, comprenant un câble (30) qui est connecté électriquement à l'élément de contact électrique (10), et un boîtier de fiche de connexion (101) selon l'une quelconque des revendications 1 à 8.

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10. Fiche de raccordement électrique (1) pour une connexion de ressort d'horloge ou un couplage de coussin de sécurité gonflable, en particulier un coussin de sécurité gonflable de véhicule à moteur, comprenant une fiche de connexion électrique (100) selon la revendication 9, et un connecteur électrique d'accouplement (200) lui correspondant.

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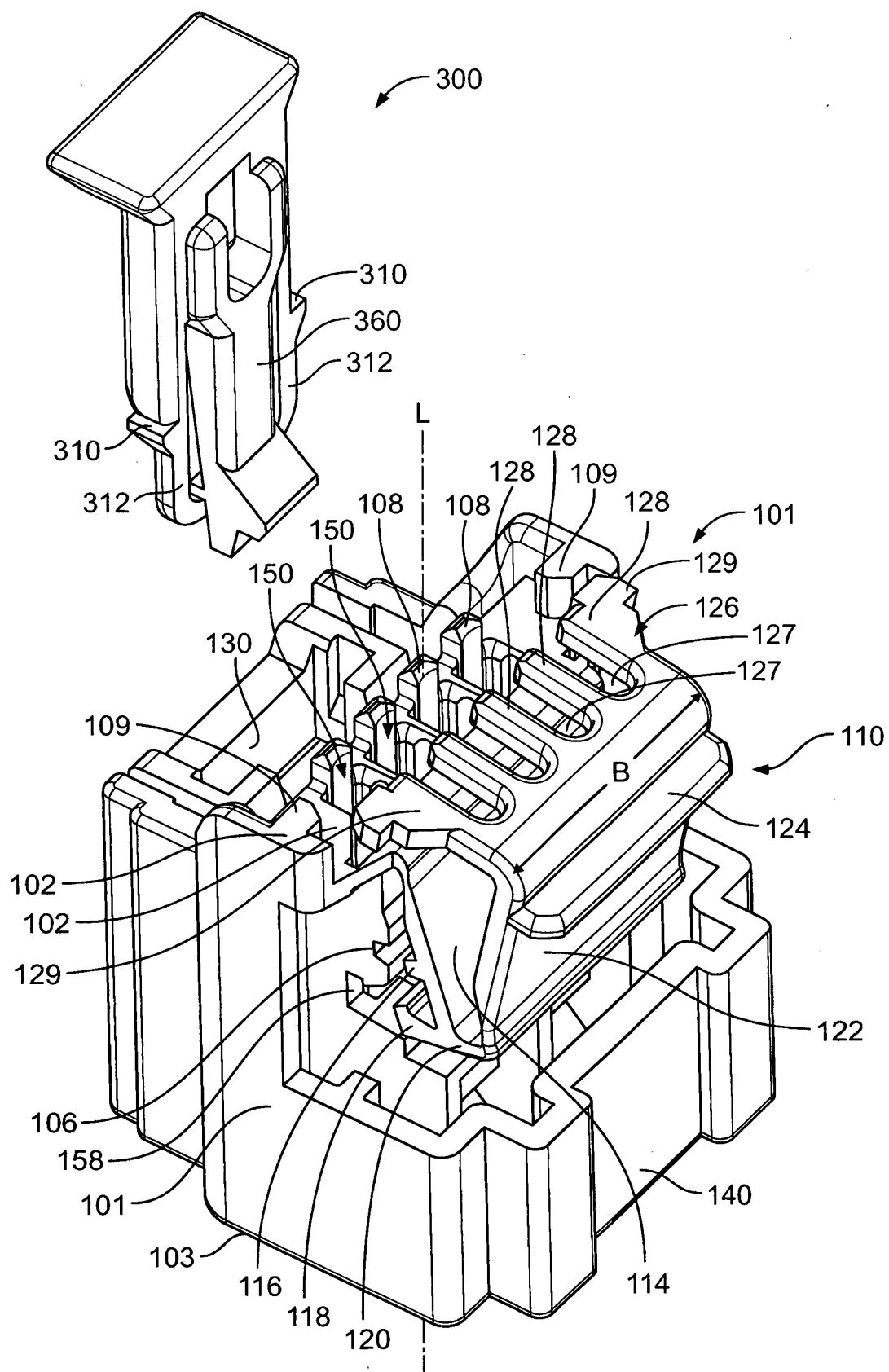


Fig. 1

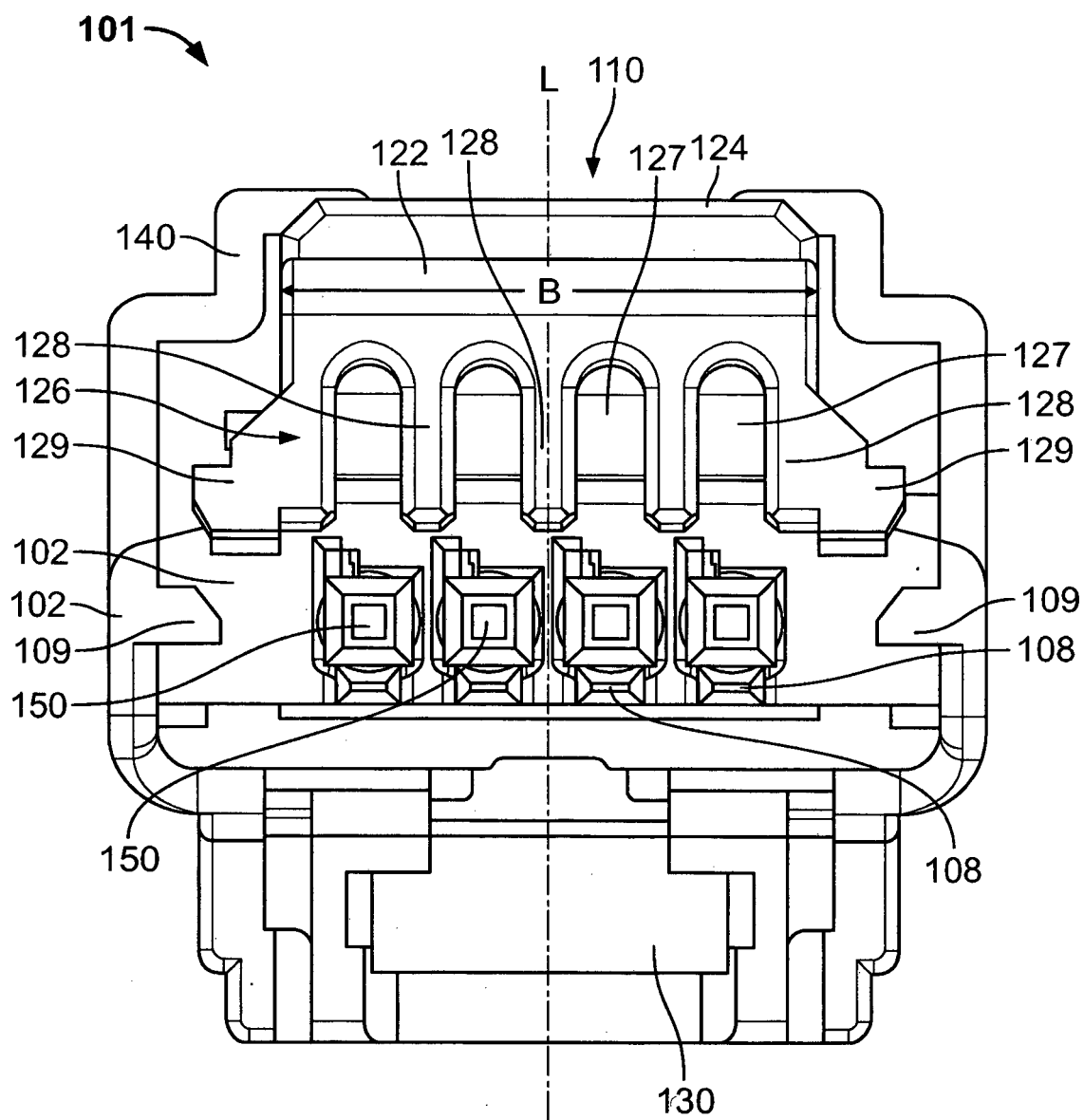


Fig. 2

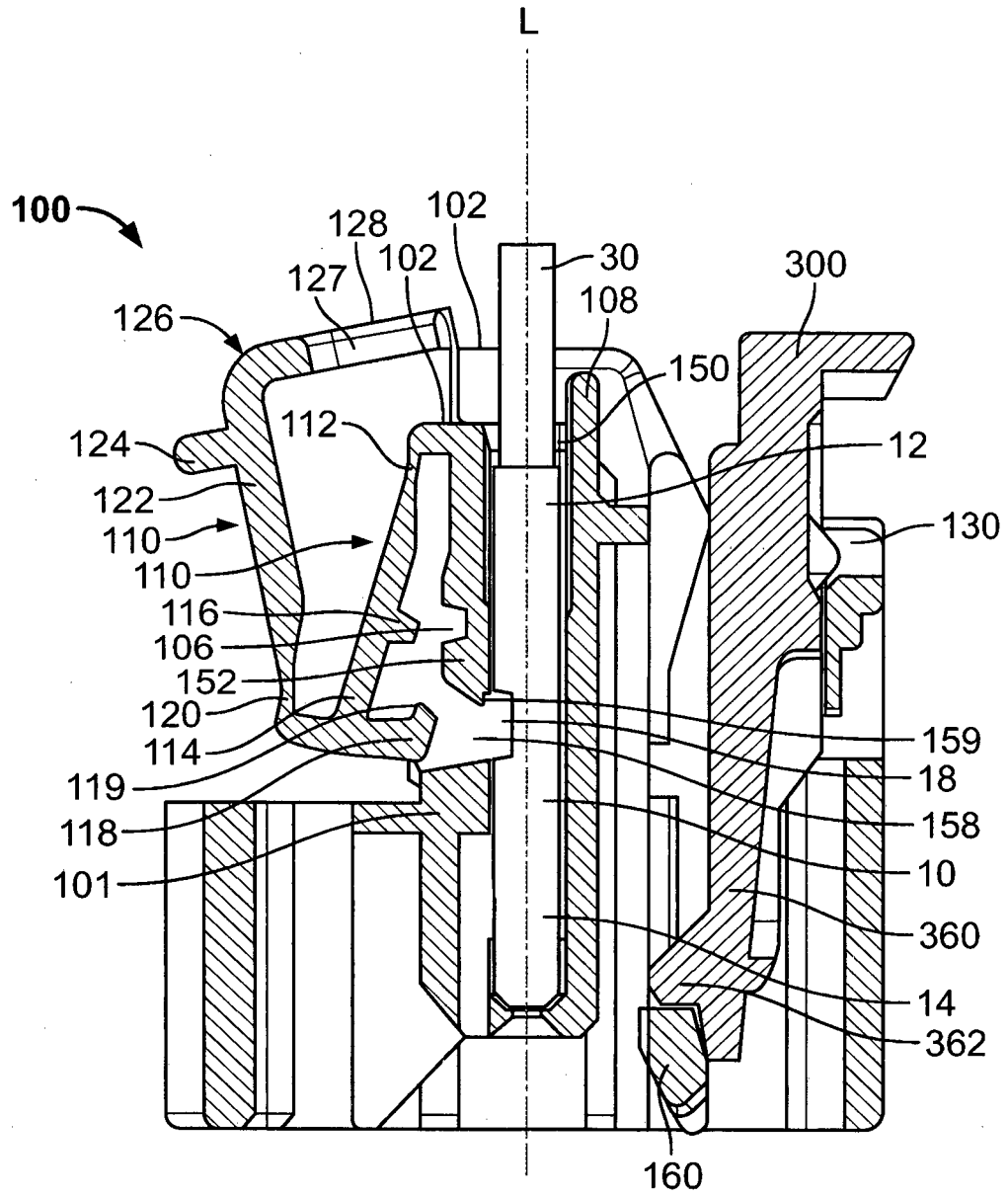


Fig. 3

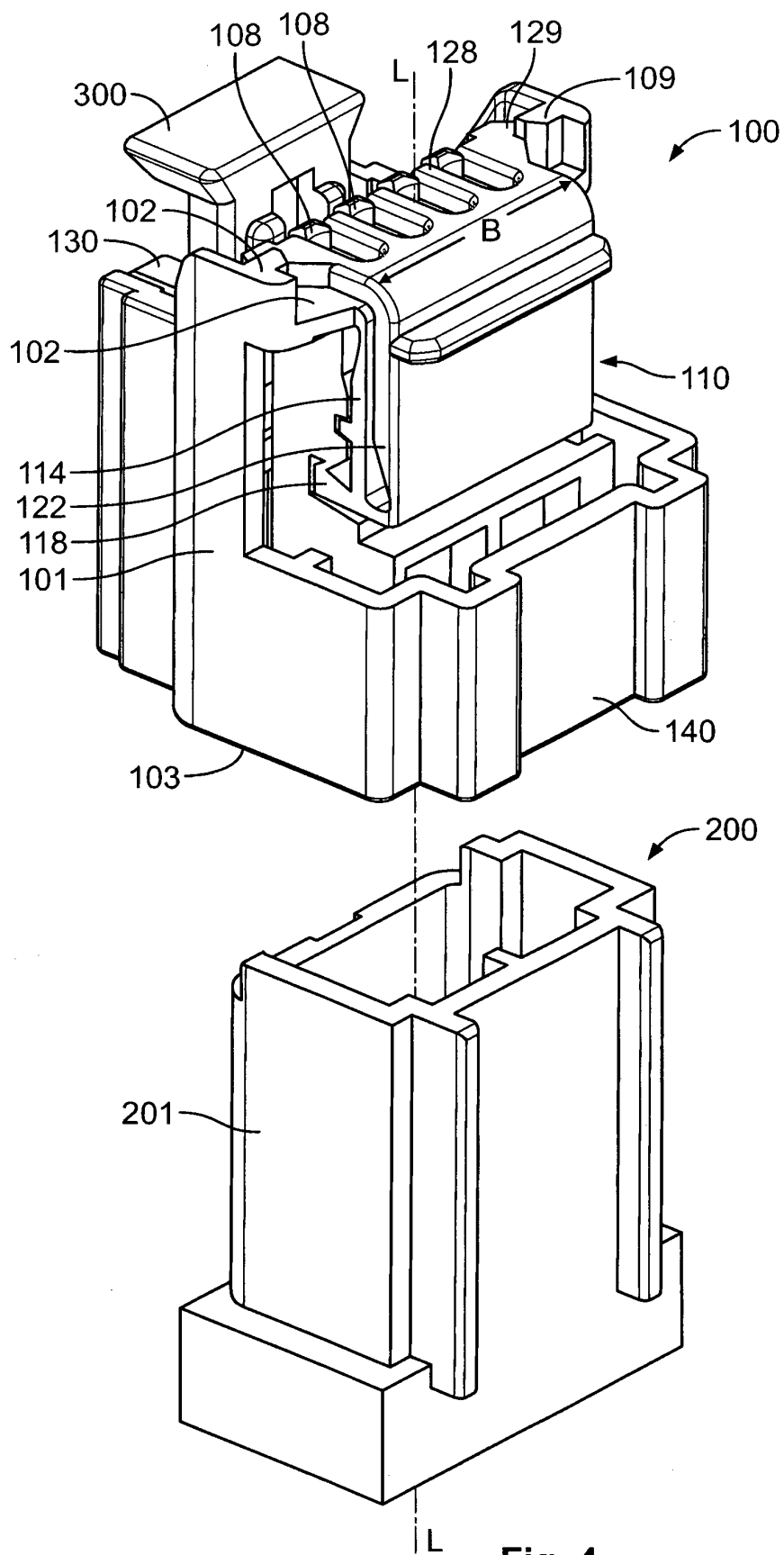


Fig. 4

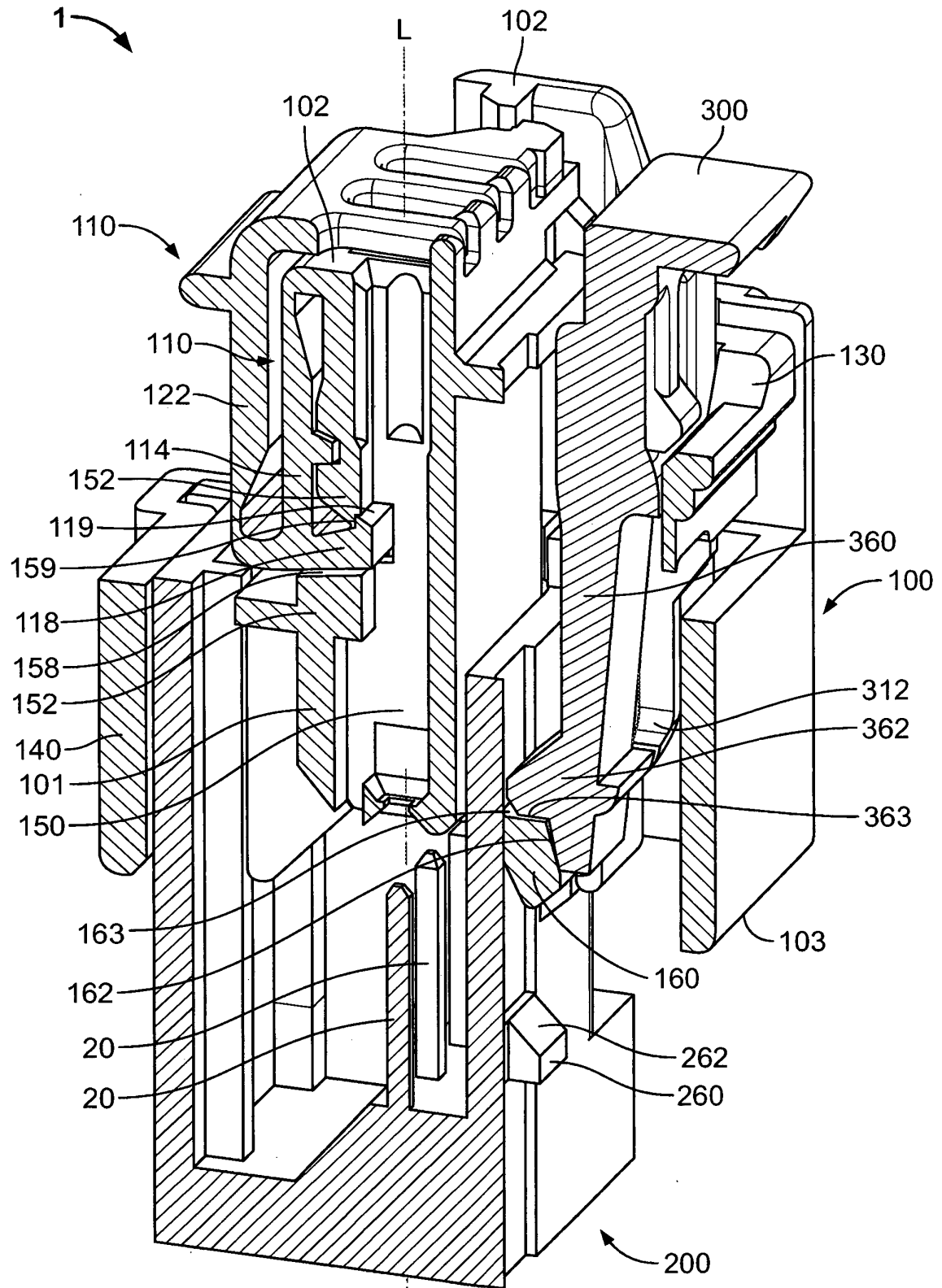


Fig. 5

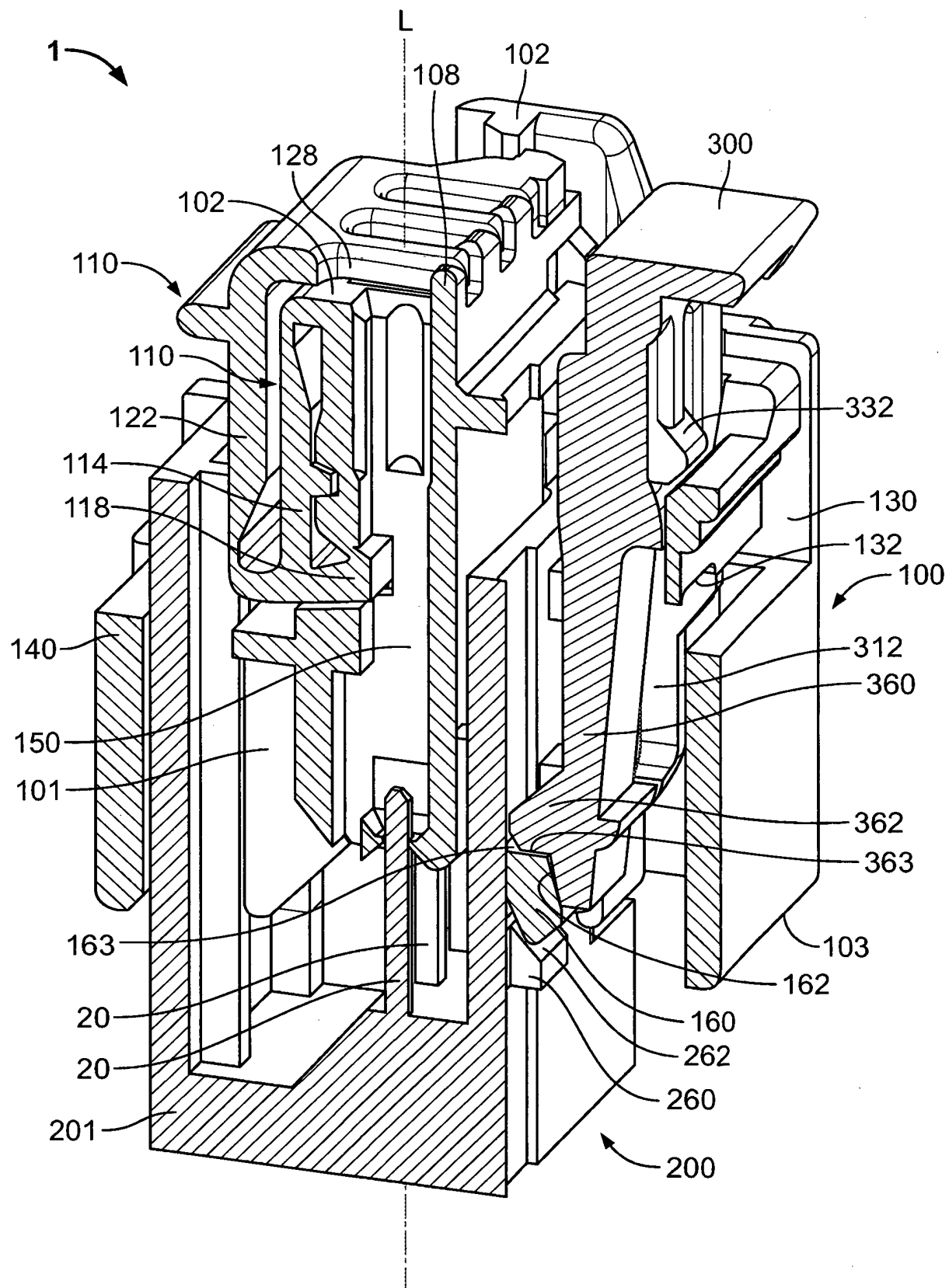


Fig. 6

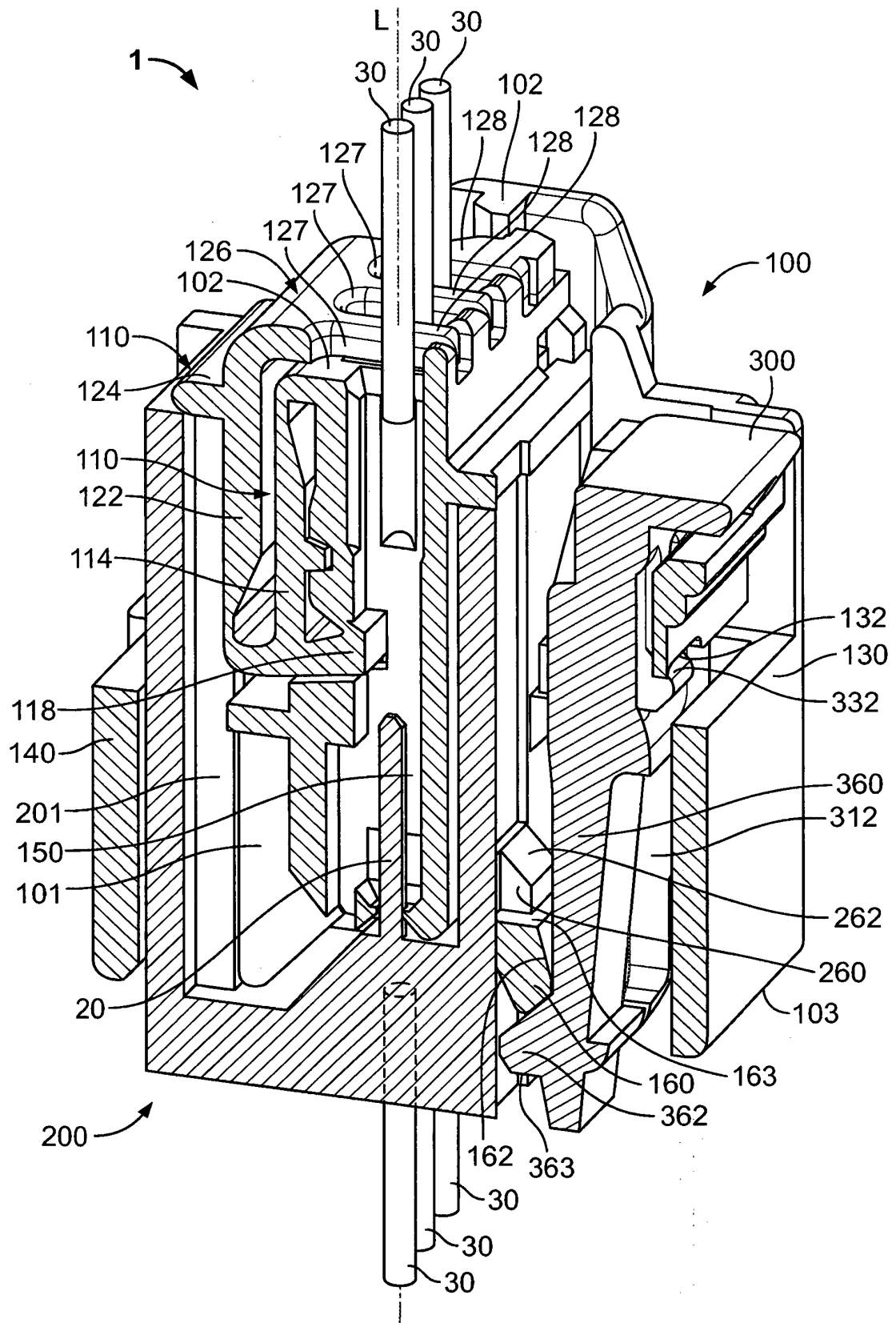


Fig. 7

REFERENCES CITED IN THE DESCRIPTION

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