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(54) CLOSURE ARRANGEMENT FOR CLOSING OFF AN INSERTION OPENING IN A FRONT WALL OF A HOUSING

VERSCHLUSSANORDNUNG ZUM VERSCHLIESSEN EINER EINSETZÖFFNUNG IN EINER STIRNWAND EINES GEHÄUSES

AGENCEMENT DE FERMETURE POUR FERMER UNE OUVERTURE D'INSERTION DANS UNE PAROI AVANT D'UN BOÎTIER

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EP 3 667 833 B1

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Description

[0001] The invention relates to a closure arrangement for closing off an insertion opening in a front wall of a housing for a connector which is insertable through the insertion opening.

[0002] In the case of such a closure arrangement, it is known for in each case one closure part to be arranged, so as to be pivotable about a pivot axis, at two mutually opposite edges of the insertion opening. As the connector is inserted through the insertion opening into the housing, the closure parts, which in the closed position bear against one another by way of their edges facing toward one another, are pivoted into the interior of the housing counter to the spring forces. The closure parts that project here into the housing interior space require a large structural space, whereby not only the closure arrangement but also the housing has a large structural size.

[0003] The International Patent Application WO 2014014475 A1 describes a connector cover that may be used to protect a connector from exposure to environmental contaminants and physical abuse. In some examples, the connector cover includes a housing defining an opening that is configured to receive a connector positioned on the end of a transmission line. The housing may contain a complementary connector for mating with the transmission line connector.

[0004] It is an object of the invention to create a closure arrangement according to claim 1 which protects the interior of the housing against an ingress of dirt and moisture when the connector is not inserted into the insertion opening, which has a small structural space requirement, and which is of simple construction.

[0005] Said object is achieved according to the invention in that the closure parts are, with their mutually opposite regions directed toward the front wall, displaceably in contact with slide curves of the front wall, which extend from the outer region to the inner region of the insertion opening such that they diverge from one another in convex fashion, wherein those regions of the closure parts which bear against the slide curves have contours corresponding to the slide curves, and the closure parts are acted on displaceably toward one another along the slide curves by first spring forces.

[0006] The closure parts are preferably of plate-like form. The closure arrangement may advantageously be used in the case of USB connection sockets in the case of which the circuit board which bears electrical and electronic components arranged in the housing must be protected.

[0007] Since, owing to this embodiment, during the insertion of the connector, the closure parts acted on by said connector are moved along the inner side of the front wall approximately parallel thereto, only a small structural space is required.

[0008] Here, the closure parts are guided effectively on their displacement travel if the slide curves of the front wall are A-class surfaces.

[0009] The displacement travel of the closure parts away from one another can be limited in a structural-space-saving manner in that the closure parts are, after an initial travel out of the closed position in the direction of the open position, pivotable counter to second spring forces about axes of rotation extending transversely with respect to the displacement travel.

[0010] Here, it is preferable if the closure parts can, after the initial travel out of the closed position, be pivotable further into a position in which those regions of the closure parts which close off the insertion opening in the closed position extend parallel to the displacement travel and the connector slides along on said regions.

[0011] The closure parts have, on their sides directed toward the interior of the housing, projections which, in the closed position of the closure parts, project parallel to the displacement travel into the interior of the housing and whose ends projecting freely into the interior of the housing are, after the initial travel of the closure parts, acted on by the second spring forces in the direction of the displacement travel. Thus, either the closure parts can be held in contact with the slide curves, or the pivoting function of the closure parts parallel to the displacement travel is achieved using few components, which is expedient from an assembly aspect.

[0012] According to the invention, the first spring forces and the second spring forces can be generated by a single-piece spring element fastenable to the housing, thereby involving few components.

[0013] According to the present invention, the spring element is a closed, stadium-shaped spring plate element, the plate plane of which extends in the displacement travel direction, wherein spring arms which generate the first spring forces are arranged at the central regions of the longitudinal extent of the stadium-shaped spring plate element, by means of which spring arms the closure parts are acted on toward one another with a preload.

[0014] The central regions of the longitudinal extent of the stadium-shaped spring plate element may extend parallel to one another, wherein said central regions can be acted on by the free ends of the projections of the closure parts so as to move away from one another and thus generate the second spring forces.

[0015] For the fastening of the spring plate element to the front wall, fastening elements may be arranged on the inner side of the front wall of the housing, by means of which fastening elements the short end regions of the stadium-shaped spring plate element are fastenable to the front wall.

[0016] For simple assembly without the need for additional fastening components, the fastening elements may be pegs which project into the interior of the housing and which can be resiliently enclosed by loop-like regions at the short end regions of the stadium-shaped spring element.

[0017] Here, simple plug-in assembly is possible if the pegs are of cylindrical form and have radial widenings at

their free ends, wherein the loop-like regions of the spring plate element surround the cylindrical regions of the pegs.

[0018] An exemplary embodiment of the invention is illustrated in the drawing and will be described in more detail below. In the figures:

- figure 1 shows a cross section of a detail of a closure arrangement with a non-inserted connector,
- figure 2 shows a cross section of a detail of the closure arrangement as per figure 1, with a partially inserted connector,
- figure 3 shows a cross section of a detail of the closure arrangement as per figure 1, with a fully inserted connector,
- figure 4 shows a perspective view of a detail of the closure arrangement as per figure 1, with a non-inserted connector,
- figure 5 shows a perspective view of a detail of the closure arrangement as per figure 1, with a partially inserted connector,
- figure 6 shows a perspective view of a detail of the closure arrangement as per figure 1, with a fully inserted connector,
- figure 7 shows a perspective illustration of a spring plate element of the closure arrangement as per figure 1,
- figure 8 shows a plan view of the spring element as per figure 7,
- figure 9 shows a side view of the spring element as per figure 7,
- figure 10 shows a rear view of the spring element as per figure 7.

[0019] The illustrated closure arrangement shows a front wall 1 of a housing. An insertion opening 2 which leads from the housing exterior to the interior 4 of the housing is formed in the front wall 1. Two mutually opposite walls of the insertion opening 2 are formed by two slide curves 3, 3', which extend from the outer region to the interior 4 of the housing such that they diverge from one another in convex fashion and which are formed as A-class surfaces.

[0020] In the interior of the housing, there are arranged two plate-like closure parts 5, 5' which bear against the front wall 1.

[0021] In the closed position of the closure arrangement as illustrated in figures 1 and 4, the closure parts 5, 5' bear against one another by way of in each case

one of their end sides 7, 7' and close off the insertion opening 2. The plane of the end sides 7, 7' bearing against one another extends in this case in the center of the insertion opening 2. The outer surfaces 8, 8', directed toward the housing exterior, of the closure parts 5, 5' in the region of the insertion opening 2 extend in this case in the plane of the outer side of the front wall 1.

[0022] The closure parts 5, 5' are, by way of their surfaces facing toward the front wall 1, in abutment with the slide curves 3, 3' such that said closure parts are displaceable away from one another and toward one another, wherein those surfaces of the closure parts 5, 5' which bear against the slide curves 3, 3' have contours 6, 6' which correspond to the slide curves 3, 3'.

[0023] The second end sides 9, 9', situated opposite one another, of the closure parts 5, 5' are each acted on with force by preloaded spring arms 10, 10' such that they are displaceable into their closed position.

[0024] An electrical connector 11 is insertable from the outside through the insertion opening 2 into the interior 4 of the housing in a displacement travel direction 16, and is contactable with an electrical contact piece 12 arranged in the interior 4 of the housing.

[0025] For this purpose, the connector 11 is moved against the closure parts 5, 5' situated in their closed position (figures 1 and 4).

[0026] The force that is exerted here by the connector 11 on the closure parts 5, 5' has the effect that the closure parts 5, 5' move apart from one another counter to the forces of the spring arms 10, 10', wherein the closure parts 5, 5' slide with their contours 6, 6' along the slide curves 3, 3'.

[0027] When a spacing of the end sides 7, 7' of the closure parts 5, 5' which corresponds to the thickness of the connector 11 is reached, the connector 11 is displaced onward between the closure parts 5, 5' until it contacts the electrical contact piece 12 (figures 3 and 6).

[0028] Here, a lift-off of the closure parts 5, 5' with their contours 6, 6' from the slide curves 3, 3' is prevented by virtue of the closure parts 5, 5' having, on their sides directed toward the interior 4 of the housing, protruding projections 13, 13' which, during the opening movement of the closure parts 5, 5', abut against central regions 14, 14' of a spring plate element 15 and deflect these counter to their spring force.

[0029] The spring plate element 15 is of closed, stadium-shaped form, wherein the plate plane 17 of the spring plate element 15 extends parallel to the displacement travel direction 16.

[0030] From the central regions 14, 14', extending approximately parallel to one another, of the longitudinal extent of the stadium-shaped spring plate element 15, in each case one pair of the spring arms 10, 10' extends in cantilevered fashion transversely with respect to said longitudinal extent and act under preload with their free ends 18, 18' on the closure parts 5, 5'.

[0031] During the opening process of the closure parts 5, 5', the projections 13, 13' also abut against said central

regions 14, 14', wherein the central regions 14, 14' are moved apart from one another so as to exert an opposing force on the closure parts 5, 5'.

[0032] The short end regions 19, 19' of the spring plate element 15 are formed as double loops 20, 20' and, for the fastening of the spring plate element 16 to the front wall 1, resiliently enclose, by way of each loop of the double loops 20, 20', a peg (not illustrated). Said pegs are arranged on the front wall 1 and project freely into the interior 4 of the housing.

[0033] To permit simple plug-in assembly of the spring plate element 15, said pegs have radial widenings at their free ends.

List of reference signs

[0034]

1	Front wall	
2	Insertion opening	
3	Slide curve	
3'	Slide curve	
4	Interior of the housing	
5	Closure part	
5'	Closure part	25
6	Contour	
6'	Contour	
7	End side	
7'	End side	
8	Outer surface	30
8'	Outer surface	
9	Second end side	
9'	Second end side	
10	Spring arms	
10'	Spring arms	35
11	Connector	
12	Contact piece	
13	Projections	
13'	Projections	
14	Central region	40
14'	Central region	
15	Spring plate element	
16	Displacement direction	
17	Plate plane	
18	Free end	45
18'	Free end	
19	End region	
19'	End region	
20	Double loop	
20'	Double loop	50

Claims

1. A closure arrangement for closing off an insertion opening (2) in a front wall (1) of a housing for a connector (11) which is insertable through the insertion opening (2), on a displacement travel extending at

right angles to the front wall (1), into the interior (4) of the housing and which can be contacted there with a contact piece (12), the closure arrangement having:

the front wall (1),
two closure parts (5, 5') which are arranged on the inner side of the front wall (1) and which, counter to spring forces, can be acted on by the connector (11) inserted into the insertion opening (2) such that they are movable away from one another from a closed position, in which they each close off half of the insertion opening (2) and in which the closure parts (5, 5') bear against one another, by way of their end sides (7, 7') facing toward one another, in the center of the insertion opening (2), into an open position, in which the connector (11) can pass through, the closure parts (5, 5') are, with their mutually opposite regions directed toward the front wall (1), displaceably in contact with slide curves (3, 3') of the front wall (1), which extend from the outer region to the inner region of the insertion opening (2) such that they diverge from one another, wherein those regions of the closure parts (5, 5') which bear against the slide curves (3, 3') have contours (6, 6') corresponding to the slide curves (3, 3'), and the closure parts (5, 5') are acted on displaceably toward one another along the slide curves (3, 3') by first spring forces,

characterised in that

the slide curves (3, 3') diverge from one another in convex fashion,

and **in that** the closure parts (5, 5') are, after an initial travel out of the closed position in the direction of the open position, pivotable counter to second spring forces about axes of rotation extending transversely with respect to the displacement travel,

wherein the closure arrangement further comprises a single-piece spring element fastenable to the housing, the single-piece spring element generating the first spring forces and the second spring forces, and

in that the spring element is a closed, stadium-shaped spring plate element (15), the plate plane (17) of which extends in the displacement travel direction (16), wherein spring arms (10, 10') which generate the first spring forces are arranged at the central regions (14, 14') of the longitudinal extent of the stadium-shaped spring plate element (15), by means of which spring arms the closure parts (5, 5') are acted on toward one another with a preload.

2. The closure arrangement as claimed in claim 1, wherein the closure parts (5, 5') have, on their sides directed toward the interior (4) of the housing, pro-

jections (13, 13') which, in the closed position of the closure parts (5, 5'), project parallel to the displacement travel (16) into the interior (4) of the housing and whose ends projecting freely into the interior (4) of the housing and wherein said central regions (14, 14') can be acted on by the free ends of the projections (13, 13') of the closure parts (5, 5') so as to move away from one another and thus generate the second spring forces.

3. The closure arrangement as claimed in either of claims 1 and 2, wherein fastening elements are arranged on the inner side of the front wall (1) of the housing, by means of which fastening elements the short end regions (19, 19') of the stadium-shaped spring plate element (15) are fastenable to the front wall (1).
4. The closure arrangement as claimed in claim 3, wherein the fastening elements are pegs which project into the interior (4) of the housing and which can be resiliently enclosed by loop-like regions at the short end regions (19, 19') of the stadium-shaped spring element (15).
5. The closure arrangement as claimed in claim 4, wherein the pegs are of cylindrical form and have radial widenings at their free ends, wherein the loop-like regions of the spring plate element (15) surround the cylindrical regions of the pegs.

Patentansprüche

1. Verschlussanordnung zum Verschließen einer Einführöffnung (2) in einer Vorderwand (1) eines Gehäuses für einen Stecker (11), der durch die Einführöffnung (2) auf einem Verschiebeweg, der sich rechtwinklig zu der Vorderwand (1) erstreckt, in das Innere (4) des Gehäuses einführbar ist und der dort mit einem Kontaktstück (12) kontaktiert werden kann, wobei die Verschlussanordnung Folgendes aufweist:

die Vorderwand (1),
zwei Verschlusssteile (5, 5'), die an der Innenseite der Vorderwand (1) angeordnet sind und auf die durch den in die Einführöffnung (2) eingeführten Stecker (11) entgegen Federkräften eingewirkt werden kann, so dass sie aus einer geschlossenen Position, in der sie jeweils die Hälfte der Einführöffnung (2) verschließen und in der die Verschlusssteile (5, 5') mit ihren aufeinander zu weisenden Endseiten (7, 7') in der Mitte der Einführöffnung (2) aneinander anliegen, voneinander weg in eine offene Position beweglich sind, in der der Stecker (11) hindurchgehen kann, wobei die Verschlusssteile (5, 5'), deren

sich gegenüberliegende Bereiche der Vorderwand (1) zugewandt sind, mit Gleitkurven (3, 3') der Vorderwand (1) verschiebbar in Kontakt sind, die sich von dem äußeren Bereich zu dem inneren Bereich der Einführöffnung (2) erstrecken, so dass sie voneinander divergieren, wobei jene Bereiche der Verschlusssteile (5, 5'), die an den Gleitkurven (3, 3') anliegen, Konturen (6, 6') haben, die den Gleitkurven (3, 3') entsprechen, und erste Federkräfte so auf die Verschlusssteile (5, 5') einwirken, dass diese entlang der Gleitkurven (3, 3') aufeinander zu verschiebbar sind,

dadurch gekennzeichnet, dass

die Gleitkurven (3, 3') konvex voneinander divergieren und dass die Verschlusssteile (5, 5') nach einer anfänglichen Bewegung aus der geschlossenen Position in die Richtung der offenen Position entgegen zweiter Federkräfte um Rotationsachsen schwenkbar sind, die sich quer bezüglich des Verschiebewegs erstrecken,

wobei die Verschlussanordnung ferner ein einteiliges Federelement umfasst, das an dem Gehäuse befestigt werden kann, wobei das einteilige Federelement die ersten Federkräfte und die zweiten Federkräfte erzeugt, und

dass das Federelement eine geschlossenes stadionförmiges Federplattenelement (15) ist, dessen Plattenebene (17) sich in der Verschiebewegrichtung (16) erstreckt, wobei Federarme (10, 10'), die die ersten Federkräfte erzeugen, an den mittleren Bereichen (14, 14') der Längserstreckung des stadionförmigen Federplattenelements (15) angeordnet sind, wobei die Verschlusssteile (5, 5') durch die Federarme mittels einer Vorbelastung aufeinander zu beaufschlagt werden.

2. Verschlussanordnung nach Anspruch 1, wobei die Verschlusssteile (5, 5') an ihren dem Inneren (4) des Gehäuses zugewandten Seiten Vorsprünge (13, 13') aufweisen, die in der geschlossenen Position der Verschlusssteile (5, 5') parallel zu dem Verschiebeweg (16) in das Innere (4) des Gehäuses vorragen und deren Enden frei in das Innere (4) des Gehäuses vorragen, und wobei die freien Enden der Vorsprünge (13, 13') der Verschlusssteile (5, 5') auf die mittleren Bereiche (14, 14') einwirken können, so dass sie sich voneinander weg bewegen und somit die zweiten Federkräfte erzeugen.
3. Verschlussanordnung nach Anspruch 1 oder 2, wobei Befestigungselemente an der Innenseite der Vorderwand (1) des Gehäuses angeordnet sind, wobei die kurzen Endbereiche (19, 19') des stadionförmigen Federplattenelements (15) mittels dieser Befestigungselemente an der Vorderwand (1) befestigt

werden können.

4. Verschlussanordnung nach Anspruch 3, wobei die Befestigungselemente Stifte sind, die in das Innere (4) des Gehäuses vorragen und die an den kurzen Endbereichen (19, 19') des stadionförmigen Federelements (15) von schlaufenartigen Bereichen federnd umschlossen sein können. 5
5. Verschlussanordnung nach Anspruch 4, wobei die Stifte eine zylindrische Form haben und an ihren freien Enden radiale Aufweitungen haben, wobei die schlaufenartigen Bereiche des Federplattenelements (15) die zylindrischen Bereiche der Stifte umgeben. 10 15

Revendications

1. Structure de fermeture pour fermer une ouverture d'insertion (2) dans une paroi avant (1) d'un logement pour un connecteur (11) qui est propre à être inséré à travers l'ouverture d'insertion (2), par un déplacement de connecteur perpendiculaire à la paroi avant (1), dans l'intérieur (4) du logement où il peut être mis en contact avec une pièce de contact (12), la structure de fermeture comportant : 20 25

la paroi avant (1),
deux parties de fermeture (5, 5') qui sont placées sur le côté intérieur de la paroi avant (1) et sur lesquelles peut agir, à l'encontre de forces élastiques, le connecteur (11) inséré dans l'ouverture d'insertion (2) de façon à les écarter l'une de l'autre d'une position fermée, dans laquelle elles ferment chacune une moitié de l'ouverture d'insertion (2) et dans laquelle les parties de fermeture (5, 5') sont en appui l'une contre l'autre, par le biais de leurs côtés d'extrémité (7, 7') orientés l'un vers l'autre, au centre de l'ouverture d'insertion (2), à une position ouverte, dans laquelle le connecteur (11) peut passer, les parties de fermeture (5, 5') se trouvant, avec leurs régions mutuellement opposées dirigées vers la paroi avant (1), en contact de manière déplaçable avec des courbes de coulissement (3, 3') de la paroi avant (1), qui s'étendent de la région extérieure à la région intérieure de l'ouverture d'insertion (2) de telle sorte qu'elles divergent l'une de l'autre, les régions des parties de fermeture (5, 5') qui sont appui contre les courbes de coulissement (3, 3') présentant des contours (6, 6') correspondant aux courbes de coulissement (3, 3'), et des premières forces élastiques agissant sur les parties de fermeture (5, 5') de façon à les déplacer l'une vers l'autre le long des courbes de coulissement (3, 3'),
caractérisée en ce que

les courbes de coulissement (3, 3') divergent l'une de l'autre de façon convexe, et **en ce que** les parties de fermeture (5, 5') sont, après un déplacement initial de la position fermée en direction de la position ouverte, propres à pivoter à l'encontre de secondes forces élastiques autour d'axes de rotation s'étendant transversalement par rapport au déplacement de connecteur,

la structure de fermeture comprenant, en outre, un élément élastique monobloc propre à être fixé au logement, l'élément élastique monobloc générant les premières forces élastiques et les secondes forces élastiques, et

en ce que l'élément élastique est un élément fait d'une plaque élastique fermée en forme de stade (15), dont le plan de plaque (17) s'étend dans la direction du déplacement de connecteur (16), des bras élastiques (10, 10') qui génèrent les premières forces élastiques étant situés au niveau de régions centrales (14, 14') de l'étendue longitudinale de l'élément fait d'une plaque élastique en forme de stade (15), les bras élastiques agissant sur les parties de fermeture (5, 5') avec une précharge de façon à les solliciter l'une vers l'autre.

2. Structure de fermeture selon la revendication 1, dans laquelle les parties de fermeture (5, 5') comportent, sur leurs côtés dirigés vers l'intérieur (4) du logement, des saillies (13, 13') qui, dans la position fermée des parties de fermeture (5, 5'), font saillie parallèlement au déplacement de connecteur (16) dans l'intérieur (4) du logement et dont les extrémités font saillie librement dans l'intérieur (4) du logement et dans laquelle les extrémités libres des saillies (13, 13') des parties de fermeture (5, 5') peuvent agir sur lesdites régions centrales (14, 14') de façon à les écarter l'une de l'autre et à générer ainsi les secondes forces élastiques. 30 35 40
3. Structure de fermeture selon l'une ou l'autre des revendications 1 et 2, dans laquelle des éléments de fixation sont placés sur le côté intérieur de la paroi avant (1) du logement, les régions d'extrémité courtes (19, 19') de l'élément fait d'une plaque élastique en forme de stade (15) étant propres à être fixées à la paroi avant (1) au moyen desdits éléments de fixation. 45 50
4. Structure de fermeture selon la revendication 3, dans laquelle les éléments de fixation sont des chevilles qui font saillie dans l'intérieur (4) du logement et qui peuvent être encerclées de manière élastique par des régions semblables à des boucles au niveau des régions d'extrémité courtes (19, 19') de l'élément élastique en forme de stade (15). 55

5. Structure de fermeture selon la revendication 4, dans laquelle les chevilles sont de forme cylindrique et comportent des parties radialement élargies au niveau de leurs extrémités libres, dans laquelle les régions semblables à des boucles de l'élément fait d'une plaque élastique (15) entourent les régions cylindriques des chevilles.

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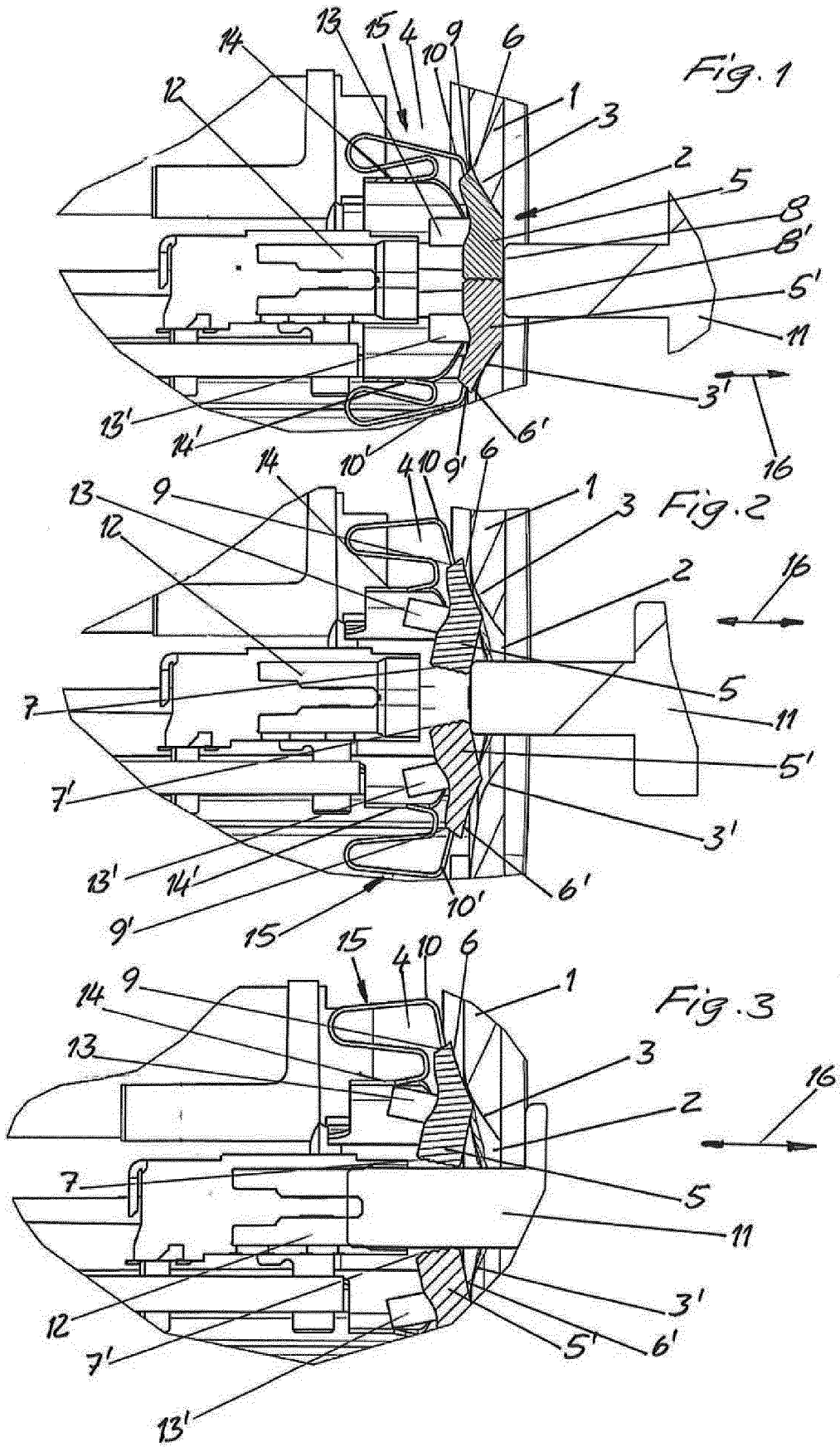
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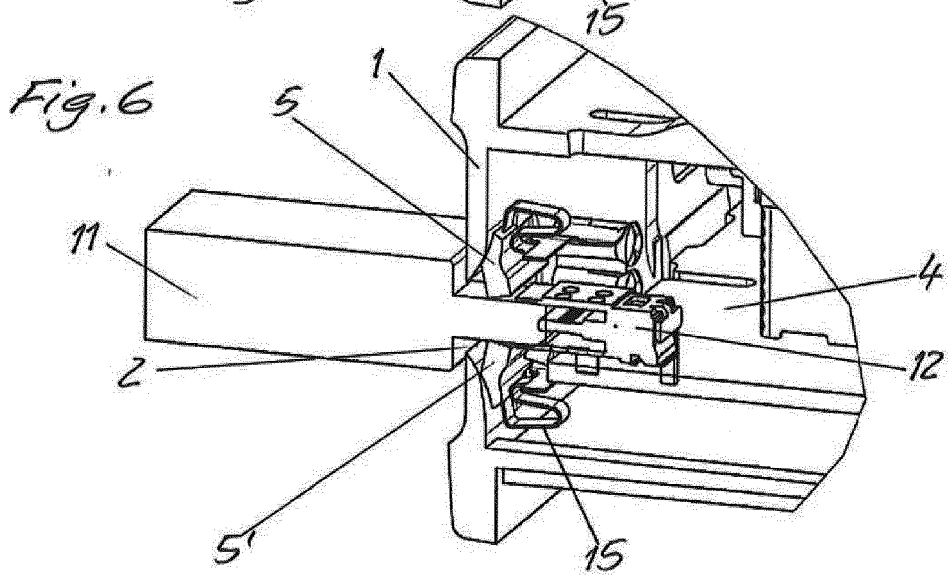
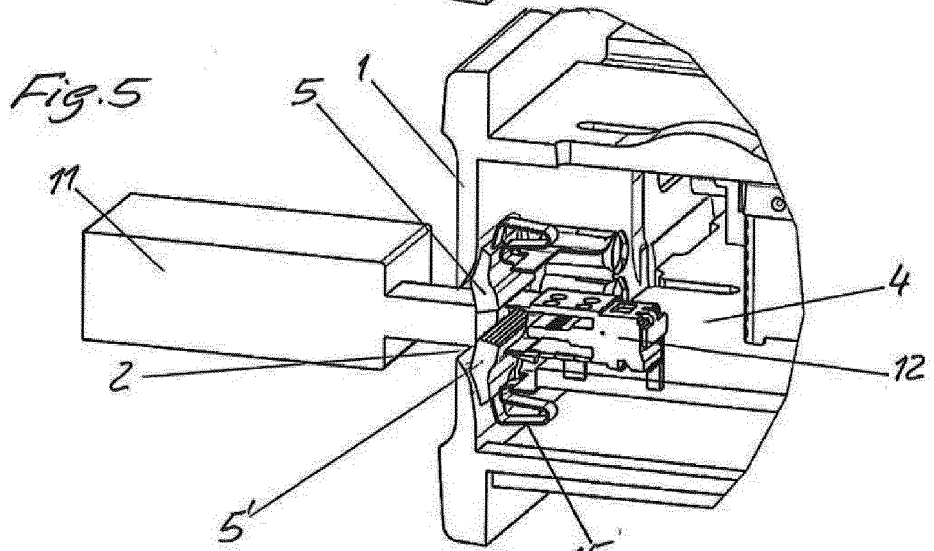
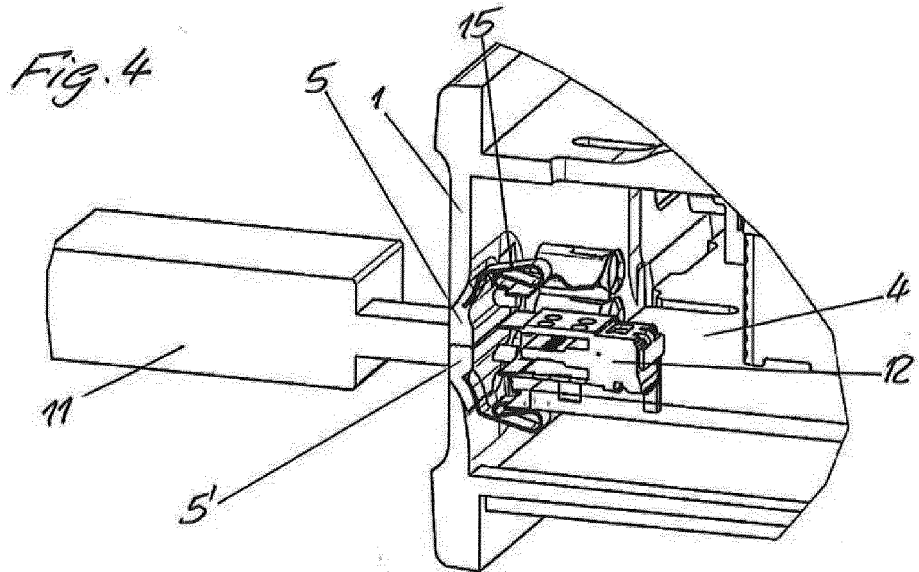
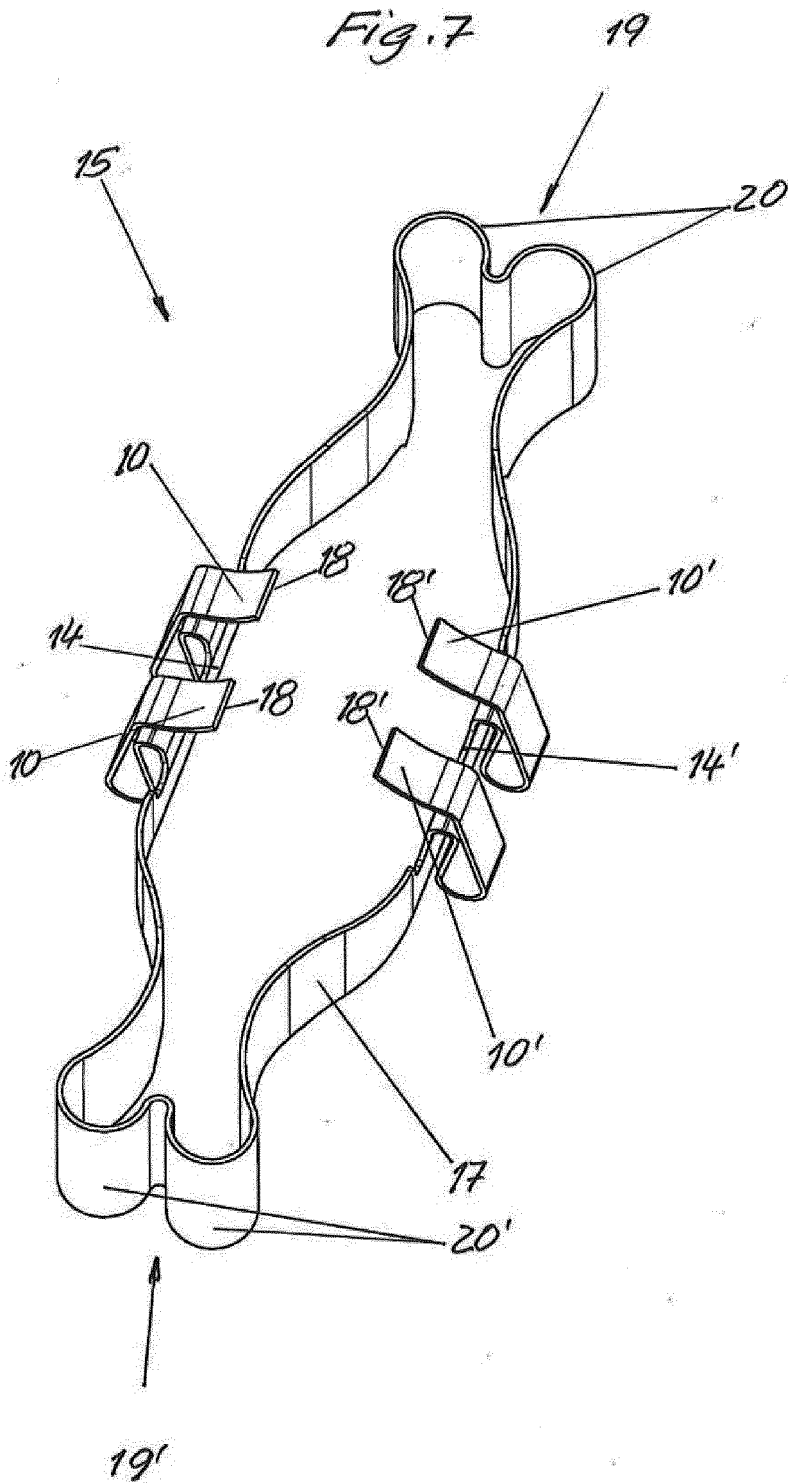
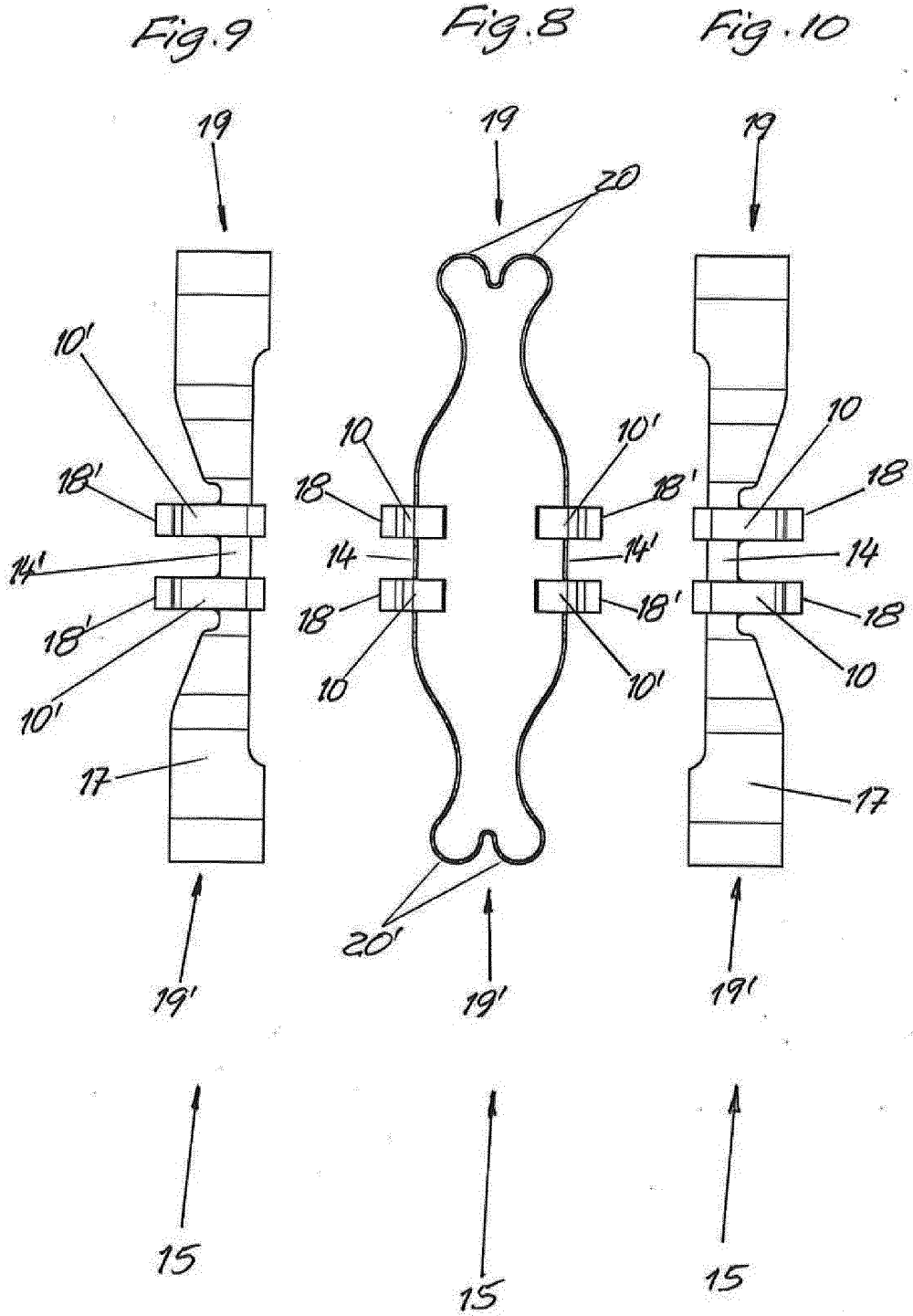


Fig. 7





REFERENCES CITED IN THE DESCRIPTION

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