

(19)



(11)

EP 3 667 833 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
17.06.2020 Bulletin 2020/25

(51) Int Cl.:
H01R 13/453 ^(2006.01) **H01R 13/52** ^(2006.01)

(21) Application number: **18465636.1**

(22) Date of filing: **13.12.2018**

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
 GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
 PL PT RO RS SE SI SK SM TR**
 Designated Extension States:
BA ME
 Designated Validation States:
KH MA MD TN

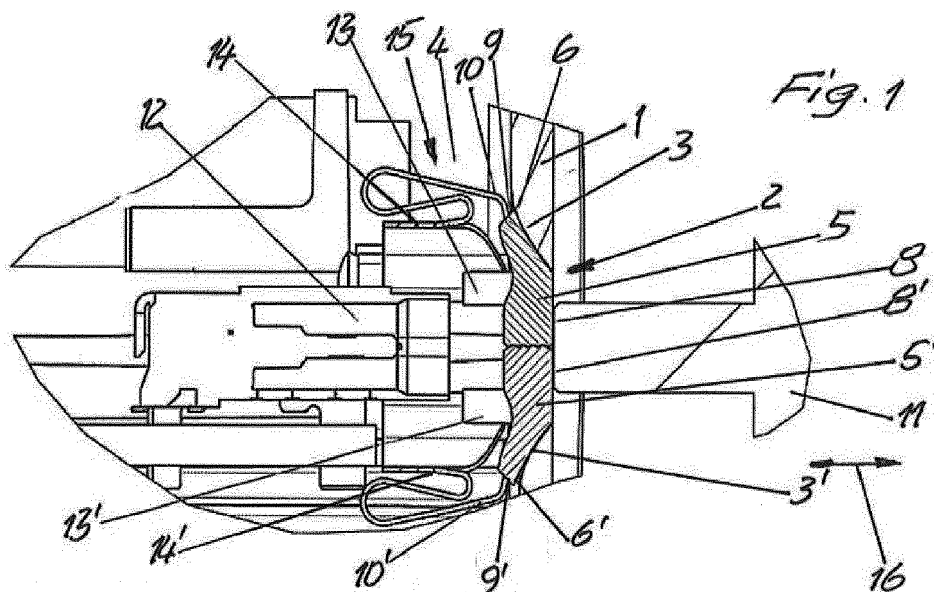
(71) Applicant: **Continental Automotive GmbH**
30165 Hannover (DE)

(72) Inventor: **Homutescu, Adrian**
700934 Iasi (RO)

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

(57) The invention relates to 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. Having 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 in convex fashion. Here, 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.

**EP 3 667 833 A1**

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, on a displacement travel extending at right angles to the front wall, into the interior of the housing and which can be contacted there with a contact piece, having two closure parts which are arranged on the inner side of the front wall and which, counter to spring forces, can be acted on by the connector inserted into the insertion opening such that they are movable away from one another from a closed position, in which they each close off half of the insertion opening and in which the closure parts bear against one another, by way of their end sides facing toward one another, in the center of the insertion opening, into an open position, in which the connector can pass through.

[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] It is an object of the invention to create a closure arrangement of the type mentioned in the introduction 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.

[0004] 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.

[0005] 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.

[0006] 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.

[0007] Here, the closure parts are guided effectively on their displacement travel if the slide curves of the front wall are A-class surfaces.

5 **[0008]** 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.

10 **[0009]** 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.

15 **[0010]** The closure parts may 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.

20 **[0011]** It is likewise expedient from an assembly aspect, and involves few components, if the first spring forces and/or the second spring forces can be generated by a single-piece spring element fastenable to the housing.

25 **[0012]** Here, in a simple embodiment, the spring element is preferably 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.

30 **[0013]** 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.

35 **[0014]** 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.

40 **[0015]** 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.

[0016] 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.

[0017] 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.

[0018] 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.

[0019] In the interior of the housing, there are arranged two plate-like closure parts 5, 5' which bear against the

front wall 1. 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.

[0020] 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'.

[0021] 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.

[0022] 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.

[0023] For this purpose, the connector 11 is moved against the closure parts 5, 5' situated in their closed position (figures 1 and 4).

[0024] 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'.

[0025] 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).

[0026] 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.

[0027] 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.

[0028] 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'.

[0029] 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'.

[0030] 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.

[0031] 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

[0032]

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

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), having 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, **characterized in that** 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 in convex fashion, 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.

2. The closure arrangement as claimed in claim 1, **characterized in that** the slide curves (3, 3') of the front wall (1) are A-class surfaces.

3. The closure arrangement as claimed in claim 1, **characterized 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.

4. The closure arrangement as claimed in claim 3, **characterized in that** the closure parts are, after the initial travel out of the closed position, 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.

5. The closure arrangement as claimed in any of the preceding claims, **characterized in that** the closure parts (5, 5') have, on their sides directed toward the interior (4) of the housing, projections (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 are, after the initial travel of the closure parts (5, 5'), acted

on by the second spring forces in the direction of the displacement travel (16).

6. The closure arrangement as claimed in any of the preceding claims, **characterized in that** the first spring forces and/or the second spring forces can be generated by a single-piece spring element fastenable to the housing. 5

7. The closure arrangement as claimed in claim 6, **characterized 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. 10
15
20

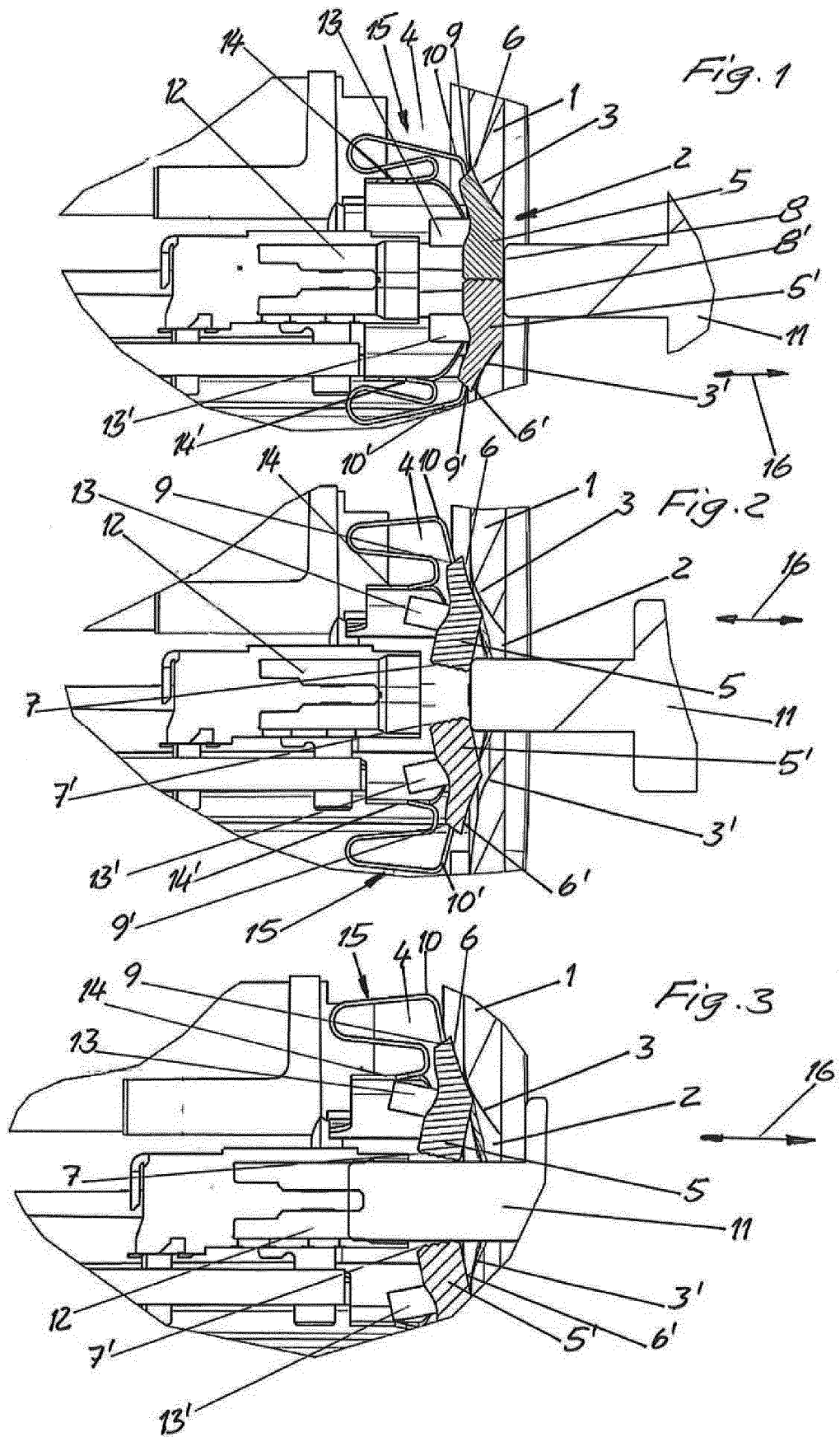
8. The closure arrangement as claimed in claims 5 and 7, **characterized in that** central regions (14, 14') of the longitudinal extent of the stadium-shaped spring plate element (15) extend parallel to one another, wherein said central regions (14, 14') can be acted on by the free ends of the projections (13, 13') of the closure parts (5, 5') so as to move away from one another and thus generate the second spring forces. 25

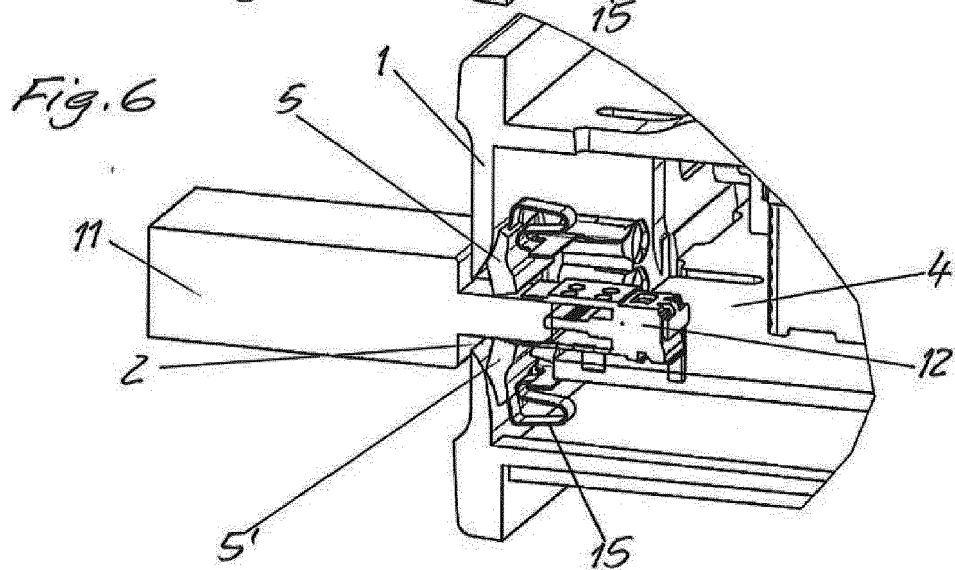
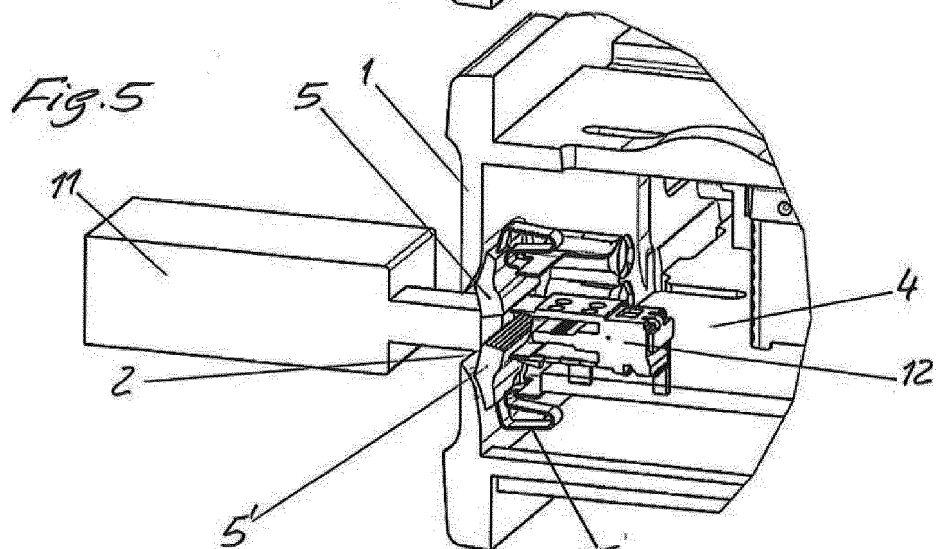
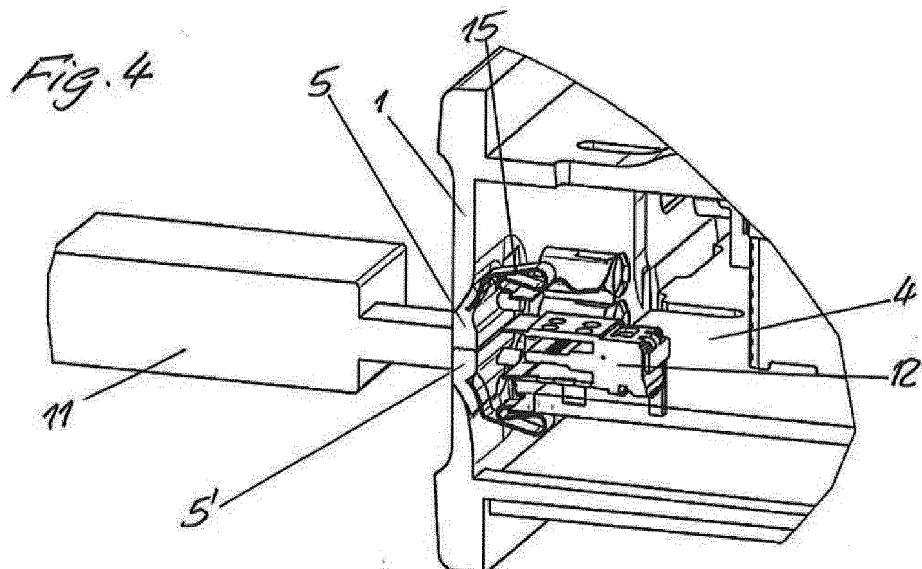
9. The closure arrangement as claimed in either of claims 7 and 8, **characterized in that** fastening elements are arranged on the inner side of the front wall (1) of the housing, by means of which fastening elements the short end regions (19, 19') of the stadium-shaped spring plate element (15) are fastenable to the front wall (1). 30
35

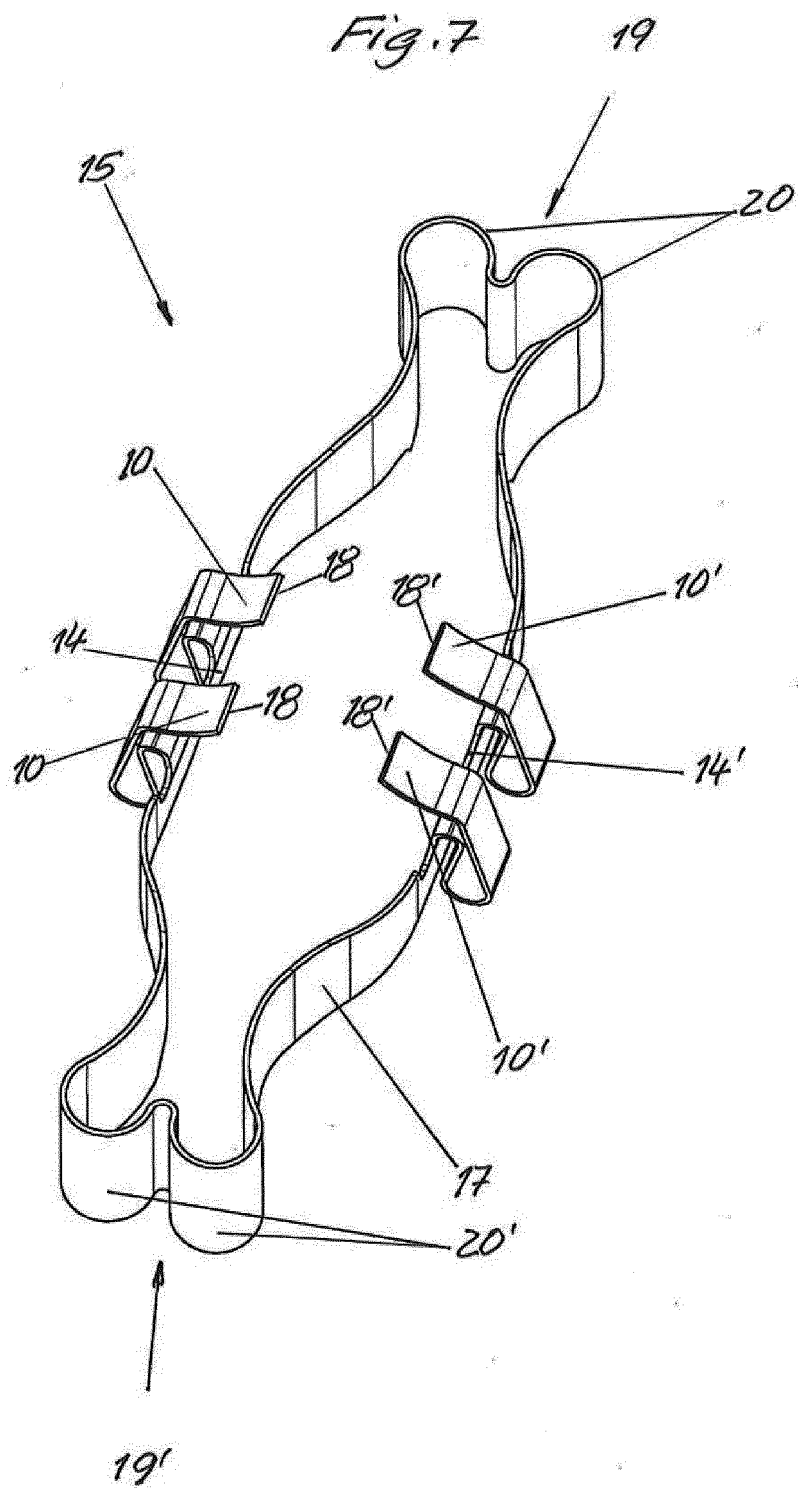
10. The closure arrangement as claimed in claim 9, **characterized in that** the fastening elements are pegs which project into the interior (4) of the housing and which can be resiliently enclosed by loop-like regions at the short end regions (19, 19') of the stadium-shaped spring element (15). 40

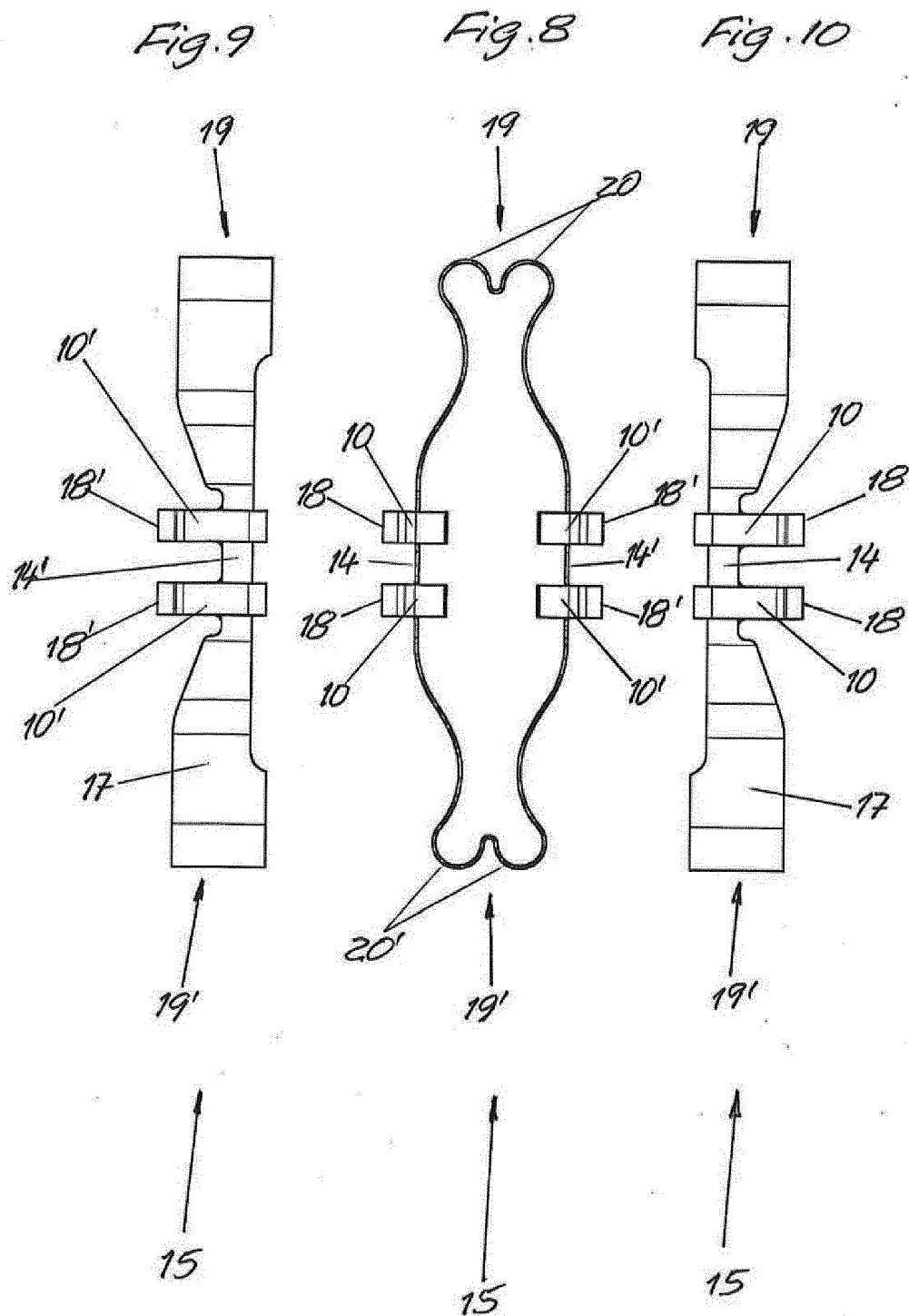
11. The closure arrangement as claimed in claim 10, **characterized in that** the pegs are of cylindrical form and have radial widenings at their free ends, wherein the loop-like regions of the spring plate element (15) surround the cylindrical regions of the pegs. 45
50

55











EUROPEAN SEARCH REPORT

Application Number
EP 18 46 5636

5

10

15

20

25

30

35

40

45

50

55

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2014/014475 A1 (ACIST MEDICAL SYS INC [US]; RUSSELL JOHN [US]) 23 January 2014 (2014-01-23) * figures 1-3,5a,5b * * paragraph [0029] *	1-6	INV. H01R13/453
A	----- WO 2005/047052 A1 (MAGCODE AG [DE]; NEIDLEIN HERMANN [DE]) 26 May 2005 (2005-05-26) * figures 1-4 *	7-11	ADD. H01R13/52
A	----- US 2 816 680 A (NIEMEYER JOHN A) 17 December 1957 (1957-12-17) * figures 1-6 *	1	

			TECHNICAL FIELDS SEARCHED (IPC)
			H01R
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 17 May 2019	Examiner Hugueny, Bertrand
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03/82 (P04C01)

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

EP 18 46 5636

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

17-05-2019

10

15

20

25

30

35

40

45

50

55

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2014014475 A1	23-01-2014	CN 104662744 A	27-05-2015
		EP 2875553 A1	27-05-2015
		HK 1210322 A1	15-04-2016
		JP 6254588 B2	27-12-2017
		JP 2015526852 A	10-09-2015
		WO 2014014475 A1	23-01-2014

WO 2005047052 A1	26-05-2005	DE 10352547 A1	09-06-2005
		WO 2005047052 A1	26-05-2005

US 2816680 A	17-12-1957	NONE	

EPO FORM P0459

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