(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 821 446 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
28.01.1998 Bulletin 1998/05

(51) Int. Cl.[6]: **H01R 13/74**

(21) Application number: **97201924.4**

(22) Date of filing: **23.06.1997**

(84) Designated Contracting States:
AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE

(30) Priority: **23.07.1996 DE 19629594**

(71) Applicant:
Delphi Automotive Systems Deutschland GmbH
D-42369 Wuppertal (DE)

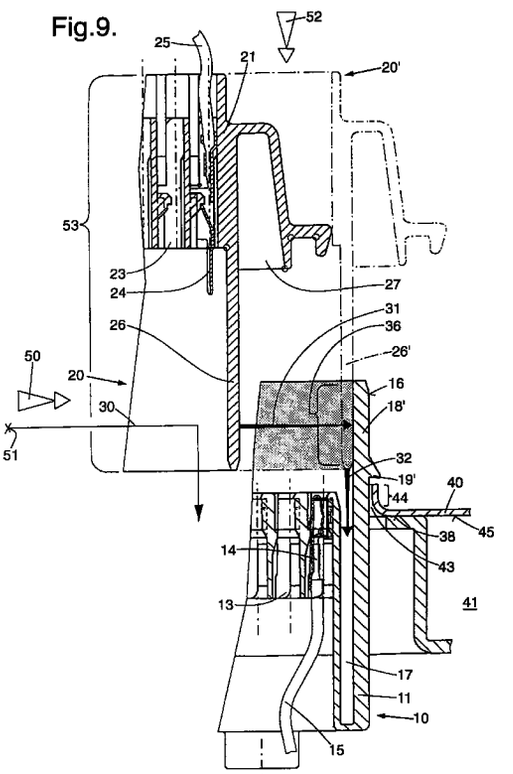
(72) Inventor: **Zakrzewski, Michael**
47809 Krefeld (DE)

(74) Representative:
Denton, Michael John
Delphi Automotive Systems
Centre Technique Paris
117 avenue des Nations
B.P. 60059
95972 Roissy Charles de Gaulle Cedex (FR)

(54) Two-part electrical coupling

(57) In an electrical coupling comprising two coupling parts 10, 20, the one housing 11 is a stationary housing which has a casing pointing in insertion direction 52 with a casing extension 36 which permits an angular coupling movement 30 of the mobile insertion housing 21, equipped with a collar 26, of the other coupling part 20. For this purpose leaf springs 18' with snap projections 19' are integrated in the casing 16, which serve to fix the stationary housing 11 in the opening 43 of a wall 40. The fixing depth is defined by axial stops 38 on the stationary housing 11. On coupling 30, a radial alignment movement 31 of the insertion housing 21 with respect to the stationary housing 11 initially takes place, until the collar 26 strikes the casing extension 36. An axial insertion movement 32 only takes place after this. The collar 26 travels into an axially open gap 17 which separates the casing 16 from a field 12 with chambers 13 for contact parts 14 arranged in the stationary coupling part 10. The casing extension 36 penetrates into an axially open channel 27 adjacent to the collar 26 of the insertion housing 21.

Fig.9.



EP 0 821 446 A2

Description

Technical Field

The invention relates to an electrical coupling of the type stated in the pre-characterising clause of Claim 1. In vehicles these are preferably used in order electrically and mechanically to connect lines running between the engine compartment and the passenger compartment through an opening in the body wall.

Background of the Invention

In the prior art, flexible pipes laid in the wall opening of the body and through which the lines from the passenger compartment are routed are used for this purpose. The mutually engaging coupling parts are located in the engine compartment, and in fact in a region of the vehicle which is not readily accessible. Vision for coupling the two parts is greatly restricted. It is a difficult and laborious process to put the two coupling parts together and because vision is impaired it is more difficult to centre the coupling parts when coupling. There is the risk of one coupling part being pressed back into the passenger compartment when they are inserted into each other.

The object of the invention is to develop a coupling of the kind quoted in the pre-characterising clause of Claim 1, the two coupling parts of which can be quickly and reliably inserted into each other. According to the invention this is achieved by the measures described in the distinguishing feature of Claim 1 which have the following special importance.

Summary of the Invention

In the invention the housing of the first coupling part is arranged in the wall opening in a stationary manner, for which reason it will be abbreviated below to "stationary housing". The housing of the other coupling part is loose and is, after the fixing of the stationary housing, inserted into it and will be abbreviated below to "insertion housing". In the invention the stationary housing has an axial casing which at least region-wise includes the field located there for contact parts connected to electrical lines, which will be abbreviated to "chamber field" below. In the event of fixing this casing rests on the interior wall of the wall opening. Leaf springs with radial snap projections which engage with the wall opening are integrated in this casing whilst axial stops on the stationary housing are supported on the inner surface of the wall in the event of fixing. By this means the position of the stationary housing is determined both axially and radially.

The coupling process is decisively facilitated by means of a casing extension which projects out of the stationary housing fixed to the wall. The insertion housing has a collar which surrounds the chamber field there. In the coupling process the insertion housing is initially moved radially with respect to the static stationary housing until its collar strikes the casing extension. There is then definitely an axial alignment of the two housings which then permits an axial insertion movement of the coupling parts without problems. The casing extension therefore acts as a guide surface for the insertion housing. In the invention a combined radial/axial coupling movement takes place. The casing with its extension on the one hand and the collar on the other hand finally travel into axially open gaps and/or channels which are mutually provided in the two housings. In the invention the coupling process is very simple; it can be carried out accurately and quickly, virtually "with one's eyes closed".

Furthermore the fixing position of the stationary housing in the wall opening is assured. This arises because the collar from the insertion housing travels at least behind a leaf spring located in the casing of the stationary housing and stiffens it. This means that the leaf spring can no longer be elastically deformed and a disengagement of its snap projection engaging with the wall opening is ruled out in principle.

Brief Description of the Drawings

Further measures and advantages of the invention will emerge from the sub-claims, the description which follows and the drawings. The invention is illustrated in an embodiment in the drawings, in which:

Figure 1 shows a top view onto the stationary housing of the one coupling part according to the invention,

Figures 2 and 3 show side views at right angles to each other of the stationary housing as viewed in the direction of the arrows II and III of Figure 1,

Figure 4 shows a cross-section through the stationary housing along the offset broken line IV-IV of Figure 1,

In a view corresponding to Figure 4, Figure 5 shows a top view onto the complementary insertion housing of the other coupling part,

By analogy with Figures 2 and 3, Figures 6 and 7 show two side views of the insertion housing as viewed in the direction of the arrows VI and VII of Figure 5,

By analogy with Figure 4, Figure 8 shows a cross-section through the insertion housing along line VIII-VIII of Figure 5,

In a cross-section corresponding to Figure 4 and Figure 8 respectively, Figure 9 shows fragments of the two coupling parts in the course of their coupling process and

In a view similar to Figure 9, Figure 10 shows parts of the two coupling parts after coupling has been completed.

Description of the Preferred Embodiment

As can best be seen from the fragments of Figure 9, the electrical coupling according to the invention comprises two coupling parts 10, 20. The two coupling parts each comprise a housing 11, 21, the appearance of which is shown in the various views of Figures 1 to 4 on the one hand and Figures 5 to 8 on the other hand. Both housings 11, 21 comprise a central field 12 and/or 22 with an assemblage of parallel chambers 13 and/or 23 which each receive mutually complementary contact parts 14 and/or 24 and position them in an axially fixed manner, as can be seen from Figure 9. The individual contact parts 14, 24 are connected to electrical lines 15, 25 in each case, which project from the mutually opposite ends of the two housings 11, 21. As already initially stated, these fields 12, 22 will be denoted as "chamber fields" below. The one contact part 14 is a socket, for example, whereas the other contact part 24 is formed by a connector.

Such coupling parts 10, 20 are normally inserted into each other axially, as shown in Figure 9 by the arrow 52. In the invention, however, this axial direction 52 is only the last phase of the coupling process, the entire movement sequence of which is indicated by an arrow 30 in Figure 9. This entire movement 30 can be divided into two movement phases 31, 32, to which, apart from the axial insertion movement 32 marked by an arrow 32, a preceding radial alignment movement 31 determined by stops and also marked by an arrow in Figure 9, belongs. For this purpose the two housings 11, 21 have a special construction.

The purpose of the coupling comprising the two coupling parts 10, 20 is to connect two chambers 41, 42 separated from each other by a wall 40 to electrical lines 15, 25 via a wall opening 43. In the embodiment shown these are lines 15, 25 of a vehicle which are to be laid between a passenger compartment 41 and an engine compartment 42 and indeed through a wall opening 43 of a body 40. In this case the body wall 40 consists of sheet metal and is therefore delimited in its wall opening 43 by means of a tubular shoulder 44 formed by the sheet metal. The one housing 11 is fixed to this body wall 40, for which reason this housing 11 proves to be the "stationary housing" already mentioned. Accordingly the other housing 21 is the initially mentioned "insertion housing" which is to be coupled to the static stationary housing 11 by means of the two-phase movement 30 described above. The direction of insertion marked by the arrow 52 will be described as "axial direction" below and it comes to rest perpendicular to the drawing plane in the top views of Figures 1 and/or 5 of the two housings 11 and/or 21.

The stationary housing 11 shown in Figures 1 to 4 in the different views and sections quoted initially comprises a casing 16 running in the axial direction and surrounding the central chamber field 12 of the stationary housing 11 on all sides, as can best be seen from Figure 1. In this case therefore the casing 16 indeed has a sleeve shape but, as can be seen from Figures 2 and 3, different axial heights 33 and/or 34 which are achieved in that region-wise the casing 16 has a continuation extended by the height 35 which will be denoted below as "casing extension". This casing extension 36 is emphasised in Figures 1 to 3 by dotted hatching. The casing 16 has an angular, namely a rectangular contour and, as Figure 1 shows, the casing extension 36 is located in a corner region 37 of the stationary housing 11. Located between the chamber field 12 and the casing 16 and/or its casing extension 36 is a gap 17, annularly closed in this case, which is axially open.

A further special feature of the stationary housing 11 lies in the fact that leaf springs 18, 18' which have outwards-pointing radial snap projections 19, 19' are integrated in the casing 16. In the event of fixing, according to Figure 9, the snap projections 19' engage with the wall opening at the end of the tubular pipe shoulder 44 whereas a partial piece of the casing 16 comes to rest with its peripheral surface against the interior surface of the wall opening 43. In the event of fixing, according to Figure 9 axial stops 38 provided on the housing come to rest against the inner surface 45 of the body wall 40. The position of the body wall with respect to the stationary housing 11 is shown in broken lines in Figures 1 to 4 also. As can be seen from Figure 1, the axial stops 38 arise by means of opposing shouldered steps in the stationary housing 11. In the step surfaces 38 are integrated spring elements 39 which, as can best be seen from the partial section in Figure 2, are pointed against the snap projections 19, 19' of the leaf springs 18, 18'. These spring elements 39 are intended to equalise tolerances of the sheet metal thickness and/or of the tubular shoulder 44 and ensure that the body wall 40 is clamped under pretension between the snap projections 19, 19' on the one hand and the axial stops 38 on the other hand.

In places the casing 16 with different axial heights 33, 34 round its circumference is provided with interruptions 46 which can be seen in Figure 2 and which at this point produce the leaf springs 18 virtually from a part-piece of the casing 16. This means that the leaf spring 18 can be elastically bent in the fixing process of the housing 11 in the wall opening 43 until, as already mentioned, its snap projection 19 engages with the wall opening 43. The radial inwards movement of the leaf spring 18 which is shown by a curved arrow 47 in Figure 4 is required for this. The same also applies to the leaf spring 18', although this is designed differently as follows.

As can best be seen from Figure 2, the leaf spring 18' is located in the region of the casing extension 36. It arises in that two slots 48 running at a lateral distance apart are cut into the casing 16 so that this leaf spring 18' arises from the casing piece lying in between. It can also be seen from Figure 2 that the outer axial leaf end 49 again blends into the outer region of the casing

extension 36 and is therefore formed in one piece to that extent. Whereas the leaf spring 18 is deformed like a one-sidedly tensioned bending arm when the housing 11 is mounted on the body wall 40, the leaf spring 18' deforms like a two-sidedly tensioned spring beam.

In the above-mentioned views and sections Figures 5 to 8 show the associated insertion housing 21 of the other coupling part 20 of Figure 9. The insertion housing 20 comprises a shouldered collar 26 which annularly surrounds the chamber field 22 there. This collar 26 is surrounded by an annular channel 27 best seen in Figures 5 and 8. The collar 26 does not need to have a consistent axial height in the entire annular region. Rather, as can be seen from Figure 7, the collar edge 28 may run in a curved manner and hence have a differing axial height 29 in annular zones.

Figure 9 shows an intermediate phase of the coupling process of the two parts 10, 20. As already mentioned, when the one coupling part 10 with its stationary housing 11 is fixed to the body wall 40 in a stationary manner, which takes place from the passenger compartment 41 in fact, the stationary housing 11 nevertheless projects, as Figure 9 shows, with a substantial part of its casing 16 into the engine compartment 42. In any event its casing extension 36 is in the engine compartment 42. As already mentioned, in the coupling process only the loose coupling part 20 with its insertion housing 21 has to be handled, and in fact in the sense of the special combination movement 30 which has already been mentioned and proceeds as follows.

In practice the stationary housing 11 fixed in the engine compartment 42 can only be seen laterally, and in fact in the direction indicated by the arrow 50 in Figure 9. Because of further components in the engine compartment 42 the mounted stationary housing 11 is both inaccessible and cannot be seen into from its front side, i.e. in the axial direction 52 marked by the arrow 52. Only the one narrow axial zone 53 in front of the mounted coupling part 10 is available and this is only accessible from the radial direction 50. The insertion housing 21 connected to its lines 25 is initially located in lateral position at a considerable distance from the mounted stationary housing 11, viz. approximately at the starting point 51 emphasised in Figure 9.

The first movement phase of the combined coupling movement 30, radial in Figure 9, first takes place and it ends when the insertion housing 21 with its collar 26 strikes the inner surface of the casing extension 36 of the static stationary housing 11 in the direction of the radial movement arrow 31. This limit position 20' of the coupling part is emphasised in broken lines in Figure 9. When this stop position 20' is reached, there is an axial alignment of the collar then assuming the position 26' with the annular gap 17 of the stationary housing 11. There then follows the second movement phase of the combined coupling movement 30, shown by the axial arrow 32 of Figure 9, which can take place virtually "blind". The final state is shown in Figure 10.

According to the two movement phases 31, 32 the special feature of the coupling movement 30 according to the invention lies in an angle movement which is reminiscent of the handling of a so-called "bayonet closure" or "engaging closure". Before the per se known axial insertion movement 32 takes place, the radial introductory movement 31 must take place until the components 26, 36 stop. This can be carried out very quickly and reliably with the means according to the invention.

Figure 10 shows the coupling case 20" of the second coupling part where, according to the correspondingly marked position 26" of the collar, this is fully introduced into the annular gap 17 of the stationary housing 11. In contrast the casing 16 belonging to the stationary housing 11 also engages fully in the channel 27" belonging to the insertion housing 21 according to Figure 10, and in fact including the leading casing extension 36 belonging to the stationary housing 11. As can be seen with the aid of the leaf spring 18' which can be seen in Figure 10, this is engaged by the collar 26" of the fully coupled part 20" and is stiffened thereby. It is therefore impossible to deform the leaf spring 18' radially inwards in the direction of the curved arrow 54 of Figure 10 in order to release the associated snap projection 19' from the engagement on the tubular shoulder 44 of the wall opening. This secure mounting of the stationary housing 11 takes place as early as the start of the second movement phase 32 of Figure 9. By this means, in the coupling process 30 of Figure 9 the position of the first coupling part 10 mounted on the body wall 40 is assured; a pressing of the stationary housing 11 into the passenger compartment 41 is ruled out.

Codings 55, 56 are provided so that the two coupling parts 10, 20 can always be guided into each other in a rotation-proof manner. In this case these consist of grooves 55 on the stationary housing, according to Figure 1, and of ribs 56 on the insertion housing, as can be seen from Figure 5.

Claims

1. Two-part electrical coupling (coupling parts 10, 20), comprising two complementary housings (11, 21) which can be inserted into each other axially, each with an area (12, 22) having numerous chambers (13, 23), the chambers (13, 23) of which field receive contact parts (14, 24) connected to electrical lines (15, 25), wherein in the event of coupling the contact parts (14) of the one housing (11) are in engagement with the contact parts (24) of the other housing (21) and, through an opening (43) of a wall (40), produce a continuous electrical connection between the electrical lines (15, 25) of the two coupling parts (10, 20), characterised in that the one housing (11) can be fixed in the wall opening (43) in a stationary manner (11) and has a casing (16) pointing in axial insertion direction (52) of the other movable housing (21), wherein the casing has an

axial casing extension (36), which substantially surrounds the area (12) in the stationary housing (11) and rests against the interior surface of the wall opening (43) in the event of fixing; in that leaf springs (18, 18') are integrated in the casing (16) and have radial snap projections (19, 19') which engage with the wall opening (43) in the event of fixing, wherein the fixing depth of the stationary housing (11) in the wall opening (43) is determined by axial stops (38) arranged adjacent to the casing (16); in that a gap (17) open in axial insertion direction (32) is arranged between the casing (16) and the area (12) in the stationary housing (11), into which gap a collar (26) on the movable housing (21) travels on coupling the housing to stiffen at least one of the leaf springs (18, 18'), wherein the collar (26) substantially surrounds the area (22) in the movable housing (21) and is limited by an axially open channel (27) in the movable housing; and in that with a right-angled coupling movement (30) of the movable housing (21), the casing extension (36) serves as a guide surface for the radial (31) and axial (32) guiding of the movable housing (21) at its collar (26) and travels into the channel (27) of the movable housing (21).

2. Coupling according to Claim 1, characterised in that the casing (16) has an angular, particularly rectangular contour and the casing extension (36) is arranged only in a corner region (37) of the angular contour.

3. Coupling according to Claim 1 or 2, characterised in that the casing (16) has interruptions (46) in the peripheral direction.

4. Coupling according to Claim 1, 2 or 3, characterised in that the leaf spring (18') arranged in the region of the casing extension (36) is produced by means of slots (48) in the casing (16) and its external leaf end (49) is integral with the casing (16).

5. Coupling according to Claim 4, characterised in that the slots (48) producing a leaf spring (18') run axially (52), in the insertion direction (32), in the casing (16).

6. Coupling according to one or more of Claims 1 to 5, characterised in that spring elements (39) are provided in the region of the axial stops (38), which spring elements are supported in an elastically flexible manner on the inner surface (45) of the wall (40) in the event of fixing.

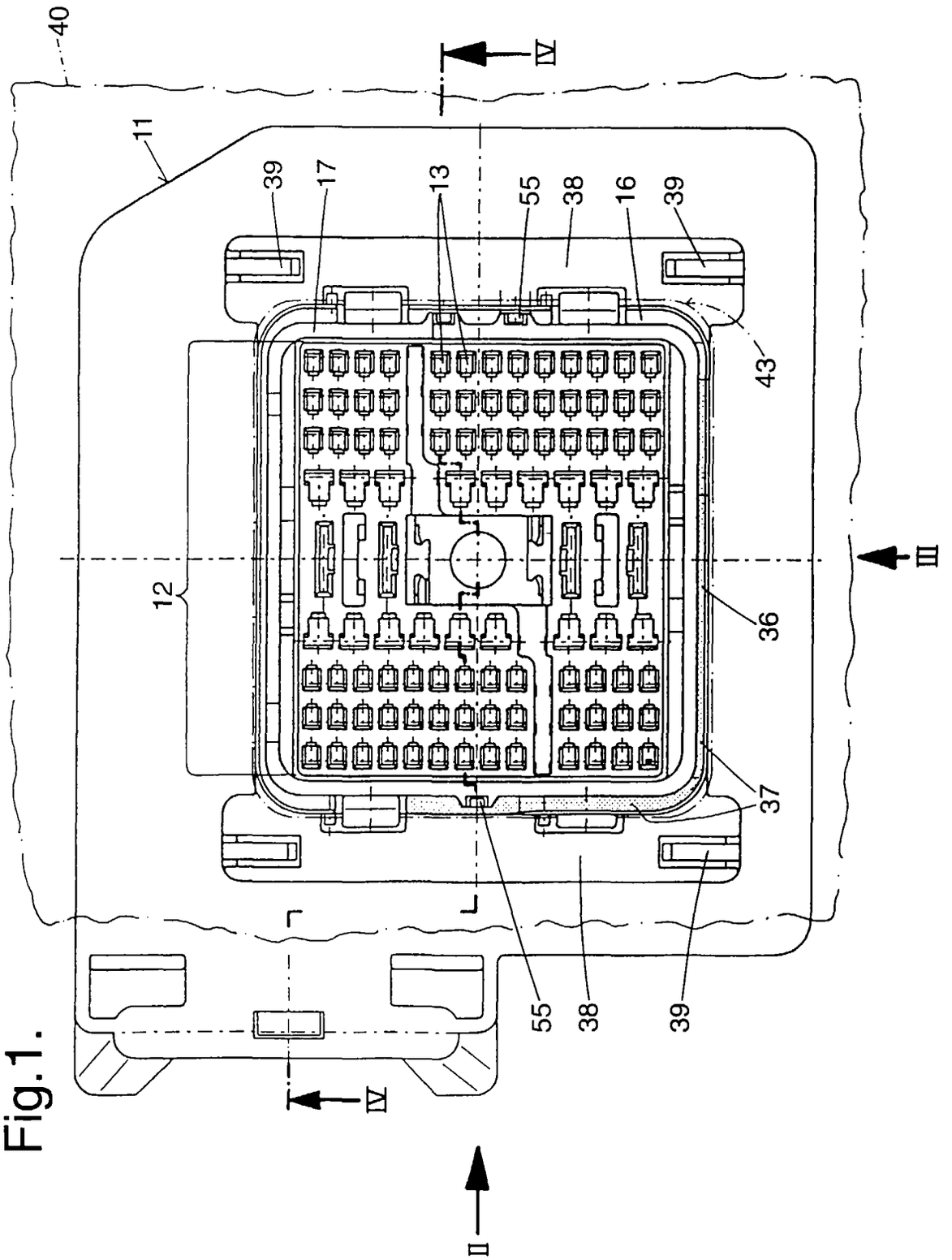


Fig.1.

Fig.2.

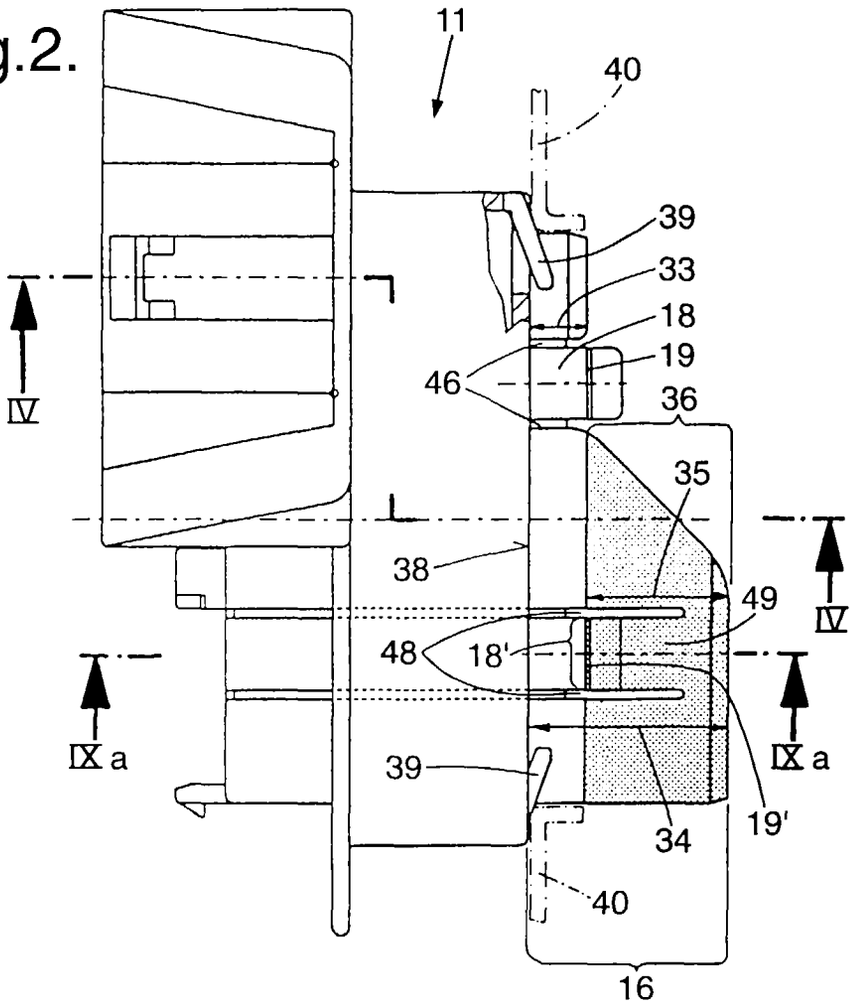

11
40
39
33
18
19
46
36
35
38
49
48
18'
IV
IV
IX a
IX a
39
19'
34
40
16

Fig.3.

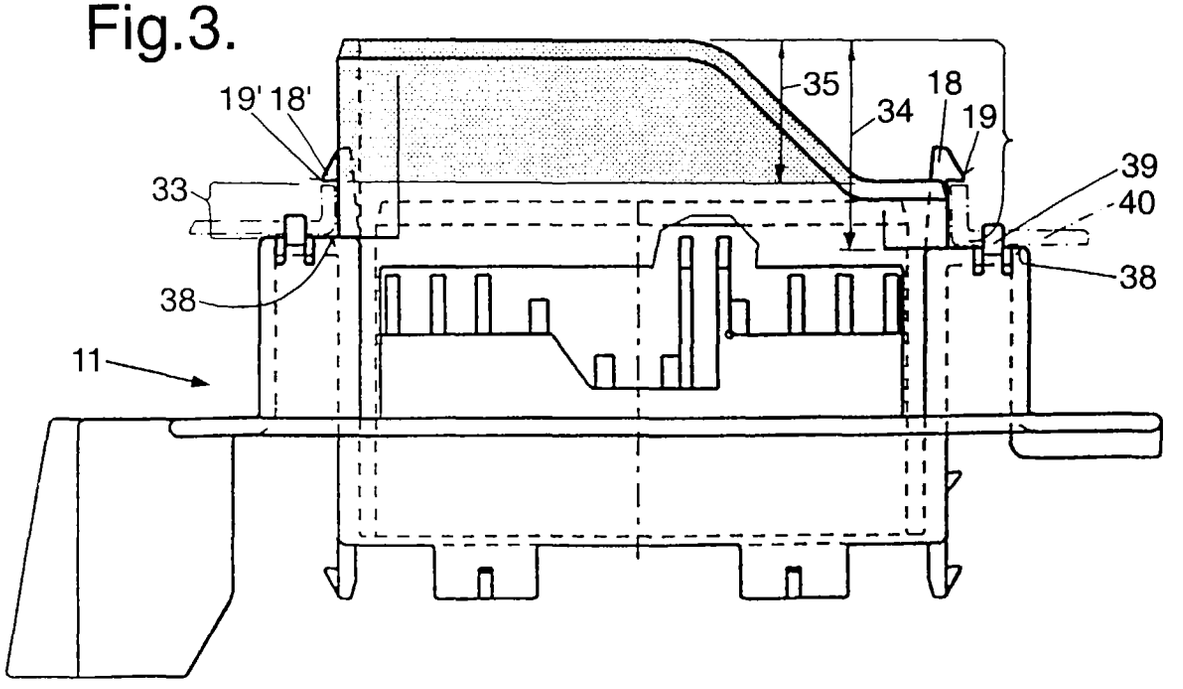

19'
18'
35
34
18
19
39
40
33
38
38
11

Fig.4.

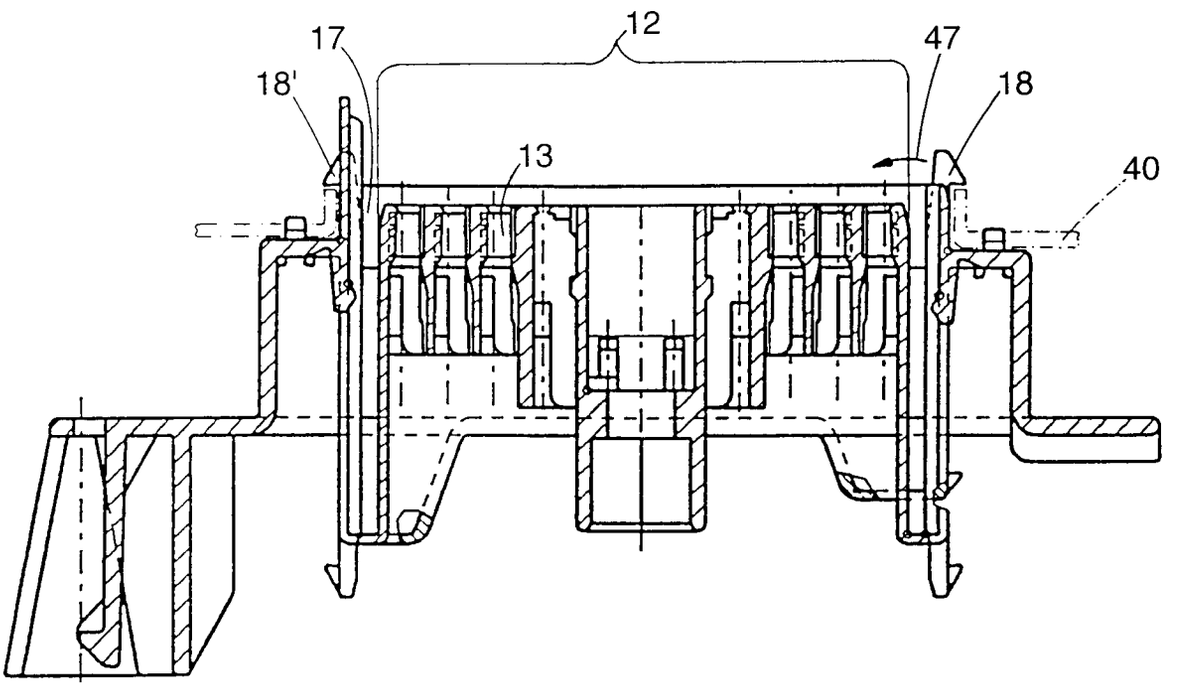


Fig.6.

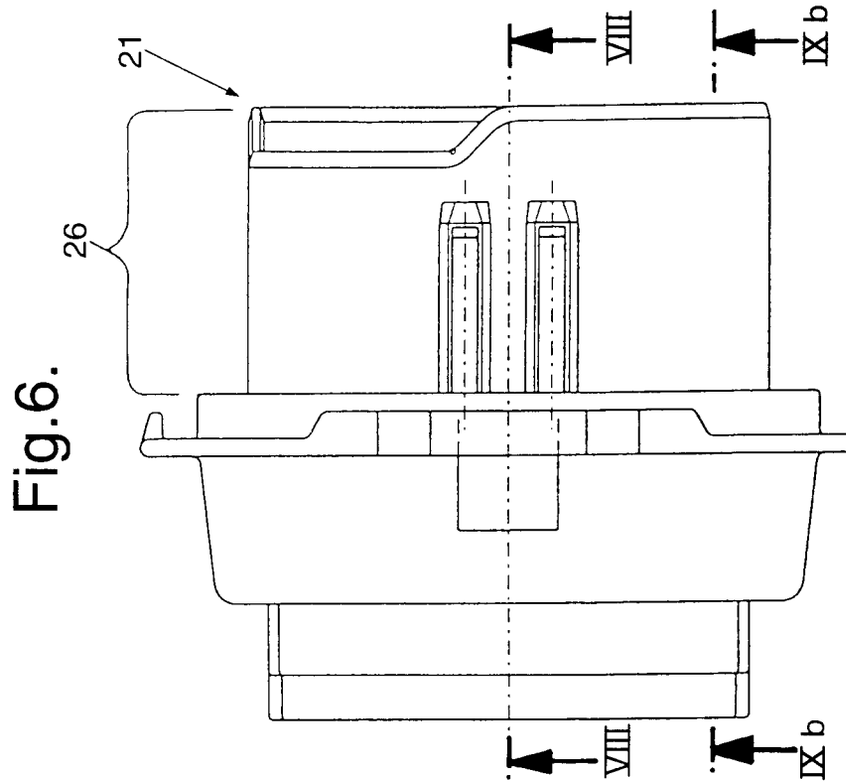


Fig.5.

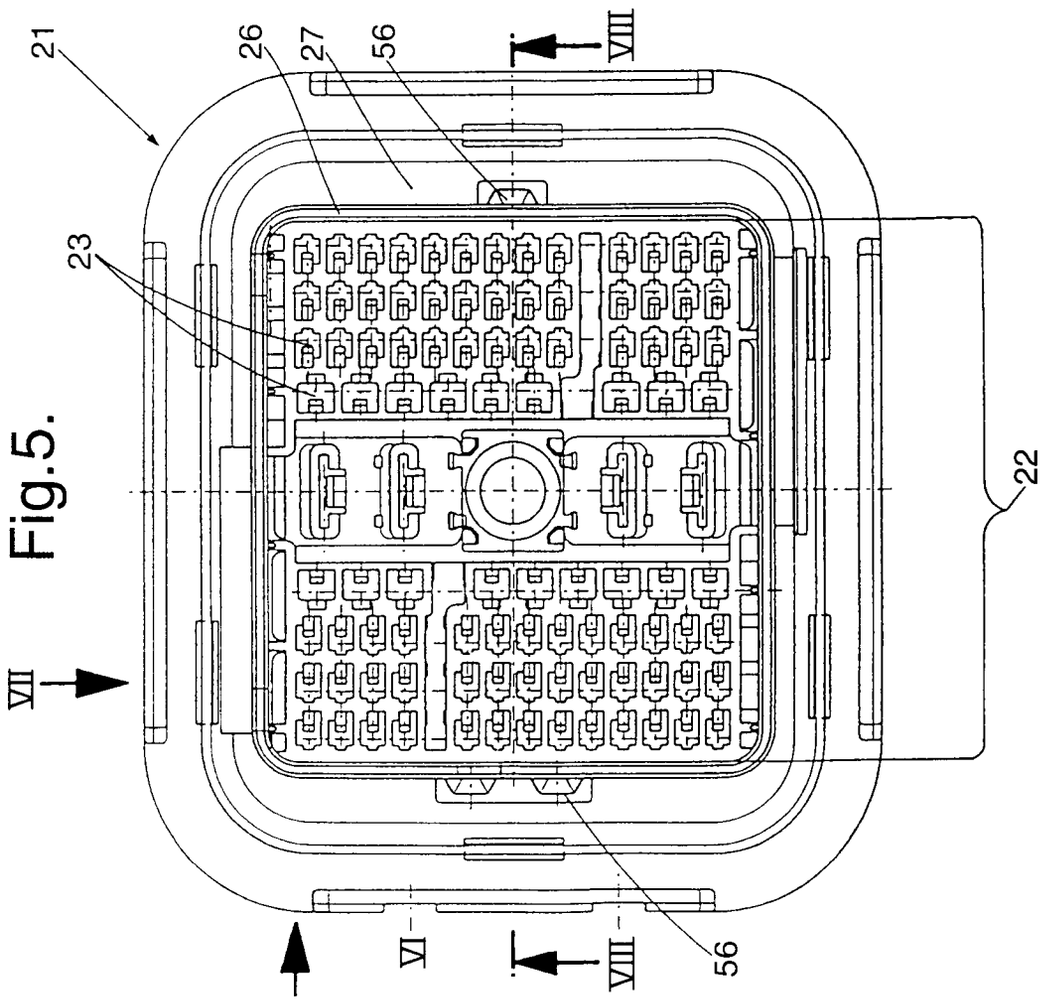


Fig.8.

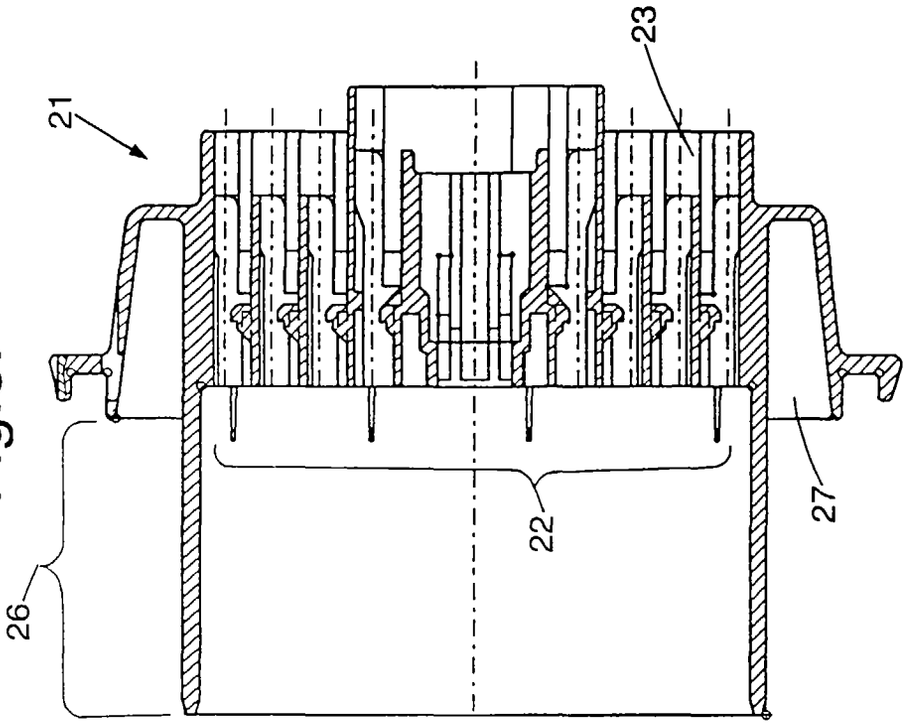


Fig.7.

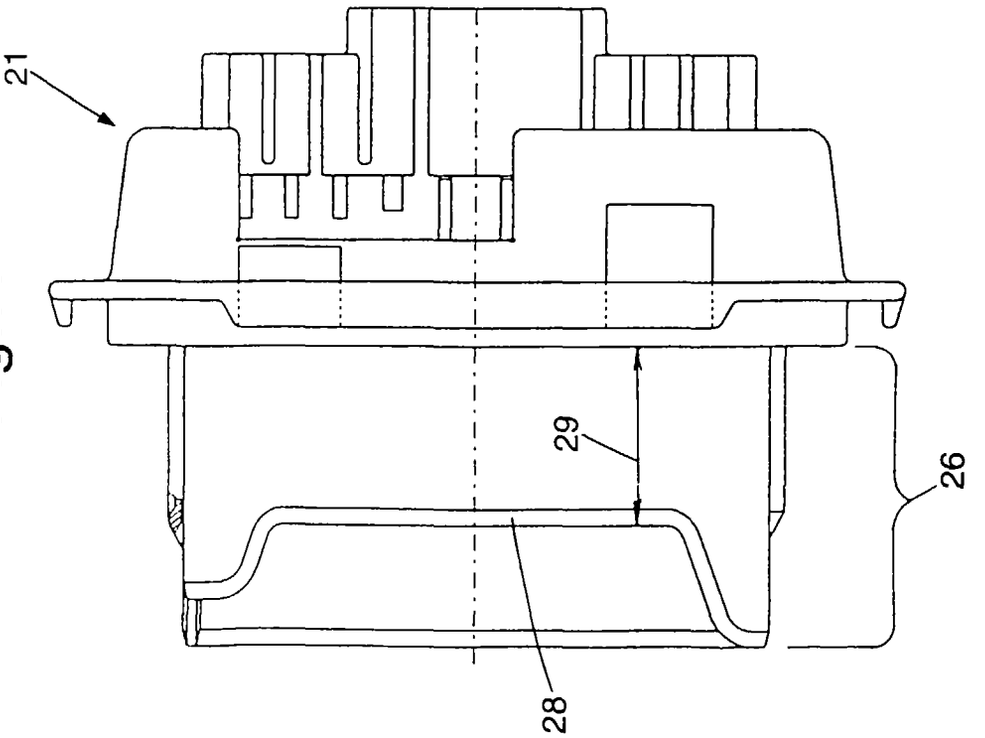


Fig.9.

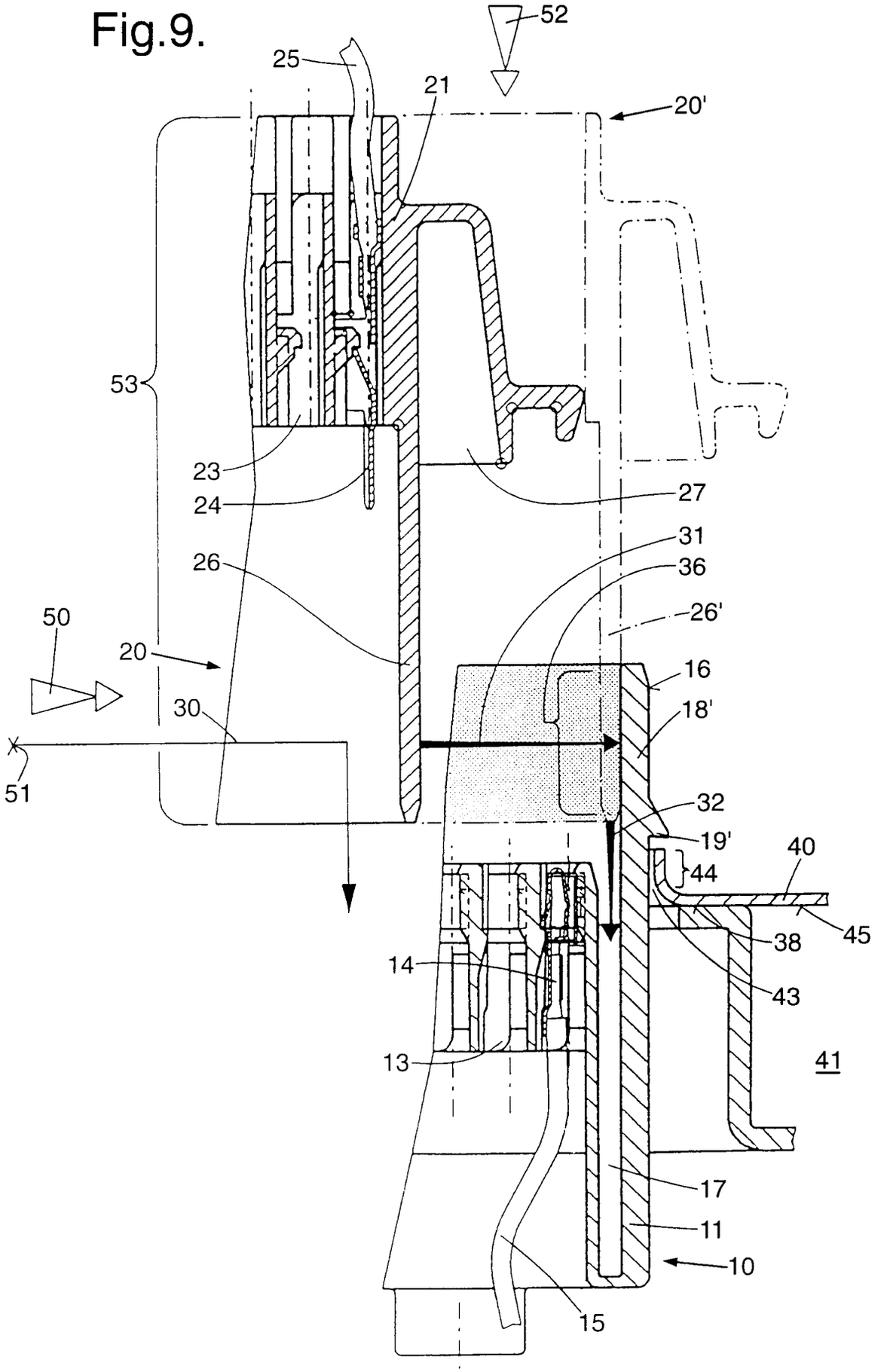

52
25
21
20'
53
23
24
27
31
36
26
26'
50
20
16
18'
30
51
32
19'
40
44
45
38
14
43
13
41
17
11
10
15

Fig.10.