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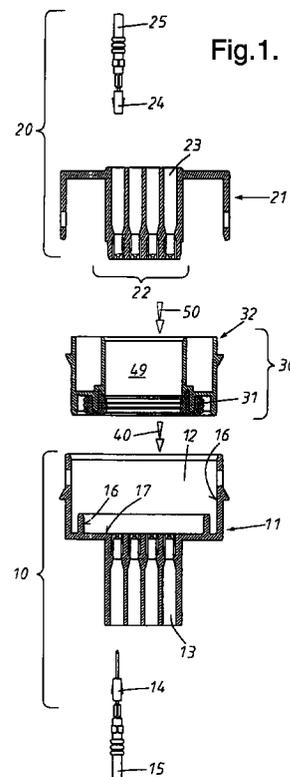
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(54) Male/female electrical connection with annular seal means

(57) The electric connector is in two parts and consists of a coupling part (10) each exhibiting a receptacle housing (11) and an opposite coupling part (20) which can be coupled thereto. The receptacle (12) in the receptacle housing (11) is used for plugging in a plug-in housing (21) belonging to the opposite coupling part (20). In the coupled state an annular seal between the radial circumferential surface (26) of the plug-in housing (21) and the radial inner surface (16) of the receptacle housing (11) is active. In order to obtain a proper seal which is easy to handle it is proposed that the seal (31) be connected in modular manner to a carrier (32) and this constructional unit (30) be arranged in the annular gap between the circumferential surface (26) of the plug-in housing (21) and the inner surface (16) of the receptacle housing (11). This constructional unit (30) is fixed in the interior of the receptacle housing.



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Description

Technical Field

The invention is aimed at an electric connector of the type specified in the introductory part of Claim 1. This connector consists of a coupling part each exhibiting a housing and of an opposite coupling part. The housing of the coupling part possesses a receptacle for plugging in the housing belonging to the opposite coupling part, for which reason in what follows the first housing is to be designated the "receptacle housing" for short and the second housing as the "plug-in housing". Both housings possess contact parts or opposite contact parts connected to electric leads which in the connected state are in engagement with one another. Between the two housings is located an annular seal which in the event of connection locks the interlocking contact parts in watertight manner in the housings which have been plugged into one another.

Background of the Invention

In a known connector, a sealing ring is pushed loosely on to the radial circumferential surface of the plug-in housing and in the connected state works together in sealing manner with the radial inner surface of the receptacle housing. When used in motor vehicle construction, the two housings of the coupling part and the opposite coupling part with the sealing ring are supplied by the manufacturer to be equipped in each case by the vehicle manufacturer with two sets of cables manufactured elsewhere on which are seated on the one hand the contact parts and on the other hand the opposite contact parts. In doing so the loose ring seal can go astray. Pushing the seal on to the plug-in housing is a relatively time-consuming process. In the harsh conditions of the assembly plant of the vehicle manufacturer inaccuracies in the position of the seal can result, in particular when the two housings have to be fitted through an opening on both sides of a wall of the bodywork.

Summary of the Invention

The object underlying the invention is to develop a reliably sealed connection of the type mentioned in the introductory part of Claim 1 which can be quickly and conveniently assembled from its components and if required fitted on a wall. This is achieved according to the invention by means of the measures specified in the characterising part of Claim 1, to which the following special significance attaches.

In the invention the seal is first preassembled with a carrier and forms a constructional unit which in the following shall be designated as the "seal carrier" for short. This seal carrier is fixed in the interior of the receptacle housing and therefore from the outset assumes a

defined position there. Because the seal is a fixed component of the carrier seated in the interior of the receptacle housing, it can be preassembled at the place of manufacture and no longer go astray in the performance of the further fitting tasks for the coupling part and opposite coupling part. In doing so it is especially advantageous not to provide the seal on the carrier in the outer region of the partition joint between the two housing parts but rather at the inner end in the base region of the annular gap between the radial circumferential surface of the plug-in housing and the radial inner surface of the receptacle housing.

Brief Description of the Drawings

The present invention will now be described, by way of example, with reference to the accompanying drawings, in which:-

Figure 1 shows the principle of construction of the electric connector according to the invention with its various parts in exploded illustration and in longitudinal section, to which a specially preassembled constructional unit, namely the aforementioned seal carrier, belongs;

Figure 2 shows the two components of the seal carrier of Figure 1 in a further exploded illustration and in longitudinal section;

Figure 3 shows the assembled components of one coupling part of the connection according to the invention in enlargement and in longitudinal section;

Figure 4 shows the detail labelled with IV in Figure 3 in a further enlargement;

Figure 5 shows the coupling part of Figure 3 in a representation corresponding to Figure 1 but enlarged, in the state of connection to an opposite coupling part, assembled from further components, of the connector according to the invention;

Figure 6 shows in plan view a practical design of a coupling part of the connector according to the invention used for vehicle electrification, the housing of which is to be fitted in the region of an opening on one side of a body wall of a motor vehicle;

Figure 7 shows a longitudinal section through the coupling part of Figure 6 along the dashed section line VII-VII there, where the position of the wall for fitting the coupling part is indicated by dotted lines and the housing, supplementary to Figure 6, is covered temporarily with a protective cap; and

Figure 8 shows both the latter coupling part as well as the opposite coupling part connected thereto on the body wall of the motor vehicle likewise indicated by dotted lines, in a sectional view analogous to Figure 7 but along the further dashed section line VIII-VIII shown in Figure 6.

Description of the Preferred Embodiment

As shown in the construction in principle of the electric connector according to the invention shown in Figures 1 to 5, two parts capable of being coupled to one another are provided which consist of a coupling part 10 and an opposite coupling part 20 which are shown in Figure 5 in the finally coupled state. As shown in Figure 1, the two parts 10, 20 comprise two housings 11, 21, the special construction of which can be seen in Figure 1. The housing 11 comprises a receptacle 12 which is destined for the plug-in reception of a housing core 22 of the other housing 21. For this reason, as has already been explained at the outset, one housing 11 is to be designated as "receptacle housing" and the other housing 21 correspondingly as "plug-in housing".

Both housings 11, 21 possess numerous chambers 13 and 23 respectively, in which on the one hand contact parts 14 and on the other hand opposite contact parts 24 can be fixed by means of inherently known, and if necessary lockable, catches. In the present case the contact parts 14 consist of plugs which are connected to a set of leads 15. For that reason the opposite contact parts 24 are designed as complementary sockets which are connected to further electric leads 25.

As can best be observed in Figure 1, the electric connection comprises as a further component a constructional unit 30 which for its part is preassembled from the two components discernible in Figure 2, that is an annular seal 31 and a carrier 32 accommodating the seal. In what follows this constructional unit, which can be seen in the assembled state in Figure 1, shall be called the "seal carrier" for short. This seal carrier 30 has the following construction.

As can best be seen in Figure 2, the carrier 32 is shaped like a ring and at its inner end 33 comprises a sleeve 34 which serves as a holding device for the seal 31. For this purpose the seal 31 has a U-shaped cross section and is divided into a U-crosspiece 37 with two legs 35, 36 of the U proceeding from it. Between these is located a U-groove 38 in which, as can be seen in Figure 1, the sleeve engages in the preassembly of the seal carrier 30, the U-crosspiece 37 covering the front end 39 of the sleeve 34. The assembled state can also be seen from the detailed view of Figure 4 where the two legs 35, 36 of the U each produce a sealing layer on the inner and outer sides 45, 46 of the sleeve 34 facing away from one another. The modular seal carrier 30 is plugged initially in the direction of the arrow 40 of Figure 1 in the receptacle 12 of the receptacle housing and there fixed by means of snap-in elements 41, 42 according to Figure 3. For this purpose the carrier 32 possesses a tube 43 constructed here in double-walled fashion, on the outer casing surface 44 of which is seated a tooth 41 functioning as a snap-in element. In the assembled state the latter engages from the radial inner surface 16 of the receptacle housing 11 into an opening 42 provided there which forms the opposing

snap-in element 42.

As emerges from Figure 4, the sealing ring is provided on its outwardly facing circumferential surface with sealing lips 47, of which that of the leg 36 of the U comes to fit in effective sealing manner against the aforementioned radial inner surface 16 in the receptacle housing 11. The sealing lips 47 located on the U-crosspiece 37 are supported against an axial shoulder 17 in the interior of the receptacle housing 11 which is here formed by the bottom of the housing. For securing the position of the seal 31 on the carrier 32 complementary profiles are provided in their outer contour region. This purpose is served by a conical perimeter channel 48 in the base region of the sleeve 34 into which the inner leg 35 of the U of the seal 31 engages with a corresponding conical end profile. By this means any pushing of the seal away during the subsequent connection of the opposite coupling part 20 is prevented. Further contour profiles, which are not illustrated, between the sleeve 34 and the inner surfaces of the U-groove 38, such as cams and recesses, can be used for additional axial cohesion of the two structural parts 31, 32 in the preassembled constructional unit 30.

The receptacle housing 11 with the seal carrier 30 seated therein through the snap-in connection 41, 42 is supplied by the manufacturer. This subassembly is then equipped at another location with a set of cables as can be seen in Figure 3 with reference to a single contact part 14 connected to a lead 15. The original receptacle 12 of the housing 11 is encased by the aforementioned double-walled tube 43 and the interior 49 of the tube is available for accommodating the plug-in housing 21.

The finished coupled state is illustrated in Figure 5. After the further leads 25 already mentioned together with their opposite contact parts 24 have been fitted in the plug-in housing 21, the core 22 of the housing of the opposite coupling part 20 is introduced into the interior 49 of the tube by means of a simple plug-in movement in the direction of the arrow 50 of Figure 1. The plug-in housing 21 possesses an outer shell 27 which in the connected state of Figure 5 covers the circumference of the receptacle housing 11. On its circumferential surface 19 the receptacle housing 11 possesses a retaining hook 18 pointing radially outwards which in this embodiment of the electric connection ensures cohesion of the two coupling parts 10, 20. It is decisive that in the coupled state the inner leg 35 of the U of the seal 31 is supported against the radial circumferential surface 26 by the core 22 of the housing of the plug-in housing 21. On disconnecting the opposite coupling part 20 from the coupling part 10 in the direction of the arrow 50' of Figure 5 the seal carrier 30 remains behind in the receptacle housing 11 on account of the elements 41, 42 which are in engagement.

Figures 6 to 8 show a practical construction of the electric connector which is designed according to the principle of construction of Figures 1 to 5 described previously. For that reason the same reference symbols are

used to label corresponding component parts. To that extent the description so far is valid. It is sufficient merely to go into the details of the differences.

As emerges from Figure 8, the two coupling parts 10, 20 are fitted on both sides of a wall 60, indicated there by dotted lines, which is a wall of the body which separates the engine compartment 52 of a motor vehicle from the passenger compartment 51. The wall 60 has an opening 63 which, as emerges from Figure 7, is penetrated by the coupling part 10. Its receptacle housing 11 is fitted from the side 61 of the wall 60 facing towards the passenger compartment 51 by simply plugging it in. In doing so the previously described retaining hooks 18 of the receptacle housing snap around the edge of the opening 63 beaded with respect to the engine compartment 52. By this means the receptacle housing 11 is already fastened in a preassembly position to the wall 60 and on the opposite side 62 projects out with its housing end 53 on the opposite side 62 of the wall. The receptacle housing 11 possesses a flange 54 on which an annular sealing means 55 rests. The latter is supported in the assembled state against one side 61 of the wall.

The structure of the coupling part 10 can be seen in the plan view shown in Figure 6. The upper front end of the tube 43 of the seal carrier 30, which is double-walled in regions and drawn in dotted lines, is seen. Three retaining hooks 18 are provided which project radially outwards with each of their hook ends in a recess of the outer wall of the tube wall 43 and engage according to Figure 7 behind the beaded rim 63 of the opening. The retaining hooks 18 are arranged in an open space of the outer tube wall 43 of the carrier. During assembly of the coupling part 10 a protective cap 56 temporarily covers the interior of the receptacle housing 11 and thereby also protects the previously described contact parts seated there which are seated at the end of the electric leads 15 drawn only by dotted lines in Figure 7. This protective cap 56 is connected to the receptacle housing 11 by means of catch elements, of which only one catch element 57 is visible in Figure 8. There of course the protective cap 56 has already been removed again. This catch element 57 consists of a recess, which is located in the preassembled seal carrier 30, that is as an opening in the inner tube wall 43 of the carrier 31. The opposing catch element, which is not shown in further detail, is seated on a tubular lug 58 engaging in the tube interior 49 and consists of a projection pointing radially outwards. After the described preassembly of the coupling part 10 on the wall 60, on account of the elastic connection through the catch elements 57 the protective cap 56 can be pulled off before the opposite coupling part 20 is plugged in axially.

Figure 8 shows the coupled state of both parts 10, 20. As has already been explained in the preceding embodiment, the plug-in housing 21 of the opposite coupling part 20 grips round the already preassembled subassembly, provided from the coupling part 10 with

the seal carrier 30 integrated therein, with an outer shell 27. The outer shell 27 covers the previously described projecting end 53 of the housing and after the coupling has been carried to completion comes to lie with its shell front edge 28 against the side 62 of the wall facing towards the engine compartment 52. The two housings 11, 21 are pushed against one another by means of a central screw 29. In doing so a definite compression of the previously described sealing means 55 results.

For this purpose the housing flange 54 carrying the sealing means 55 possesses a circumferential axial rib 59 with a defined rib height 69. This rib height 69 is of such a size that when the two housings 11, 21 are pressed together, the sealing means 55 is compressed to this extent. That is to say the front edge 68 of the flange rib 59 is supported against the side 61 of the wall, while the front edge 28 of the outer shell 27 belonging to the opposite coupling part 20 is pushed against the opposite side 62 of the wall.

As emerges from Figure 7, a further special feature consists in that the seal carrier 30 fitted in the receptacle housing 11 also serves to secure the position of the sealing means 55 provided on the flange 54. That is, for this purpose the outer wall of the double-walled tube 43 possesses radial projections 64 which always secure the proper position of the sealing means 55 on the flange 54. Therefore when handling the coupling part 10 during its assembly on the wall 60 this sealing means 55 is also secured. Thus in the assembled state on the receptacle housing, the carrier 32 has to fulfil a double function; it secures not only the inner seal 31 which it introduces but also the outer sealing means 55. Therefore during assembly of the coupling part 10 these components too can no longer go astray.

The electric leads 15, 25 belonging to the contact and opposite contact parts 14, 24 on both sides are each covered by an end cap 65, 66 after fastening by means of the screw 29. Both housings 11, 21 are in themselves composed of several housing elements. Located between the housing elements is a so-called locking slide 67 which locks the fitted contact parts 14 and opposite contact parts 24 in the two housings 11 and 21 respectively, after these have previously been plugged into the chambers 13, 33 axially and latched by means of tongues.

Claims

1. A two-part electrical connector, consisting of a coupling part (10) and of an opposite coupling part (20) capable of connection thereto,

having a receptacle housing (11) which belongs to the coupling part (10) and contains contact parts (14) connected to electric leads (15),

and the receptacle housing (11) possesses a receptacle (12) for plugging in a plug-in hous-

ing (21) which belongs to the opposite coupling part (20) and which holds the opposite contact parts (24) connected to other electric leads (25),

and having an annular seal (31) arranged between the radial circumferential surface (26) of the plug-in housing (21) of the opposite coupling part (20) and the radial inner surface of the receptacle housing of the coupling part (10),

characterised in that

the seal (31) is connected in modular manner to a carrier (32) and forms a seal carrier (30), which in the connected state is arranged in the annular gap between the circumferential surface (26) of the plug-in housing (21) and the inner surface (16) of the receptacle housing (11),

and that the seal carrier (30) is fixed (41, 42) in the interior of the receptacle housing (11).

2. A connector according to Claim 1, wherein the carrier (32) has a sleeve (34) which is provided both on its sleeve outer side (46) facing towards the radial inner surface (16) of the receptacle housing (11) as well as on its sleeve inner side (45) directed towards the radial circumferential surface (26) of the plug-in housing (21) with an elastic layer (35, 36) of the seal (31) in each case.

3. A connector according to Claim 2, wherein the annular seal (31) possesses a U-shaped cross section, in the U-groove (38) of which the sleeve (34) of the carrier (32) engages, and both legs (35, 36) of the U of which form sealing layers on the sleeve outer side and sleeve inner side (46, 45) located opposite one another.

4. A connector according to Claim 3, wherein the sleeve (34) is located at the inner end (33) of the seal carrier (30) fixed in the receptacle housing (11) and the U-crosspiece (37) of the seal located between the two legs (35, 36) of the U covers the front end (39) of the sleeve (34) and is supported in the assembled state against an axial shoulder (17) in the interior of the receptacle housing (11).

5. A connector according to one or more of Claims 2 to 4, wherein the contour lines of the seal (31) and of the carrier (32) which are in contact are profiled in complementary manner to one another in order to secure the position and the cohesion of the component parts in the seal carrier (30).

6. A connector according to Claim 5, wherein in the base region of the sleeve (34) accommodating the U-seal (31) the carrier has a conical perimeter channel (48) at least on the sleeve inner side (45)

facing towards the plug-in housing (21) and the associated leg (35) of the U of the seal engages with a conical counterprofile in the channel (48).

7. A connector according to one or more of Claims 2 to 6, wherein on its radially inner and radially outer surface and if necessary also on its axial contour surface the seal (31) exhibits sealing lips (47).

8. A connector according to one or more of Claims 1 to 7, wherein apart from the sleeve (34) accommodating the seal (32), the carrier (31) possesses a tube (43) which if need be is double-walled

and wherein seated on the outer casing surface (44) of the tube (43) are snap-in elements (41) which in the assembled state are in engagement with opposing snap-in elements (42) located on the radial inner surface (16) of the receptacle housing (11) and fasten the seal carrier (30) to the coupling part (10).

9. A connector according to one or more of Claims 1 to 8, wherein the coupling and opposite coupling part (10, 20) are arranged on both sides of a wall (60) provided with an opening (63), especially a body wall (60) separating the engine compartment (52) from the passenger compartment (51) of a motor vehicle.

10. A connector according to Claim 9, wherein the coupling part (10) can be preassembled at the opening (63) of the wall (60) by means of retaining hooks (18) formed on its receptacle housing (11), wherein the retaining hooks (18) engage behind the opening (63) with their hook ends,

and wherein the two housings (11, 21) of the coupling and opposite coupling parts (10, 20) connected into one another can be joined to one another by at least one screw (29) with interposition of the wall (60) provided with the opening (63).

11. A connector according to Claim 9 or 10, wherein, during the assembly of the coupling part (10), a protective cap (56) covers the interior of the receptacle housing (11) with the contact parts (14) seated there and the protective cap (56) is snap-connected (57) to the receptacle housing (11).

12. A connector according to Claim 11, wherein the tube (43) of the seal carrier (30) fitted in the coupling part (10) has catch elements (57) which hold the protective cap (56) through opposing catch elements.

13. A connector according to Claim 10 or 11, wherein

the receptacle housing (11) exhibits a flange (54) provided with a sealing means (55) which in the coupled state is supported against one side (61) of the wall (60),

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wherein the preassembled receptacle housing (11) projects from the opening (53) by its housing end (53) on the opposite side (62) of the wall (60)

and wherein the plug-in housing (21) possesses an outer shell (27) which in the coupled state covers the projecting housing end (53) of the receptacle housing (11) and is supported against the opposite side (62) of the wall (60).

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14. A connector according to Claim 13, wherein the flange (54) carries an axial rib (59) enclosing the sealing means (55) which in the coupled state is supported against one side (61) of the wall,

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and the rib height (69) limits the extent of the compression of the sealing means (55) on tightening the screw (29) connecting the two housings (11, 21).

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15. A connector according to one or more of Claims 9 to 14, wherein on its outer casing surface (44) the carrier (31) possesses a radial projection (64) which, when the seal carrier (30) is fastened in the receptacle housing (11), holds the sealing means (55) against the housing flange (54).

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Fig.1.

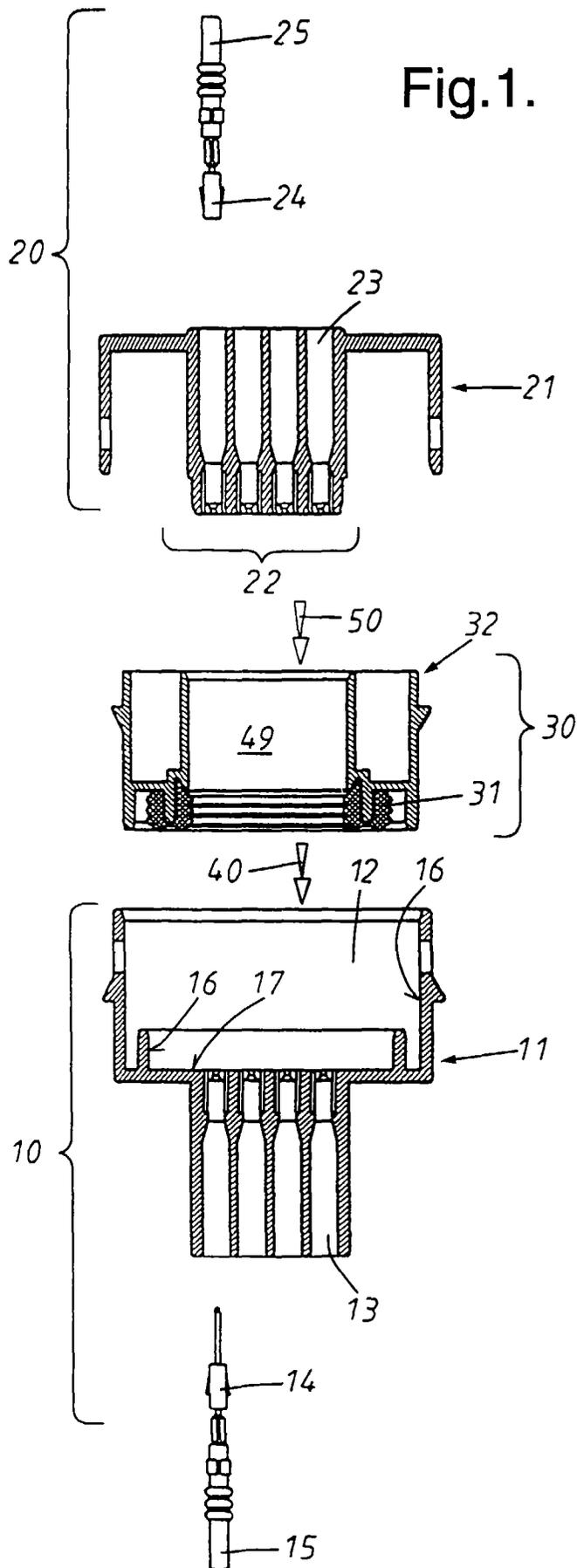


Fig.2.

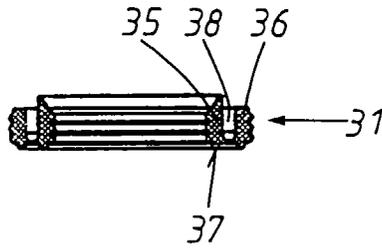
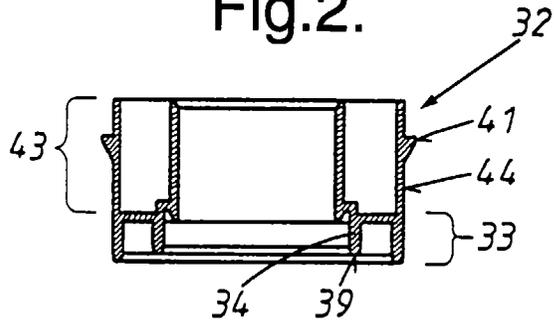


Fig.3.

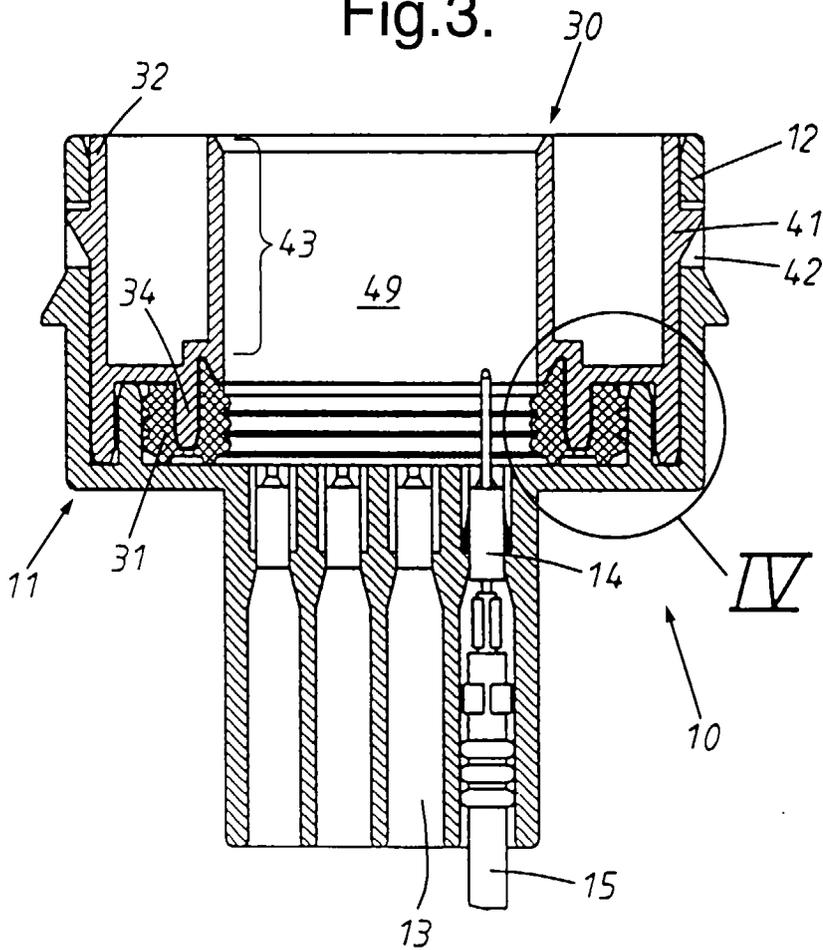


Fig.4.

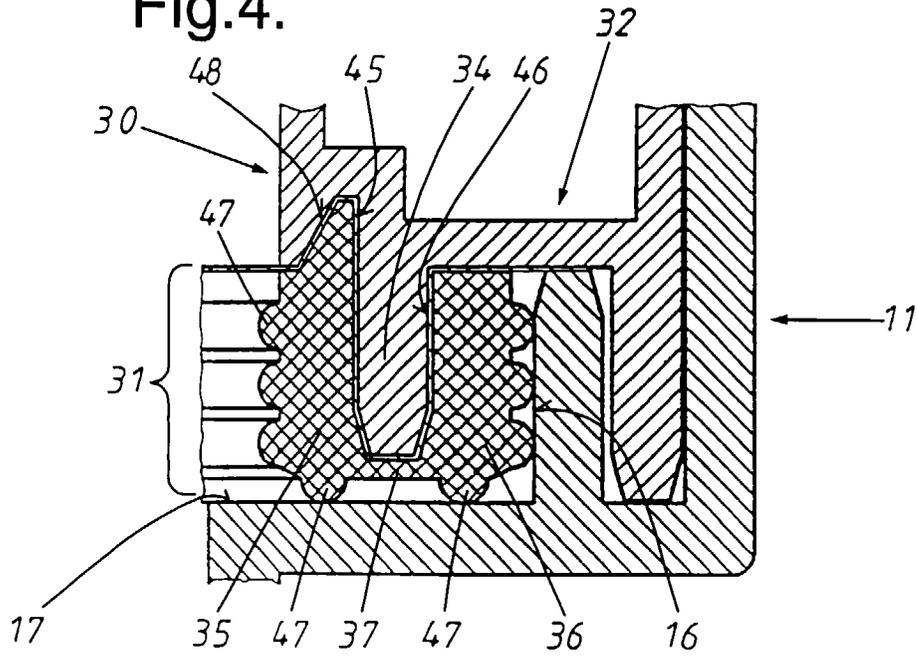
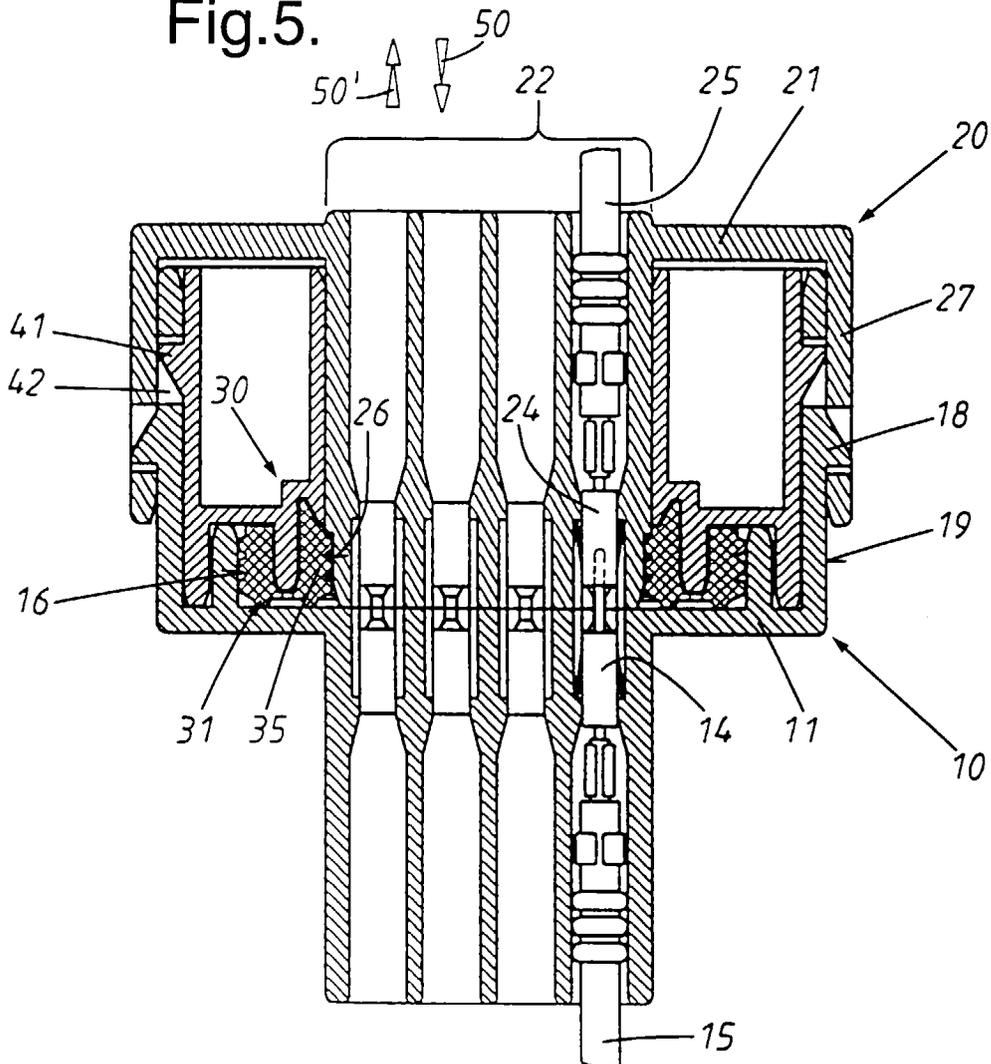


Fig.5.



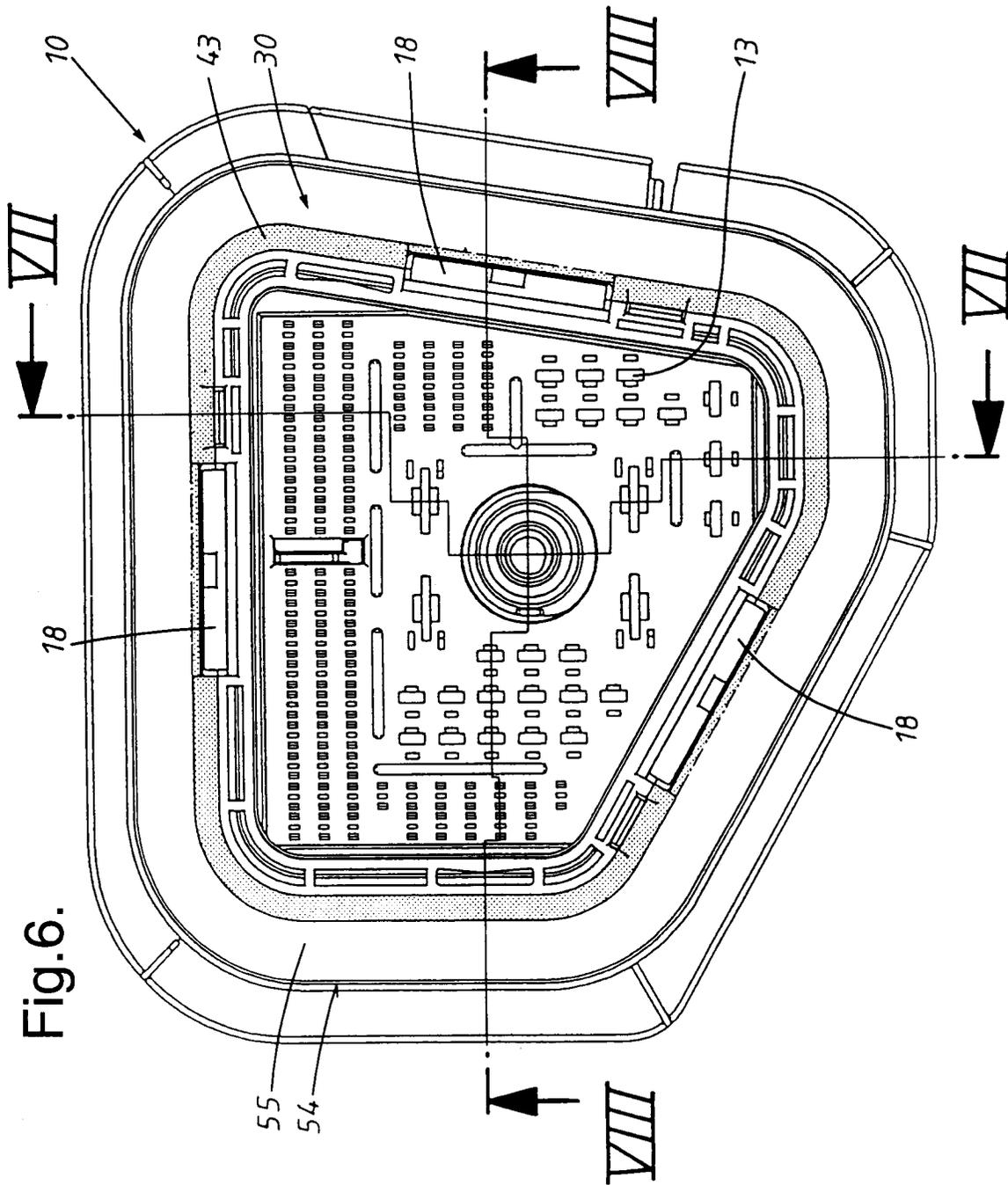
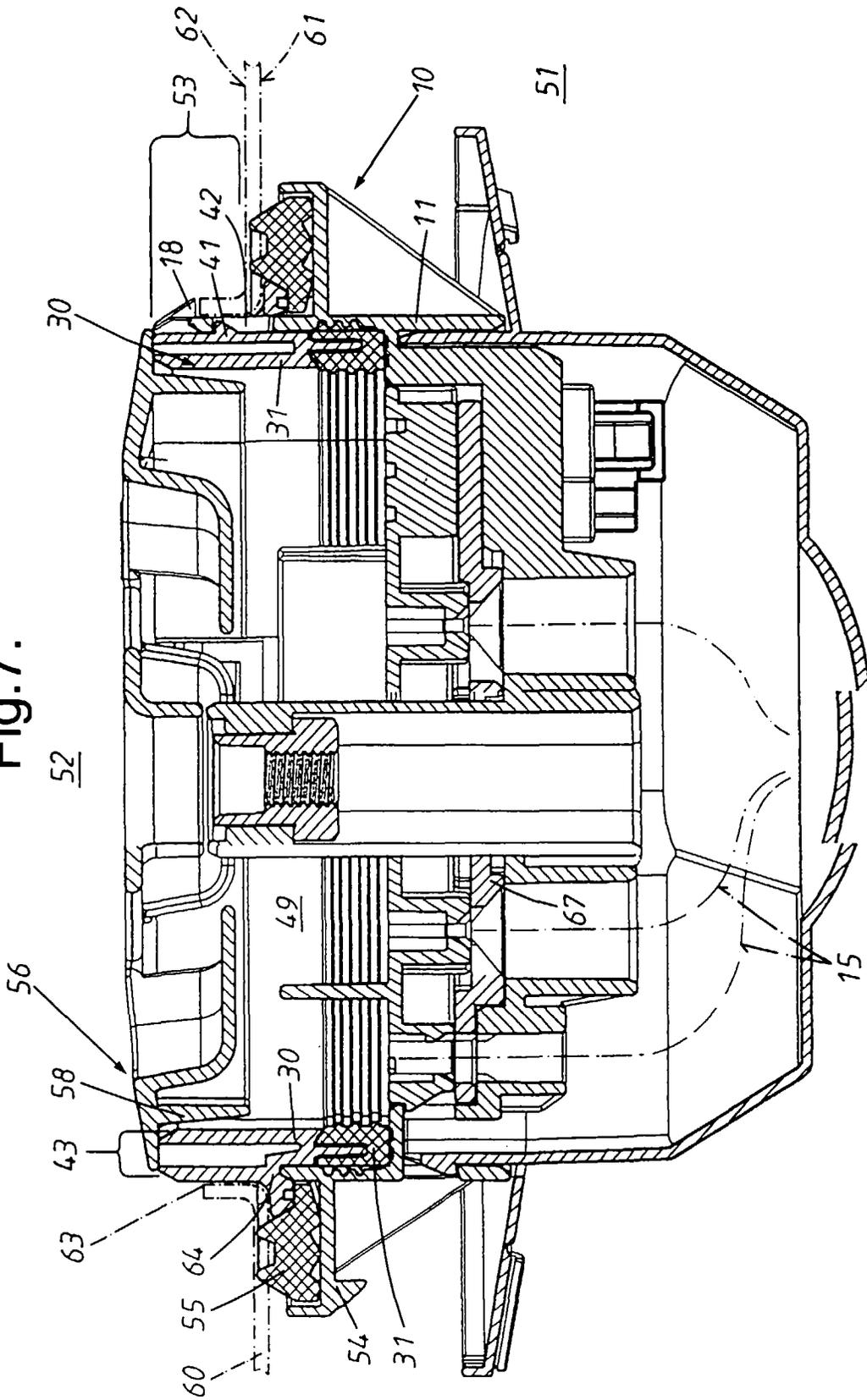


Fig. 6.

Fig. 7.



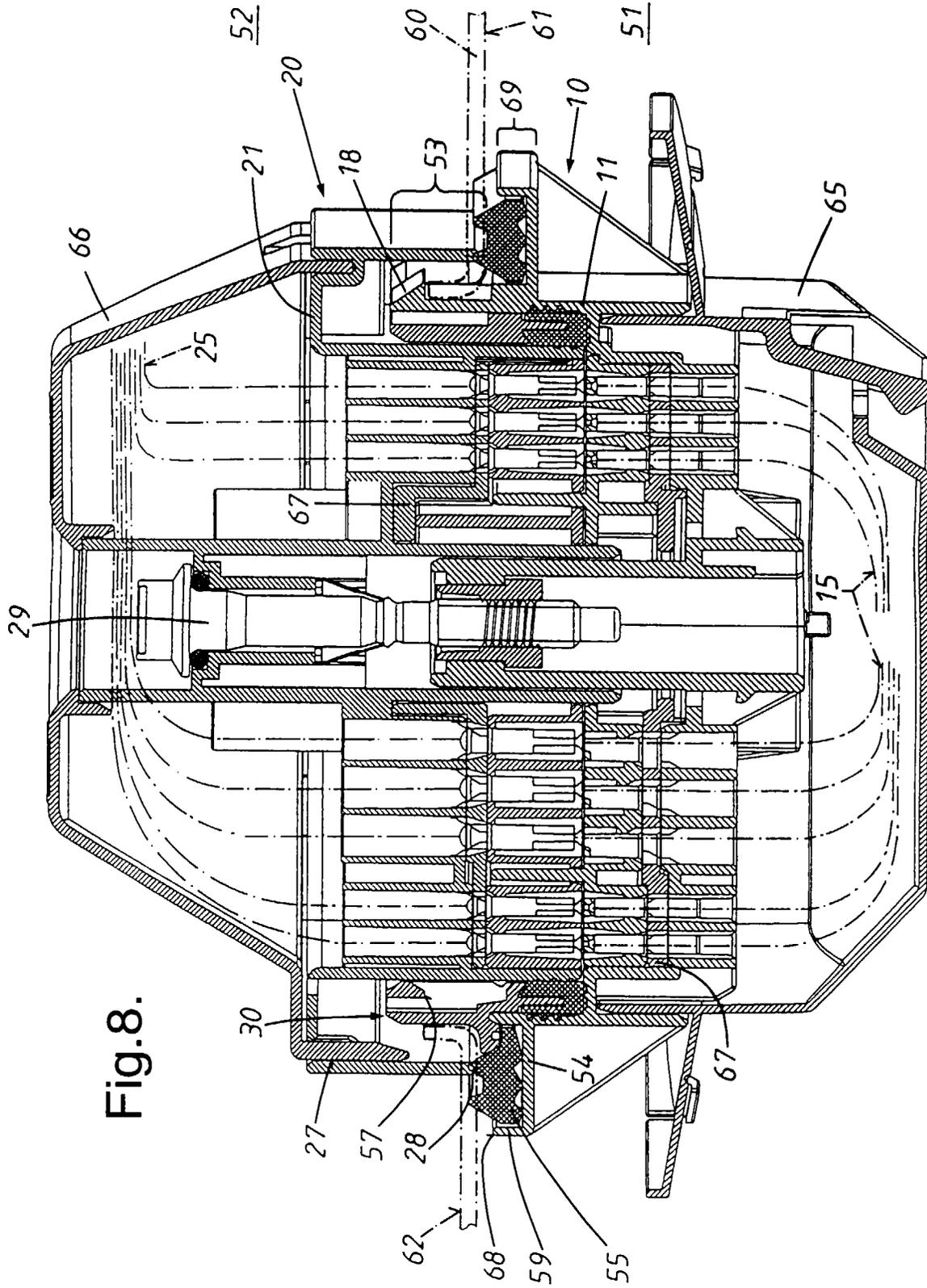


Fig.8.



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 97 20 2558

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	US 5 545 048 A (MAEDA AKIRA) * the whole document * * figures 1-4 * ---	1,8	H01R13/52
X	EP 0 537 751 A (YAZAKI CORP) * column 6, line 31 - column 7, line 38 * * figures 4,5 * ---	1	
A	US 5 277 610 A (KREHBIEL FRED L ET AL) * column 4, line 43 - column 5, line 15 * * figures 2,3 * ---	3,4	
A	EP 0 655 803 A (SUMITOMO WIRING SYSTEMS) * column 3, line 53 - column 6, line 40 * * figure 1 * ---	9,10,14	
A	US 5 295 851 A (BAWA JASPAL S ET AL) * column 3, line 13 - line 31 * * figures 1,2 * -----	14	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			H01R
Place of search		Date of completion of the search	Examiner
THE HAGUE		30 January 1998	Aivazian, D
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