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

(11) EP 0 901 194 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
10.03.1999 Bulletin 1999/10

(51) Int. Cl.[6]: **H01R 13/627**

(21) Application number: **98202645.2**

(22) Date of filing: **06.08.1998**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **08.09.1997 GB 9718894**

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(54) Two-part electrical connector

(57) A two-part electrical connector comprising a first part (12) having a housing (14) of electrically insulating material and which is substantially annular; a second part (16) having a housing (18) of electrically insulating material and which makes a sliding fit inside the housing of the first part, the housing of the second part having a radially outwardly extending substantially rigid lug (56); a locking ring (20) which is substantially annular and which is retained in the housing of the first part, the locking ring being capable of movement in an axial direction (A) relative to the housing of the first part between a first position and a second position; a latching ring (22) which is substantially annular and which is retained in the housing of the first part and is partially surrounded by the locking ring, the latching ring having a radially inwardly extending resilient latching tang (38) which can be engaged by, and latches with, the lug on the housing of the second part on sliding the housing of the second part into the housing of the first part; and a spring (24) acting on the locking ring to bias the locking ring towards the first position; wherein the locking ring has a circumferentially extending bar (48) and a circumferentially extending aperture (50) adjacent the bar in an axial direction; wherein in the first position of the locking ring, the bar is adjacent the latching tang on the latching ring to substantially prevent radially outward movement of the latching tang; and wherein in the second position of the locking ring, the aperture is adjacent the latching tang on the latching ring to allow radially outward movement of the latching tang. Easier connection and disconnection for when the connector is used in positions of difficult access.

Fig.1.

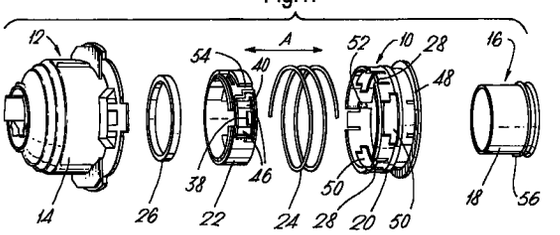
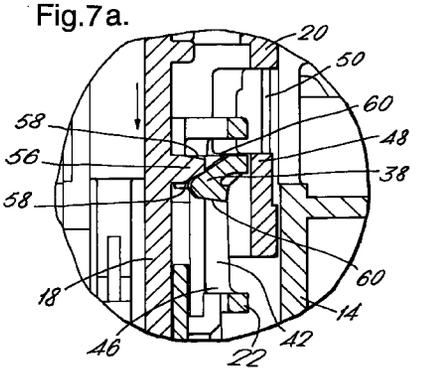


Fig.7a.



EP 0 901 194 A2

Description

Technical Field

[0001] The present invention relates to a two-part electrical connector in which one of the parts can be mounted in a wall. The present invention has particular application for providing an electrical connection through a wall in a motor vehicle.

Background of the Invention

[0002] Where it is required to make an electrical connection through a wall in a motor vehicle (for example, one of the door pillars), it is normal practice to secure a first part of an electrical connector in an aperture in the wall, and plug a second part of the electrical connector to the first part. Each part of the connector defines a housing for electrical contacts which electrically connect on mating the first and second parts together. On full mating of the two parts of the connector, flexible latching tabs can be used to lock the two parts together. In areas where access is difficult, it is not always easy to fully mate the two parts of the connector, and it is not easy always to see that full mating has actually occurred.

Summary of the Invention

[0003] It is an object of the present invention to provide a latching arrangement between the two parts of an electrical connector which is easy to achieve.

[0004] A two-part electrical connector in accordance with the present invention comprises a first part having a housing of electrically insulating material and which is substantially annular; a second part having a housing of electrically insulating material and which makes a sliding fit inside the housing of the first part, the housing of the second part having a radially outwardly extending substantially rigid lug; a locking ring which is substantially annular and which is retained in the housing of the first part, the locking ring being capable of movement in an axial direction relative to the housing of the first part between a first position and a second position; a latching ring which is substantially annular and which is retained in the housing of the first part and is partially surrounded by the locking ring, the latching ring having a radially inwardly extending resilient latching tang which can be engaged by, and latches with, the lug on the housing of the second part on sliding the housing of the second part into the housing of the first part; and a spring acting on the locking ring to bias the locking ring towards the first position; wherein the locking ring has a circumferentially extending bar and a circumferentially extending aperture adjacent the bar in an axial direction; wherein in the first position of the locking ring, the bar is adjacent the latching tang on the latching ring to substantially prevent radially outward movement of the latching tang; and wherein in the second position of the locking ring, the aperture is adjacent the latching tang on the latching ring to allow radially outward movement of the latching tang.

[0005] The present invention overcomes the problems associated with the prior art connectors.

Brief Description of the Drawings

[0006] The present invention will now be described, by way of example, with reference to the accompanying drawings, in which:-

Figure 1 is an exploded view of a two-part electrical connector is accordance with the present invention;
Figure 2 is a perspective view, partially in cross-section, of the locking ring and latching ring of the connector of Figure 1;
Figure 3 is a side view of the locking ring of the connector of Figure 1;
Figure 4 is a cross-sectional view of the locking ring of the connector of Figure 1;
Figure 5 is a side view of the latching ring of the connector of Figure 1;
Figure 6 is a partial cross-sectional view of the locking ring and the housing of the first part of the connector of Figure 1; and
Figures 7a to 7d are cross-sectional views of the latching system of the connector of Figure 1 at various stages of latching and delatching.

Description of the Preferred Embodiment

[0007] Referring to the drawings, the two-part electrical connector 10 in accordance with the present invention, comprises the first part 12 which includes a housing 14 of electrically insulating material and which is substantially annular; and the second part 16 which includes a housing 18 of electrically insulating material. The housing 18 of the second part 16 is mated with the housing 14 of the first part 12 by sliding the housing 18 inside the housing 14. Each housing 14,18 has complementary electric contacts (not shown) secured therein which make electrical connections when the housings are mated together.

[0008] The connector 10 further includes a locking ring 20, a latching ring 22, a coil spring 24, and preferably a ring seal 26. The locking ring 20 is substantially annular and has a number of radially outwardly directed resilient tabs 28 which make a sliding fit in corresponding grooves 30 formed in the inner surface 32 of the housing 14 of the first part 12 and then make a snap fit behind a shoulder 34 in the inner surface to latch the locking ring and the housing of the first part together. The locking ring 20 is capable of moving in an axial direction A relative to the housing 14 of the first part between a first position in which the tabs 28 engage the shoulder 34 and a second position in which the tabs are axially spaced from the shoulder. The coil spring 24 is

positioned between the locking ring 20 and another internal shoulder (not shown) which is spaced from, and faces, the shoulder 34 inside the housing 14, and acts on the locking ring 20 to bias the locking ring into its first position and away from the housing 14 of the first part 12. On mating of the housings 14,18, the locking ring 20 substantially surrounds the housing 18 of the second part 16.

[0009] The latching ring 22 is substantially annular and on assembly of the connector 10 is positioned between an internal shoulder 36 on the locking ring 20 and an internal shoulder (not shown) in the housing 14 of the first part 12. The ring seal 26 is preferably positioned between the latching ring 22 and the housing 14 of the first part 12. The latching ring 22 is surrounded partially by the locking ring 20 and partially by the coil spring 24. On mating of the housings 14,18, the latching ring 22 substantially surrounds the housing 18 of the second part 16. The latching ring 22 has a number of radially inwardly extending latching tangs 38 which are resiliently mounted at the free end 40 of axially extending resilient legs 42 positioned in apertures 44 in the latching ring. In this preferred arrangement, the legs 42 are substantially U-shaped and connected to the remainder of the latching ring 22 at the ends 46 of the arms of the U. Other suitable shapes for the legs 42 may be used. With this arrangement, the latching tangs 38 are capable of slight pivotal movement relative to the remainder of the latching ring 22 at the free end 40 of the legs 42 and at the connection 46 of the legs to the remainder of the latching ring. Any suitable number of latching tangs may be used.

[0010] The locking ring 20 has a corresponding number of circumferentially extending bars 48 and circumferentially extending apertures 50, the apertures being axially adjacent the bars. The locking ring 20 is also capable of moving in the axial direction A relative to the latching ring 22. The locking ring 20 preferably has a number of inwardly directed axially extending ribs 52 which make a sliding fit in corresponding grooves 54 in the latching ring 22 to aid the relative axial movement, but to substantially prevent relative rotation between the locking ring and the latching ring. In the first position of the locking ring 20, the bars 48 are positioned radially adjacent the latching tangs 38 on the latching ring 22. In the second position of the locking ring 20, the apertures 50 are positioned radially adjacent the latching tangs 38 on the latching ring 22.

[0011] The housing 18 of the second part 16 has a radially outwardly extending rigid lug which is defined by a circumferentially extending rib 56 formed on the outer surface of the housing 18. Alternatively, a number of separate rigid lugs may be formed on the housing 18. On mating of the housing 18 of the second part 16 with the housing 14 of the first part 12, the rib 56 engages the latching tangs 38 on the latching ring 22. Both engaging surfaces 58 of the latching tangs 38 and both engaging surfaces 60 of the rib 56 are preferably chamfered to aid latching and delatching as described in more detail below.

[0012] Latching and delatching of the parts 12,16 of the connector 10 is illustrated in Figures 7a to 7d. Figure 7a shows the arrangement as the housing 18 of the second part 16 is slid into the housing 14 of the first part 12. As the housing 18 moves in the direction of the arrow, the rib 56 engages the latching tang 38. The locking ring 20 is biased by the spring 24 to its first position with the bar 48 of the locking ring positioned adjacent the latching tang 38. Further movement of the housing 18 in the direction of the arrow in Figure 7b (to mate the two parts 12,16) causes the latching tang 38 to pivot relative to the free end 40 of the leg 42 to allow the rib 56 to pass the latching tang 38. The chamfered engaging surfaces 58,60 aid the passage of the rib 56 passed the latching tang 38. The bar 48 on the locking ring 20 prevents radial outward movement of the latching tang 38 (Figure 7c) and so any unauthorised attempt to pull the housing 18 out of the housing 14 is substantially prevented by the rib 56 engaging the latching tang 38, and the latching tang engaging the bar 48. However, if a need arises to remove the housing 18 of the second part 16 from the housing 14 of the first part 12 in order to disconnect the two parts, the locking ring 20 can be manually push in the axial direction (arrow X in Figure 7d) to its second position against the bias of the spring 24. In the second position of the locking ring 20, the aperture 50 in the locking ring is positioned radially adjacent the latching tang 38. Pulling of the housing 18 in the opposed axial direction (arrow Y in Figure 7d) causes the rib 56 to engage the latching tang 38 to pivot the latching tang radially outwards at the connecting end 46 of the leg 42 into the aperture 50 allowing the housing 18 to be disconnected from the housing 14 of the first part 12. Again, the chamfered engaging surfaces 58,60 aid the passage of the rib 56 passed the latching tang 38.

[0013] Connection of the two parts 12,16 is achieved by a simple push fit. The snap fit of the rib 56 behind the latching tangs 38 provides an audible sound for confirming full and correct mating of the two parts 12,16. The locking ring 20 prevents unauthorised disconnection of the two parts 12,16. Disconnection can be easily achieved simply by manual depression of the locking ring 20. The arrangement of the two-part connector of the present invention therefore overcomes the disadvantages of the prior art connectors in areas where access is difficult.

Claims

1. A two-part electrical connector comprising a first part having a housing of electrically insulating material and which is substantially annular; a second part having a housing of electrically insulating material and which makes a sliding fit inside the housing of the first part, the housing of the second part having a radially outwardly extending substan-

tially rigid lug; a locking ring which is substantially annular and which is retained in the housing of the first part, the locking ring being capable of movement in an axial direction relative to the housing of the first part between a first position and a second position; a latching ring which is substantially annular and which is retained in the housing of the first part and is partially surrounded by the locking ring, the latching ring having a radially inwardly extending resilient latching tang which can be engaged by, and latches with, the lug on the housing of the second part on sliding the housing of the second part into the housing of the first part; and a spring acting on the locking ring to bias the locking ring towards the first position; wherein the locking ring has a circumferentially extending bar and a circumferentially extending aperture adjacent the bar in an axial direction; wherein in the first position of the locking ring, the bar is adjacent the latching tang on the latching ring to substantially prevent radially outward movement of the latching tang; and wherein in the second position of the locking ring, the aperture is adjacent the latching tang on the latching ring to allow radially outward movement of the latching tang.

2. A two-part electrical connector as claimed in Claim 1, wherein the locking ring has outwardly extending tabs which engage an internal shoulder in the housing of the first part to retain the locking ring in the housing of the first part.

3. A two-part electrical connector as claimed in Claim 1 or Claim 2, wherein the locking ring has an internal axially extending rib which makes a sliding fit in a corresponding groove in the latching ring to substantially prevent relative rotation between the locking ring and the latching ring.

4. A two-part electrical connector as claimed in any one of Claims 1 to 3, wherein the latching tang is pivotally mounted on the free end of an axially extending leg which is positioned in an aperture in, and pivotally connected to, the latching ring.

5. A two-part electrical connector as claimed in Claim 4, wherein the leg is substantially U-shaped.

6. A two-part electrical connector as claimed in any one of Claims 1 to 5, wherein the engaging surfaces of the latching tang and the lug are chamfered.

7. A two-part electrical connector as claimed in any one of Claims 1 to 6, wherein the lug is defined by a circumferentially extending rib on the housing of the second part.

8. A two-part electrical connector as claimed in any one of Claims 1 to 7, wherein the latching ring has two or more latching tangs.

Fig.1.

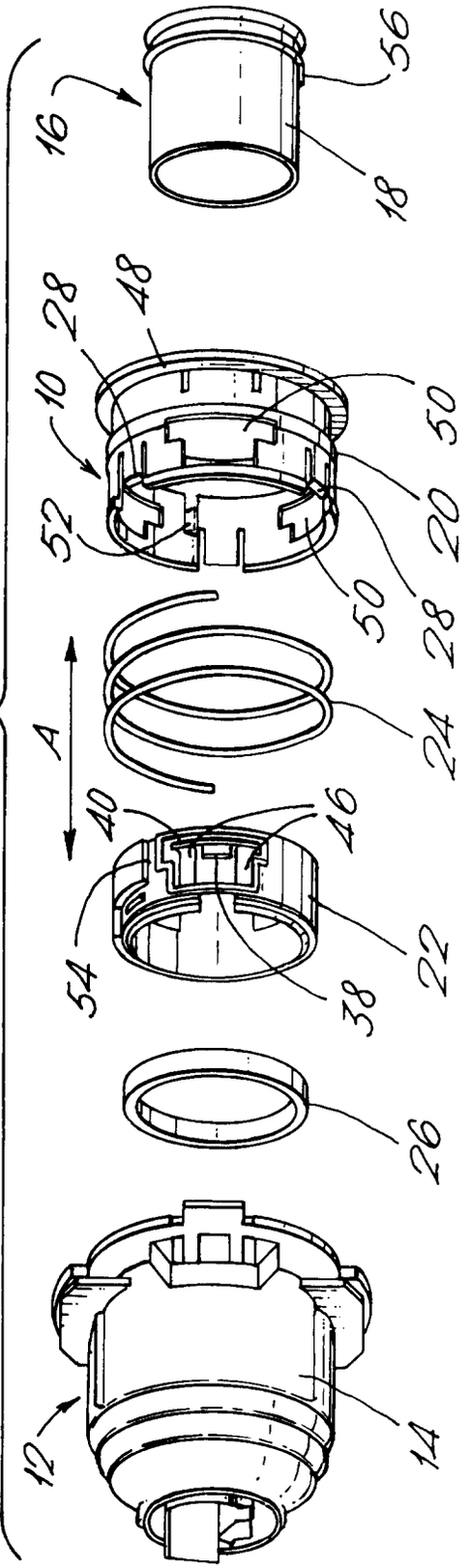


Fig.6.

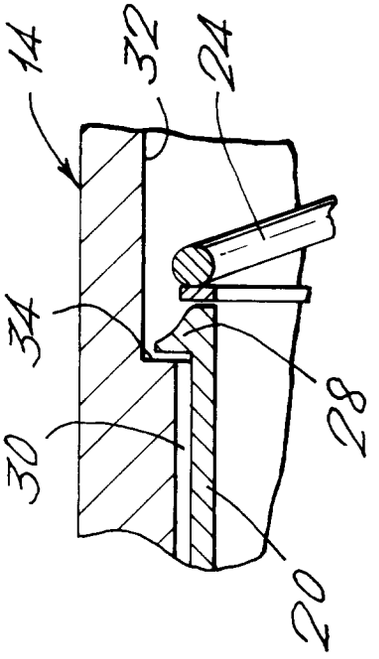


Fig.5.

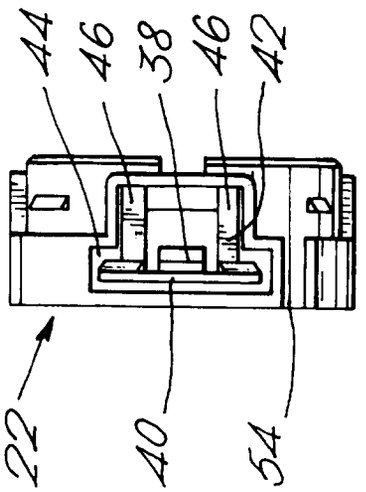


Fig.2.

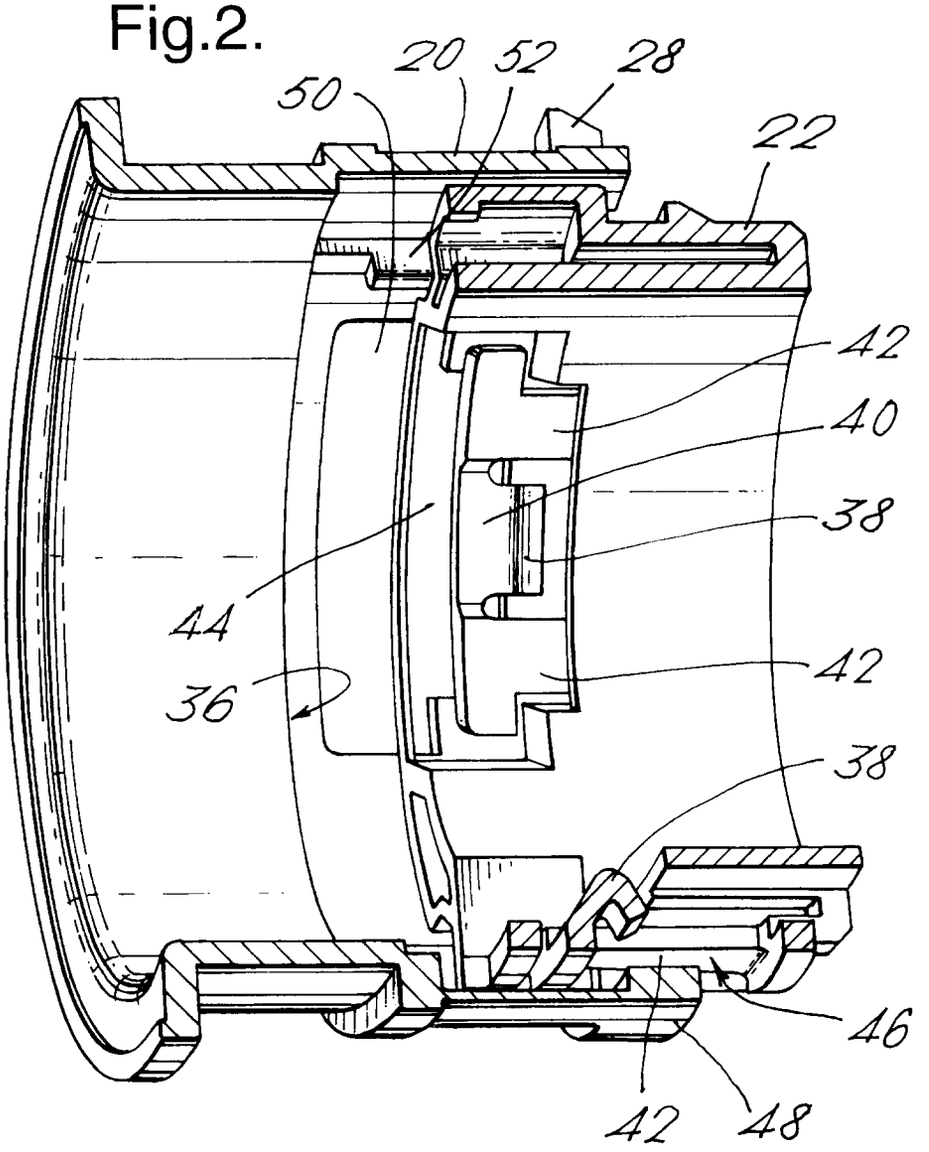


Fig.3.

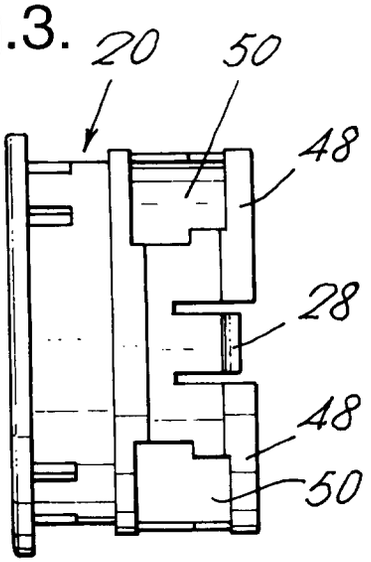


Fig.4.

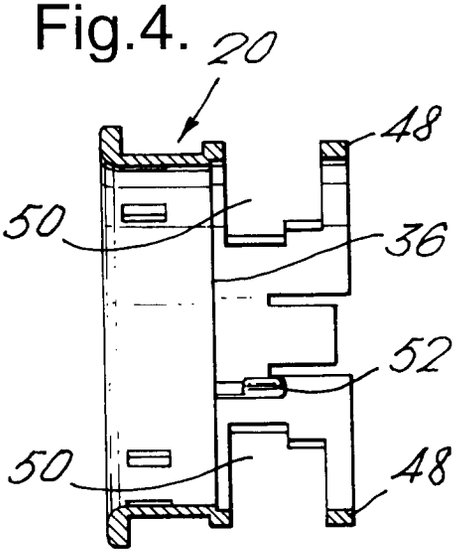
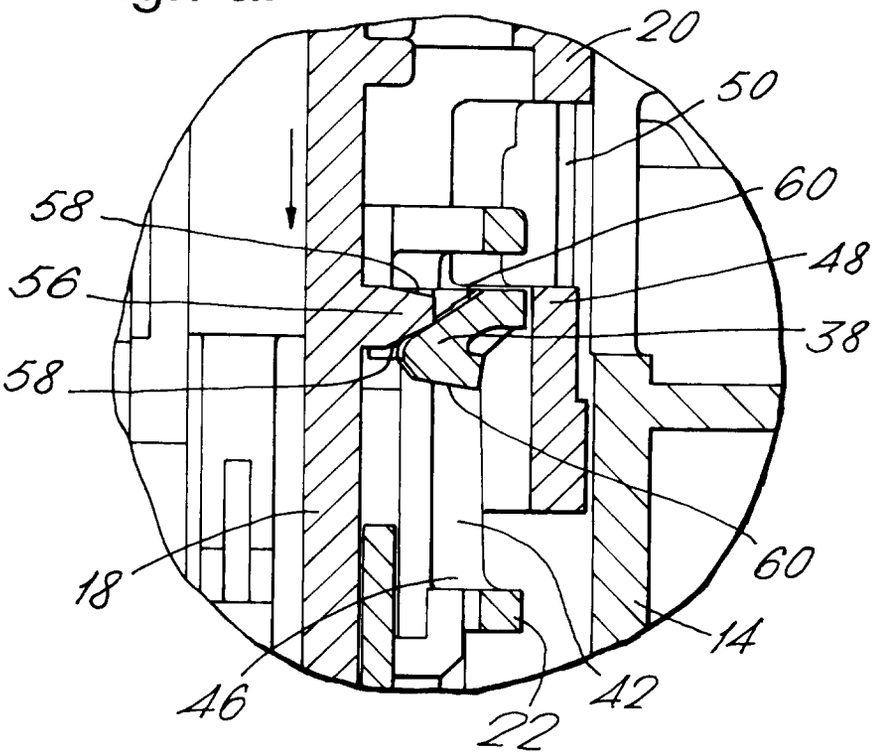


Fig.7a.


20
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56
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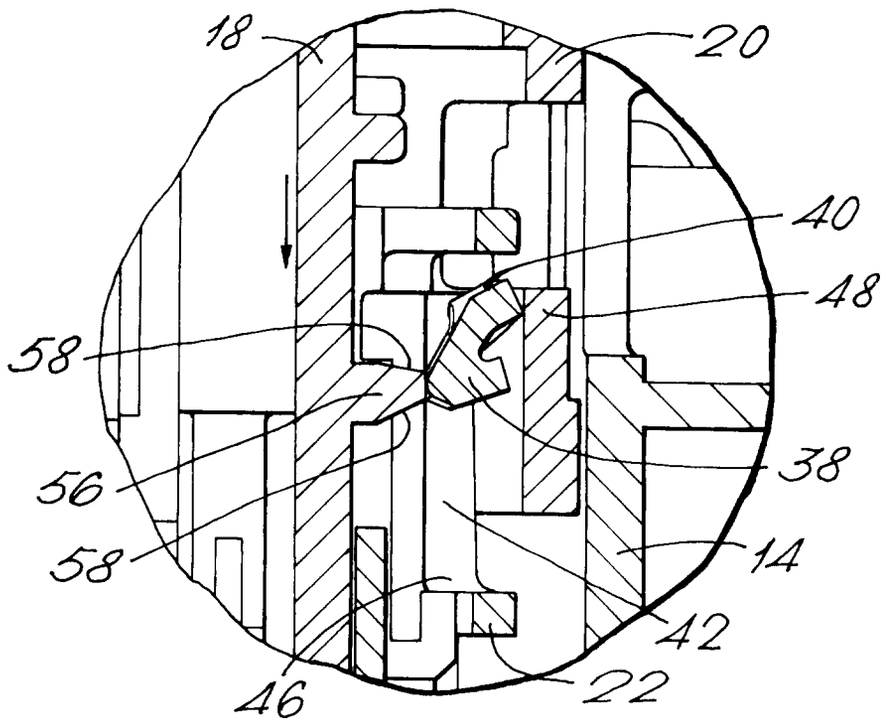
22

Fig.7b.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22

Fig.7c.

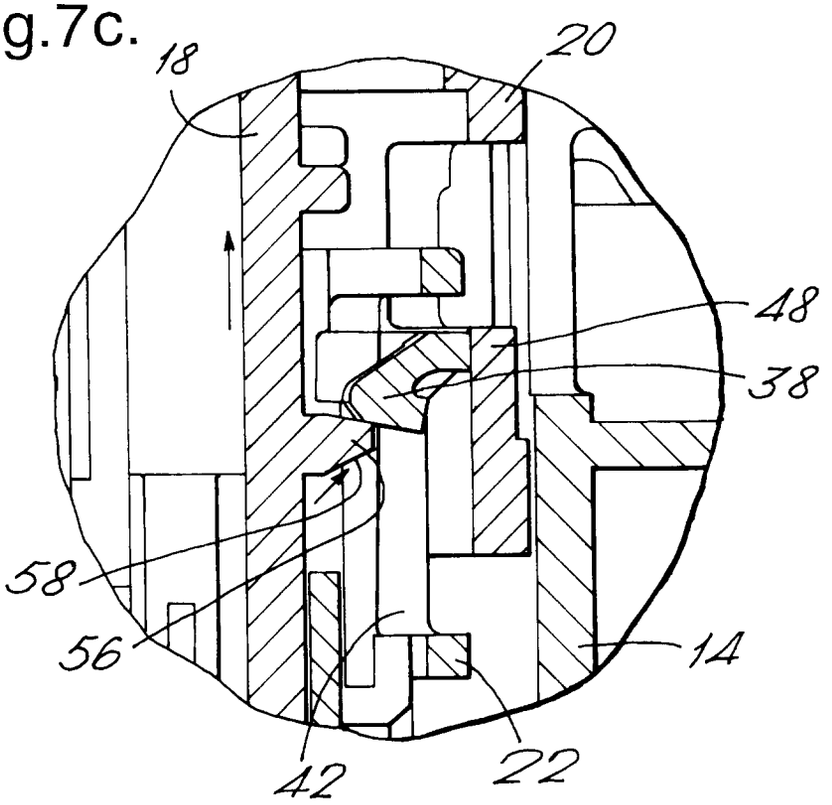

Fig.7d.