

(19)



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11)

EP 0 901 195 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: **98202661.9**

(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 9718896**

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

(72) Inventors:
• **Koburg, Dirk
42897 Remscheid (DE)**
• **Schekalla, Peter P.
42329 Wuppertal (DE)**

- **Winkler, Mark
42287 Wuppertal (DE)**
- **Michalski, Frank
42855 Remscheid (DE)**
- **Hoschek, Wolfgang
64546 Mörfelden-W (DE)**
- **Hoffmann, Uwe
42719 Solingen (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 connector

(57) A two-part electrical connector comprising a first part (12) having a housing (14) of electrically insulating material which is capable of installation in an aperture (16), of predetermined shape and size, in a wall (18) of predetermined thickness, the housing having a first ring (20) which extends substantially circumferentially around the housing, and a second ring (22) which extends substantially circumferentially around the housing, the rings being axially spaced by a distance which

is the same as or slightly more than the thickness of the wall, the first ring having a maximum diameter (D_1) which is greater than the minimum diameter (A_1) of the aperture, the second ring having a maximum diameter (D_2) which is greater than the minimum diameter of the aperture but less than the maximum diameter (A_2) of the aperture, and a minimum diameter (D_3) which is less than the minimum diameter of the aperture. Easier installation in the aperture.

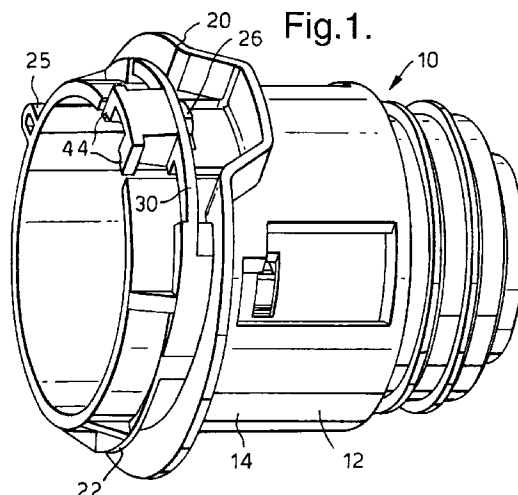
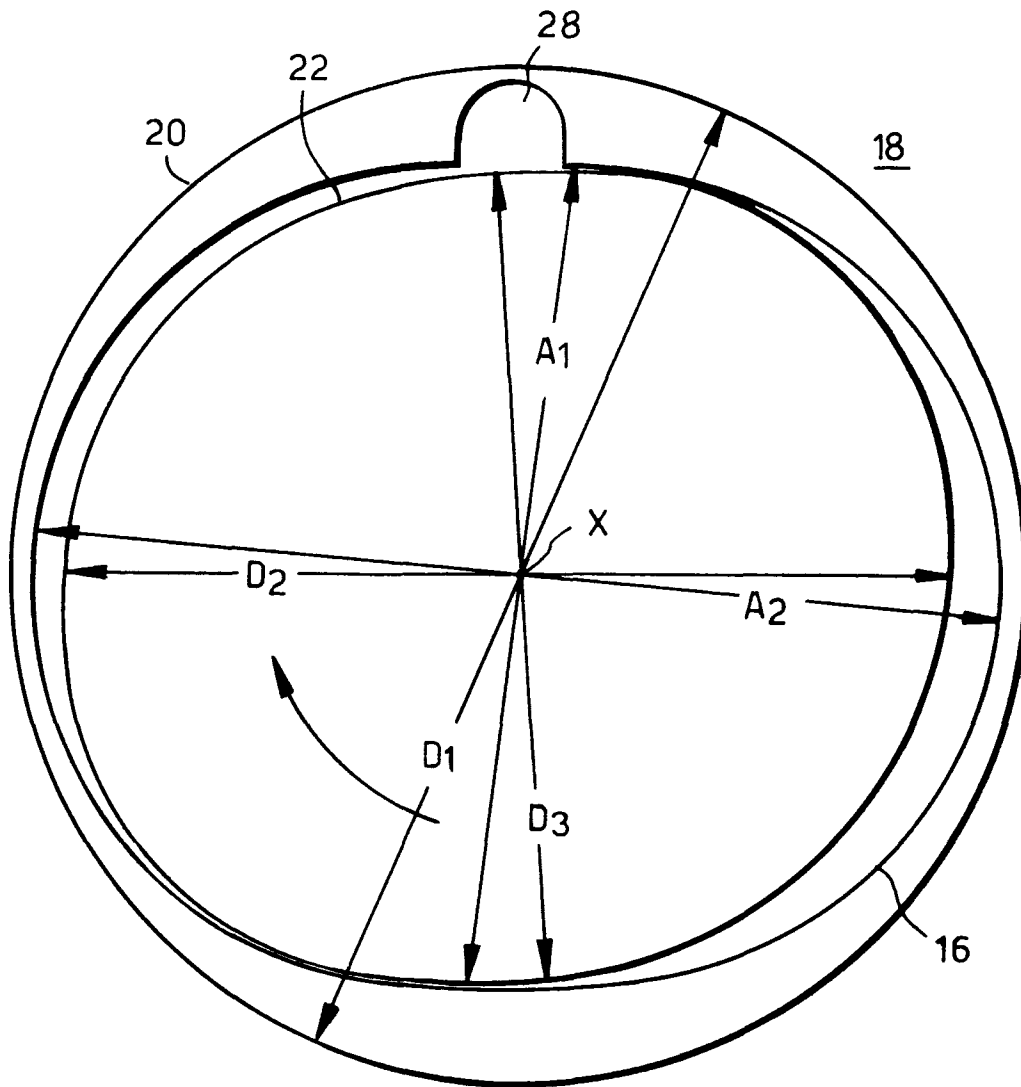


Fig. 1.

Fig.3.



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. The first part is secured in the aperture in the wall by passing the first part through the aperture until latching tangs snap fit with the wall around the opening, and then screw-threading a collar on to the first part. In areas where access is difficult, such an arrangement is difficult to install.

Summary of the Invention

[0003] It is an object of the present invention to provide an improved two-part electrical connector which allows easier installation in an aperture in a wall.

[0004] A two-part electrical connector in accordance with the present invention comprises a first part having a housing of electrically insulating material which is capable of installation in an aperture, of predetermined shape and size, in a wall of predetermined thickness, the housing having a first ring which extends substantially circumferentially around the housing, and a second ring which extends substantially circumferentially around the housing, the rings being axially spaced by a distance which is the same as or slightly more than the thickness of the wall, the first ring having a maximum diameter which is greater than the minimum diameter of the aperture, the second ring having a maximum diameter which is greater than the minimum diameter of the aperture but less than the maximum diameter of the aperture, and a minimum diameter which is less than the minimum diameter of the aperture.

[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 a side view of a first part of a two-part

electrical connector in accordance with the present invention;

Figure 2 is another side view of the connector of Figure 1;

Figure 3 is a view of an outline of the first and second ring of the connector of Figures 1 and 2 and an aperture which is suitable to receive the connector; Figure 4 is a cross-sectional view of the connector of Figure 1 with the addition of a locking ring;

Figures 5 and 6 are cross-sectional views showing the operation of the locking arrangement for the connector of Figure 4; and

Figures 7 and 8 are cross-sectional views showing the operation of the locking arrangement of another embodiment of two-part electrical connector in accordance with the present invention.

Description of the Preferred Embodiment

[0007] Referring to Figures 1 and 2 of 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 (not shown) which includes a housing of electrically insulating material. The first part 12 is capable of installation in an aperture 16 (of known shape and size) in a wall 18 (of known thickness).

[0008] The housing 14 of the first part 12 has a first ring 20 and a second ring 22. Both rings 20,22 extend substantially circumferentially around the housing 14 and are, in general, axially spaced with a predetermined separation which is the same as or slightly more than the thickness of the wall 18.

[0009] The first ring 20 has a maximum diameter D_1 (Figure 3) which is greater than the minimum diameter A_1 of the aperture 16. The second ring 22 has a maximum diameter D_2 which is greater than the minimum diameter A_1 of the aperture 16 but less than the maximum diameter A_2 of the aperture, and a minimum diameter D_3 which is less than the minimum diameter A_1 of the aperture. The first part 12 is installed in the aperture 16 by passing the second ring 22 of the housing 14 through the aperture and then rotating the housing about its longitudinal axis X to trap a portion of the wall 18 between the first and second rings 20,22. The rings and the aperture may be rectangular. However, in the preferred arrangement that is shown herein, the aperture 18 is substantially oval, the first ring 20 is substantially circular, and the second ring 22 is substantially oval in shape.

[0010] In order to compensate for any small variations in the thickness of the wall 18 and/or the separation of the rings 20,22, the first ring 20 preferably has one or more flexible legs 24 directed towards the second ring 22 to reduce the axial separation between the rings over a small circumferential distance. As an alternative, the flexible leg or legs may be formed on the second ring

and directed towards the first ring.

[0011] A notch 28 is preferably formed in the wall 18 which opens into the aperture 16. The housing 14 has an axially extending external rib 25 which passes through the notch 28 during initial installation of the first part 12 in the aperture 16. The second ring 22 has a lug 26 directed towards the first ring 20 which is formed on a resiliently flexible portion 30 of the second ring. As the first part 12 is rotated during installation in the aperture 16, the lug 26 engages the wall 18 to deflect the flexible portion 30 away from the first ring 20. When the lug 26 reaches the notch 28, the lug snaps into the notch 28. The engagement of the lug 26 in the notch 28 substantially prevents unintended rotation of the first part 12 after installation in the aperture 16. Intentional rotation is possible by manually pushing the flexible portion 30 to move the lug 26 out of the notch 28 to allow rotation of the housing 14.

[0012] In the modified arrangement shown in Figure 4, the first part 12 includes a locking ring 32 which is substantially annular and which is positioned inside the housing 14. The locking ring 32 is capable of axial movement relative to the housing 14, and is retained in the housing 14 by latches 34 which make a snap fit in axially extending apertures 36 in the housing. A coil spring 38 is positioned inside the housing 14 adjacent the locking ring 32 and acts on the locking ring to bias the locking ring in an axial direction away from the housing. The locking ring 32 has a flexible leg 40 positioned adjacent the flexible portion 30 on the housing 14. The flexible leg 40 and the flexible portion 30 preferably have corresponding dimples 42,44 respectively which can contact one another. When the flexible portion 30 is deflected due to the lug 26 engaging the wall 18, or due to manual deflection, the dimples 42,44 engage one another and the flexible leg 40 is pushed radially inwards - as can be seen in Figure 6. When the lug 26 is positioned in the notch 28, and the second part 46 of the two-part connector 10 is mated with the first part 12, as shown in Figure 5, the flexible leg 40 cannot be pushed inwards as a collar portion 48 on the housing 50 of the second part is positioned adjacent the flexible leg 40. Such an arrangement substantially ensures that the first part 12 of the connector 10 cannot be removed from the aperture 16 in the wall 18 whilst the second part 46 is still mated with the first part.

[0013] In another embodiment of connector 100 in accordance with the present invention, as shown in Figures 7 and 8, the flexible leg of the locking ring 102 is replaced by an aperture 104. When the lug 26 is positioned in the notch 28 (Figure 7) and the locking ring 102 is biased outwardly by the spring 38, the dimples 42,44 on the locking ring 102 and the flexible portion 30 of the housing 14 are positioned adjacent one another to substantially prevent movement of the flexible portion. In this position, the first part 12 cannot be removed from the aperture 16. However, to remove the first part 12 from the aperture 16, the locking ring 102 is manually

pushed inwards against the bias of the spring 38 to bring the aperture 104 adjacent the dimple 44 on the flexible portion 30 (Figure 8), and the flexible portion is then manually pushed radially inward. As the dimple 44 on the flexible portion 30 can enter the aperture 104, the lug 26 is moved out of the notch 28 and the housing 14 can be rotated to remove the first part from the aperture 16 in the wall 18.

[0014] The present invention allows easy (one-handed) installation of the first part of a two-part electrical connector in an aperture in a wall. The present invention can also provide a two-part connector in which the first part can be locked in the aperture, and, further, in which the locked first part can only be removed on when the second part is removed or when a locking ring is manually pushed.

Claims

1. A two-part electrical connector comprising a first part having a housing of electrically insulating material which is capable of installation in an aperture, of predetermined shape and size, in a wall of predetermined thickness, the housing having a first ring which extends substantially circumferentially around the housing, and a second ring which extends substantially circumferentially around the housing, the rings being axially spaced by a distance which is the same as or slightly more than the thickness of the wall, the first ring having a maximum diameter which is greater than the minimum diameter of the aperture, the second ring having a maximum diameter which is greater than the minimum diameter of the aperture but less than the maximum diameter of the aperture, and a minimum diameter which is less than the minimum diameter of the aperture.
2. A two-part electrical connector as claimed in Claim 1, in which the aperture is oval shaped, wherein the first ring is circular in shape and the second ring is oval in shape.
3. A two-part electrical connector as claimed in Claim 1 or Claim 2, wherein the first ring has a flexible leg directed towards the second ring to reduce the axial separation between the rings over a small circumferential distance.
4. A two-part electrical connector as claimed in any one of Claims 1 to 3, wherein the second ring has a lug directed towards the first ring which is capable of making a snap fit in a notch formed in the wall.
5. A two-part electrical connector as claimed in Claim 4, wherein the lug is formed on a resiliently flexible portion of the second ring, the resiliently flexible por-

tion being capable of deflection away from the first ring in a radially inward direction.

6. A two-part electrical connector as claimed in Claim 5, wherein the first part further comprises a locking ring which is annular and positioned inside the housing of the first part, the locking ring having a flexible leg positioned adjacent, and engageable by, the resiliently flexible portion of the second ring, the flexible leg being capable of deflection in a radially inward direction on deflection of, and engagement by, the resiliently flexible portion.
7. A two-part electrical connector as claimed in Claim 6, wherein the two-part connector further comprises a second part having a housing which can mated with the housing of the first part, the housing of the second part having a collar portion which is positioned adjacent the flexible leg of the locking ring on mating of the second part with the first part, the collar portion preventing radial inward deflection of the flexible leg and the resiliently flexible portion of the second ring.
8. A two-part electrical connector as claimed in Claim 5, wherein the first part further comprises a locking ring which is annular and positioned inside the housing of the first part, the locking ring being axially movable relative to the housing, the locking ring having an aperture therein and the resiliently flexible portion having a corresponding dimple which can move into the aperture on deflection of the resiliently flexible portion only at one position of the locking ring relative to the housing.

35

40

45

50

55

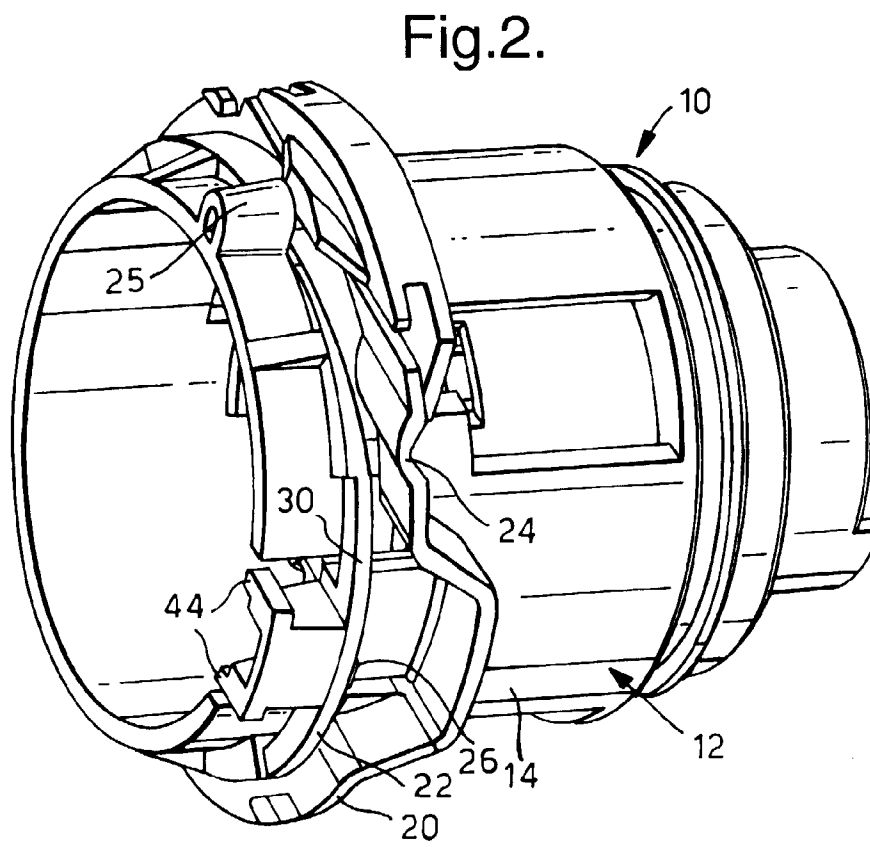
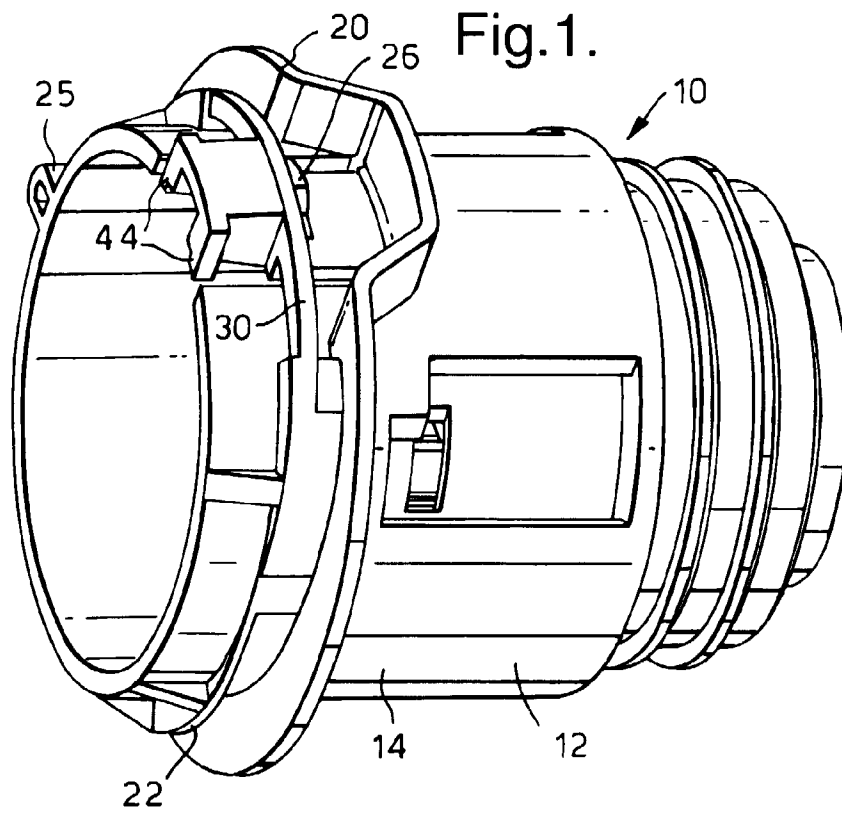
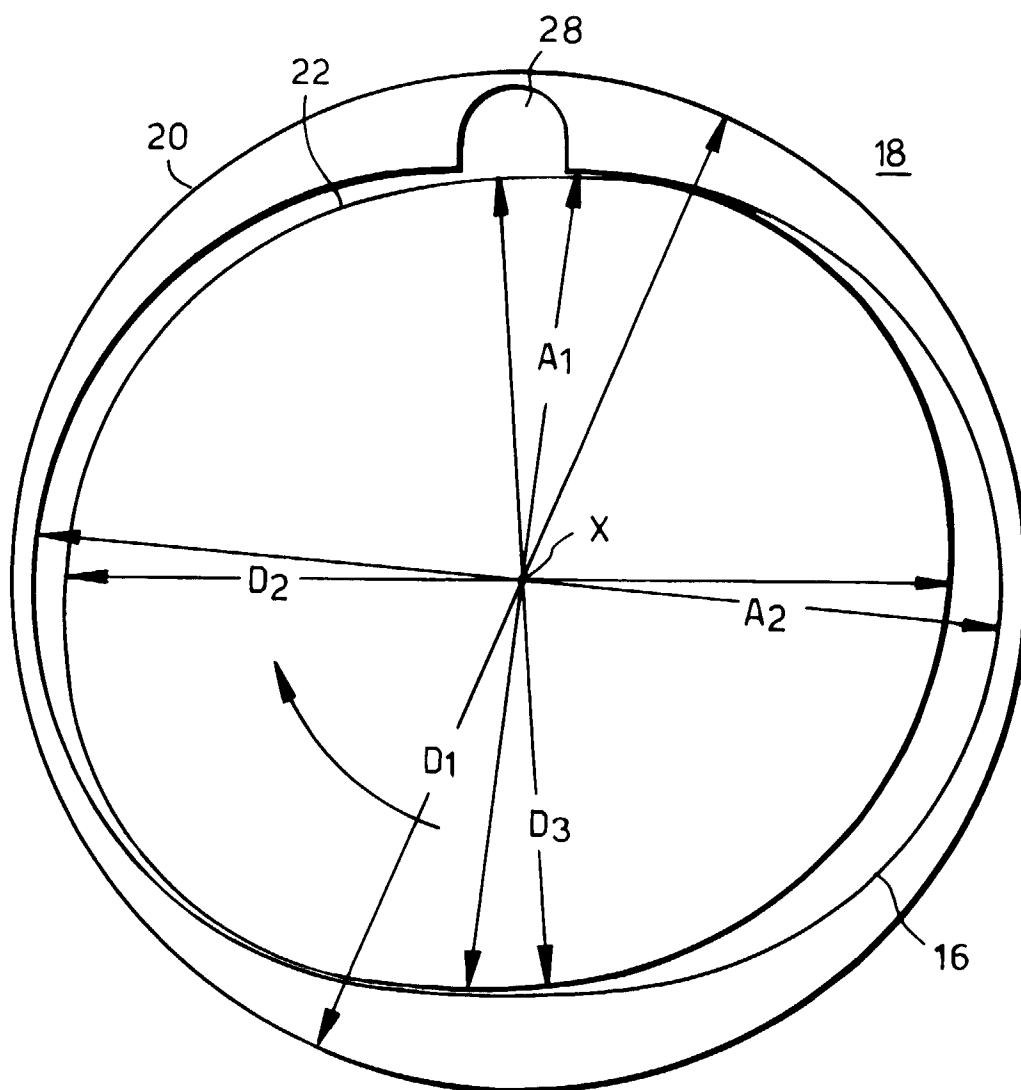


Fig.3.



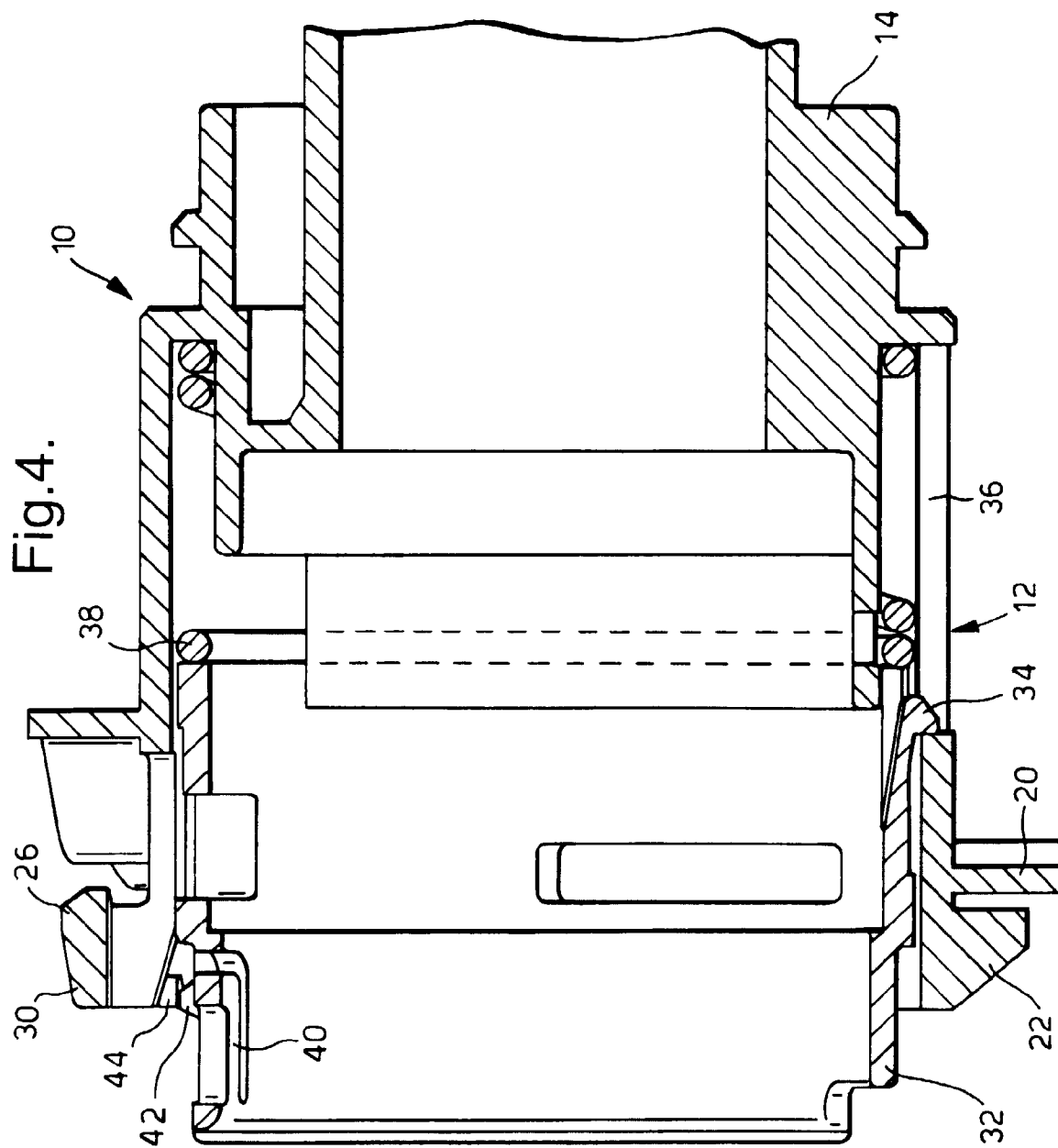


Fig.5.

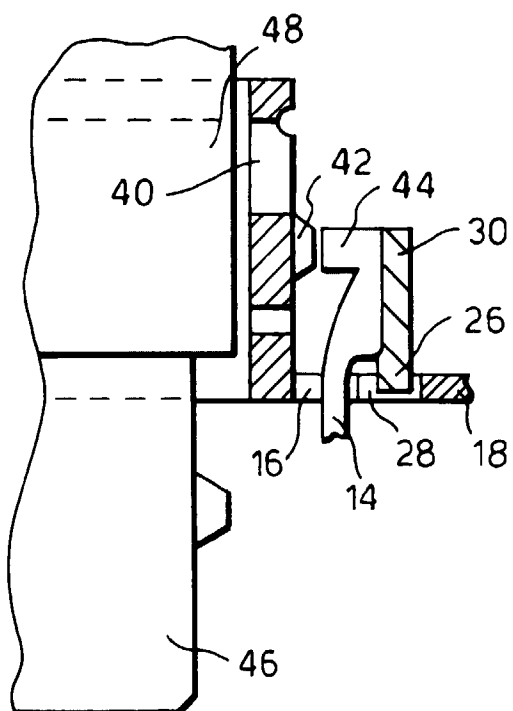


Fig.6.

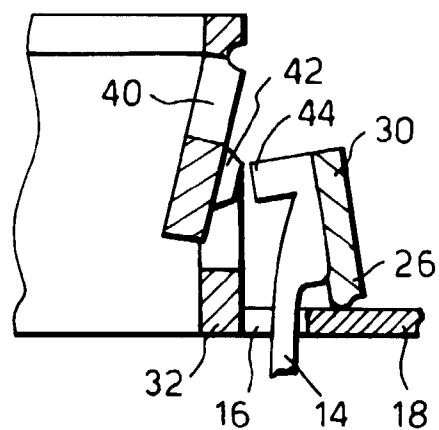


Fig.7.

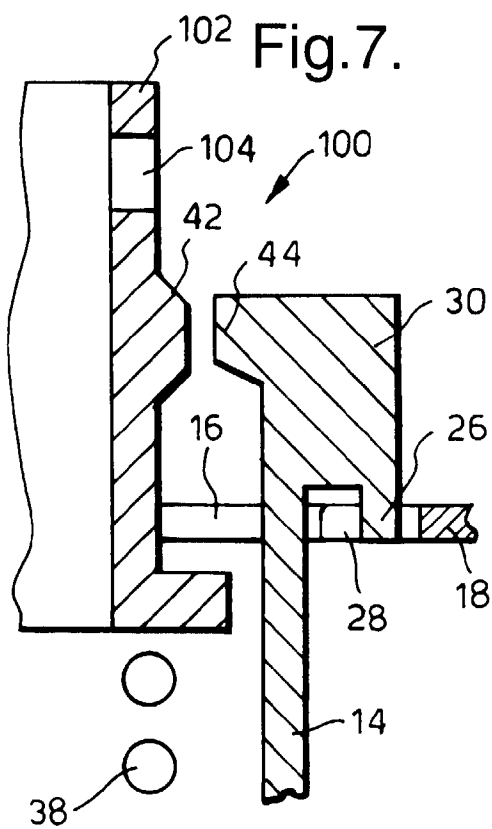


Fig.8.

