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(54) **Two-part electrical connector**

Zweiteiliger elektrischer Steckverbinder

Connecteur électrique en deux parties

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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. FR-A-931803 describes a connector in accordance with the preamble of claim 1.

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 is characterised over FR-A-931803 by the features in the characterising portion of claim 1.

[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 (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; **characterised in that** the second ring (22) has a lug (26) directed towards the first ring (20) which is capable of making a snap fit in a notch (28) formed in the wall (18).
2. A two-part electrical connector as claimed in Claim 1, in which the aperture (16) is oval shaped, wherein the first ring (20) is circular in shape and the second ring (22) is oval in shape.
3. A two-part electrical connector as claimed in Claim 1 or Claim 2, wherein the first ring (20) has a flexible leg (24) directed towards the second ring (22) 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 lug (26) is formed on a resiliently flexible portion (30) of the second ring (22), the resiliently flexible portion being capable of deflection away from the first ring (20) in a radially inward direction.
5. A two-part electrical connector as claimed in Claim 4, wherein the first part (12) further comprises a locking ring (32) which is annular and positioned inside the housing (14) of the first part (12), the locking ring having a flexible leg (40) positioned adjacent, and engageable by, the resiliently flexible portion (30) of the second ring (22), the flexible leg being capable of deflection in a radially inward direc-

tion on deflection of, and engagement by, the resiliently flexible portion.

6. A two-part electrical connector as claimed in Claim 5, wherein the two-part connector further comprises a second part (46) having a housing (50) which can mated with the housing (14) of the first part (12) the housing of the second part having a collar portion (48) which is positioned adjacent the flexible leg (40) of the locking ring (32) 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.
7. A two-part electrical connector as claimed in Claim 4, wherein the first part (20) further comprises a locking ring (102) which is annular and positioned inside the housing (14) of the first part, the locking ring being axially movable relative to the housing, the locking ring having an aperture (104) therein and the resiliently flexible portion (30) having a corresponding dimple (44) 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.

Patentansprüche

1. Zweiteiliger elektrischer Verbinder (10), umfassend einen ersten Teil (12) mit einem Gehäuse (14) aus einem elektrisch isolierenden Material, das in einer Öffnung (16) mit einer vordefinierten Form und Größe in einer Wand (18) mit einer vorbestimmten Dicke eingebaut werden kann, wobei das Gehäuse einen ersten Ring (20), der sich im Wesentlichen um den Umfang des Gehäuses herum erstreckt, und einen zweiten Ring (22), der sich im Wesentlichen um den Umfang des Gehäuses herum erstreckt, aufweist, wobei die Ringe axial um eine Distanz beabstandet sind, die gleich der oder etwas größer als die Dicke der Wand ist, wobei der erste Ring einen maximalen Durchmesser (D_1) aufweist, der größer als der minimale Durchmesser (A_1) der Öffnung ist, und der zweite Ring einen maximalen Durchmesser (D_2), der größer als der minimale Durchmesser der Öffnung aber geringer als der maximale Durchmesser (A_2) der Öffnung ist, sowie einen minimalen Durchmesser (D_3), der geringer als der minimale Durchmesser der Öffnung ist, aufweist;
dadurch gekennzeichnet, dass
der zweite Ring (22) eine in Richtung des ersten Ringes (20) gerichtete Nase (26) aufweist, die in der Lage ist, einen Schnappverschluss in einer in der Wand (18) ausgebildeten Kerbe (28) zu bilden.
2. Zweiteiliger elektrischer Verbinder nach Anspruch 1,

worin die Öffnung (16) oval ist, wobei der erste Ring (20) von kreisförmiger Form und der zweite Ring (22) von ovaler Form ist.

3. Zweiteiliger elektrischer Verbinder nach Anspruch 1 oder 2,
wobei der erste Ring (20) einen in Richtung des zweiten Ringes (22) gerichteten biegsamen Schenkel (24) aufweist, um die axiale Trennung zwischen den Ringen über eine kleine Umfangsdistanz zu verringern.
4. Zweiteiliger elektrischer Verbinder nach einem der Ansprüche 1 bis 3,
wobei die Nase (26) an einem elastisch biegsamen Abschnitt (30) des zweiten Ringes (22) ausgebildet ist, wobei der elastisch biegsame Abschnitt in der Lage ist, sich von dem ersten Ring (20) in einer radialen Richtung nach innen weg umzubiegen.
5. Zweiteiliger elektrischer Verbinder nach Anspruch 4,
wobei der erste Teil (12) ferner einen Sicherungsring (32) umfasst, der kreisringförmig und innerhalb des Gehäuses (14) des ersten Teils (12) angeordnet ist, wobei der Sicherungsring einen benachbart zu dem und in Eingriff setzbar durch den elastisch biegsamen Abschnitt (30) des zweiten Ringes (22) angeordneten biegsamen Schenkel (40) aufweist, wobei der biegsame Schenkel in der Lage ist, sich beim Umbiegen des und beim Eingriff durch den elastisch biegsamen Abschnitt/ s in einer radialen Richtung nach innen umzubiegen.
6. Zweiteiliger elektrischer Verbinder nach Anspruch 5,
wobei der zweiteilige Verbinder ferner einen zweiten Teil (46) mit einem Gehäuse (50) umfasst, das mit dem Gehäuse (14) des ersten Teils (12) gekoppelt werden kann, wobei das Gehäuse des zweiten Teils einen Bundabschnitt (48) aufweist, der beim Koppeln des zweiten Teils mit dem ersten Teil benachbart zu dem biegsamen Schenkel (40) des Sicherungsringes (32) angeordnet ist, wobei der Bundabschnitt ein radiales Umbiegen des biegsamen Schenkels und des elastisch biegsamen Abschnitts des zweiten Ringes nach innen verhindert.
7. Zweiteiliger elektrischer Verbinder nach Anspruch 4,
wobei der erste Teil (20) ferner einen Sicherungsring (102) umfasst, der kreisringförmig und innerhalb des Gehäuses (14) des ersten Teils angeordnet ist, wobei der Sicherungsring axial relativ zu dem Gehäuse bewegbar ist und der Sicherungsring eine Öffnung (104) darin aufweist und der elastisch biegsame Abschnitt (30) eine entsprechende Vertiefung (44) aufweist, die sich beim Umbiegen des

elastisch biegsamen Abschnitts nur an einer Stelle des Sicherungsringes relativ zu dem Gehäuse in die Öffnung hinein bewegen kann.

Revendications

1. Connecteur électrique en deux parties comprenant une première partie (12) ayant un boîtier (14) en matériau électriquement isolant qui peut être mis en place dans une ouverture (16) de forme et de dimensions prédéterminées, dans une paroi (18) d'épaisseur prédéterminée, le boîtier ayant une première bague (20) qui est placée essentiellement sur la périphérie autour du boîtier, et une deuxième bague (22) qui est placée essentiellement sur la périphérie autour du boîtier, les bagues étant écartées axialement d'une distance qui est identique ou légèrement supérieure à l'épaisseur de la paroi, la première bague ayant un diamètre maximal (D_1) qui est supérieur au diamètre minimal (A_1) de l'ouverture, la deuxième bague ayant un diamètre maximal (D_2) qui est supérieur au diamètre minimal de l'ouverture mais inférieur au diamètre maximal (A_2) de l'ouverture, et un diamètre minimal (D_3) qui est inférieur au diamètre minimal de l'ouverture ; **caractérisé en ce que** la deuxième bague (22) est dotée d'un ergot (26) orienté vers la première bague (20) qui peut insérer par encliquetage dans une encoche (28) formée dans la paroi (18).
2. Connecteur électrique en deux parties selon la revendication 1, dans lequel l'ouverture (16) est de forme ovale, dans lequel la première bague (20) est de forme circulaire et la deuxième bague (22) est de forme ovale.
3. Connecteur électrique en deux parties selon la revendication 1 ou la revendication 2, dans lequel la première bague (20) est dotée d'une patte flexible (24) orientée vers la deuxième bague (22) afin de réduire l'écart axial entre les bagues sur une courte distance périphérique.
4. Connecteur électrique en deux parties selon l'une quelconque des revendications 1 à 3, dans lequel l'ergot (26) est formé sur une partie élastiquement flexible (30) de la deuxième bague (22), la partie élastiquement flexible pouvant s'éloigner de la première bague (20) grâce à une déformation dans une direction vers l'intérieur selon le rayon.
5. Connecteur électrique en deux parties selon la revendication 4, dans lequel la première partie (12) comprend de plus une bague de blocage (32) qui est annulaire et positionnée à l'intérieur du boîtier (14) de la première partie (12), la bague de blocage ayant une patte flexible (40) positionnée adjacente
6. Connecteur électrique en deux parties selon la revendication 5, dans lequel le connecteur en deux parties comprend de plus une deuxième partie (46) ayant un boîtier (50) qui peut s'accoupler avec le boîtier (14) de la première partie (12), le boîtier de la deuxième partie ayant une partie de type collier (48) qui est positionnée adjacente à la patte flexible (40) de la bague de blocage (32) lors de l'accouplement de la deuxième partie avec la première partie, la partie de type collier empêchant une déformation radiale vers l'intérieur de la patte flexible et de la partie élastiquement flexible de la deuxième bague.
7. Connecteur électrique en deux parties selon la revendication 4, dans lequel la première partie (20) comprend de plus une bague de blocage (102) qui est annulaire et est positionnée à l'intérieur du boîtier (14) de la première partie, la bague de blocage pouvant se déplacer selon l'axe par rapport au boîtier, la bague de blocage présentant une ouverture (104) et la partie élastiquement flexible (30) ayant un bossage correspondant (44) qui peut se déplacer dans l'ouverture lors de la déformation de la partie élastiquement flexible seulement au niveau d'une position de la bague de blocage par rapport au boîtier.

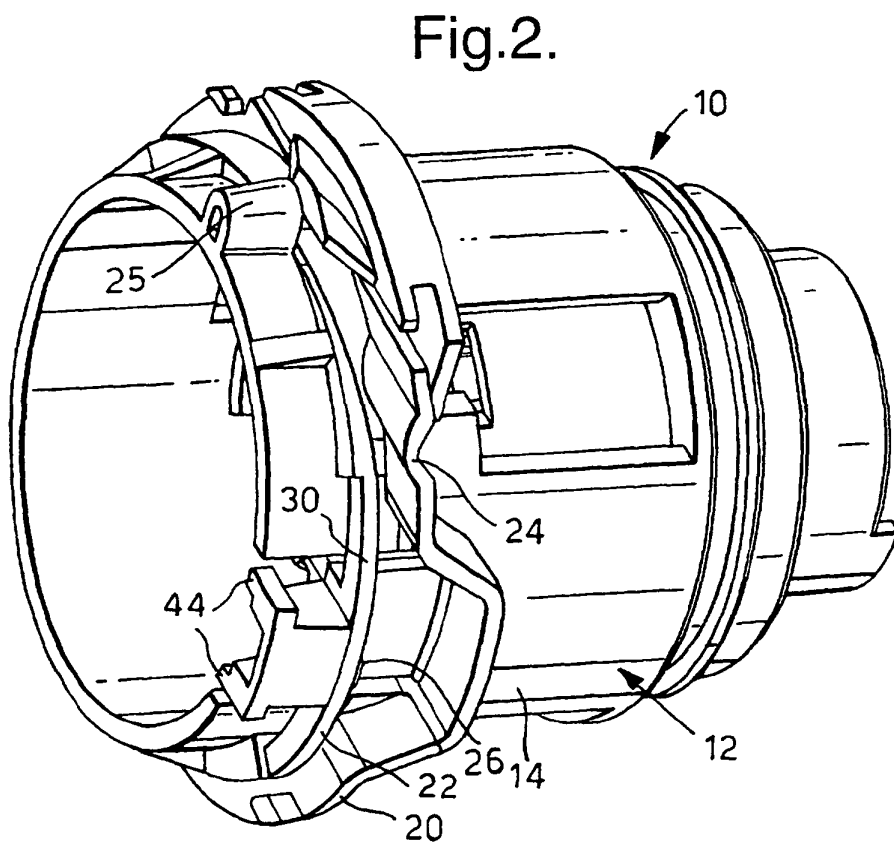
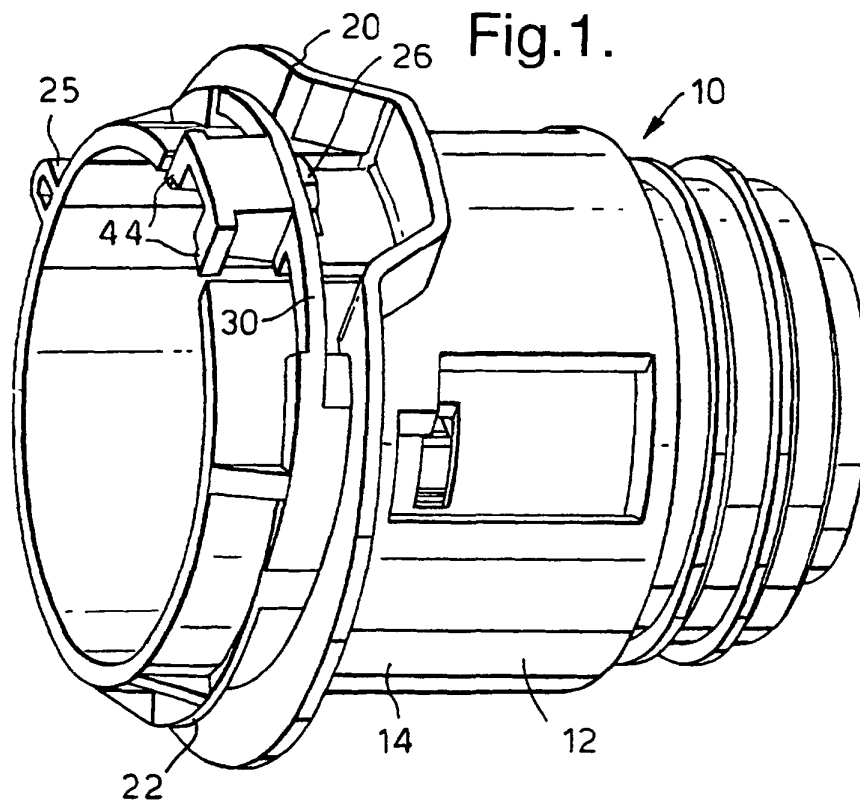
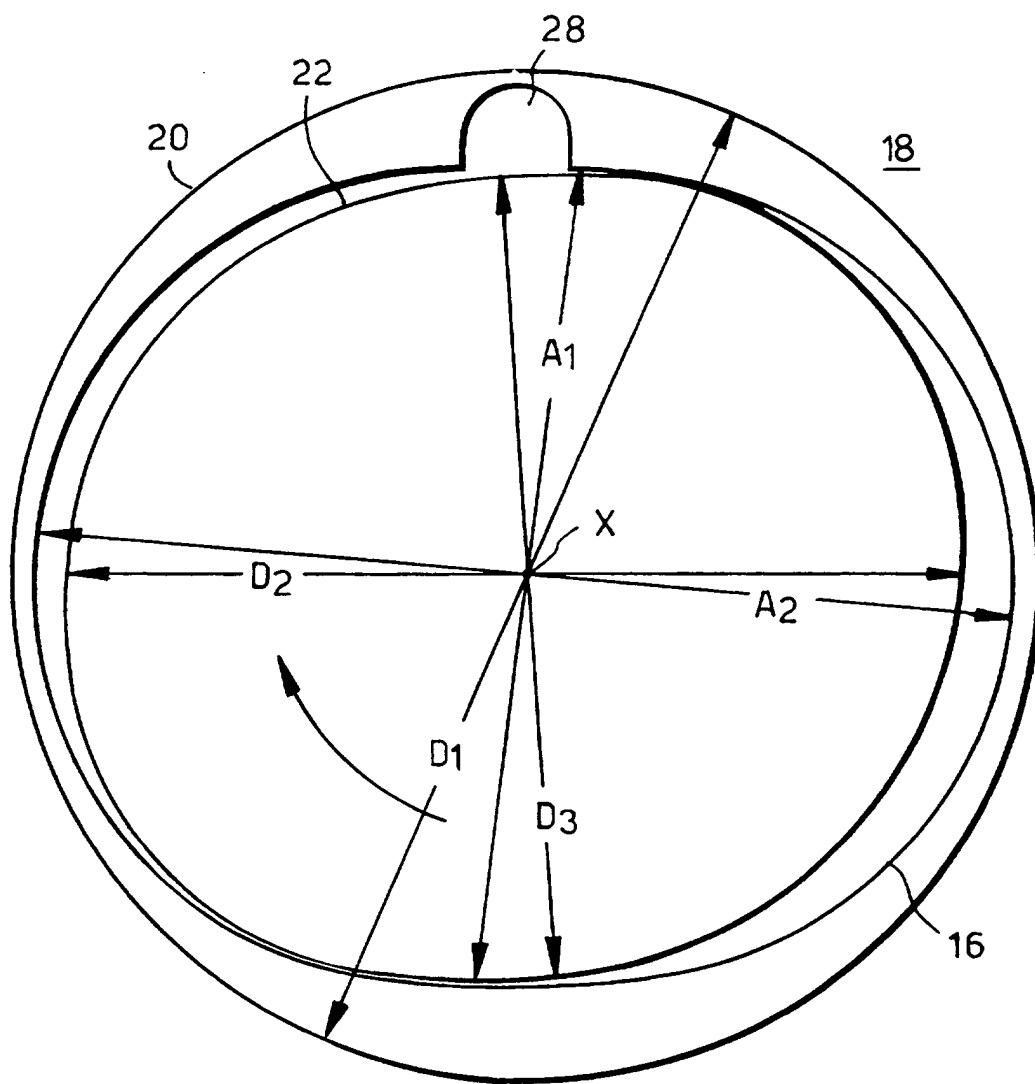


Fig.3.



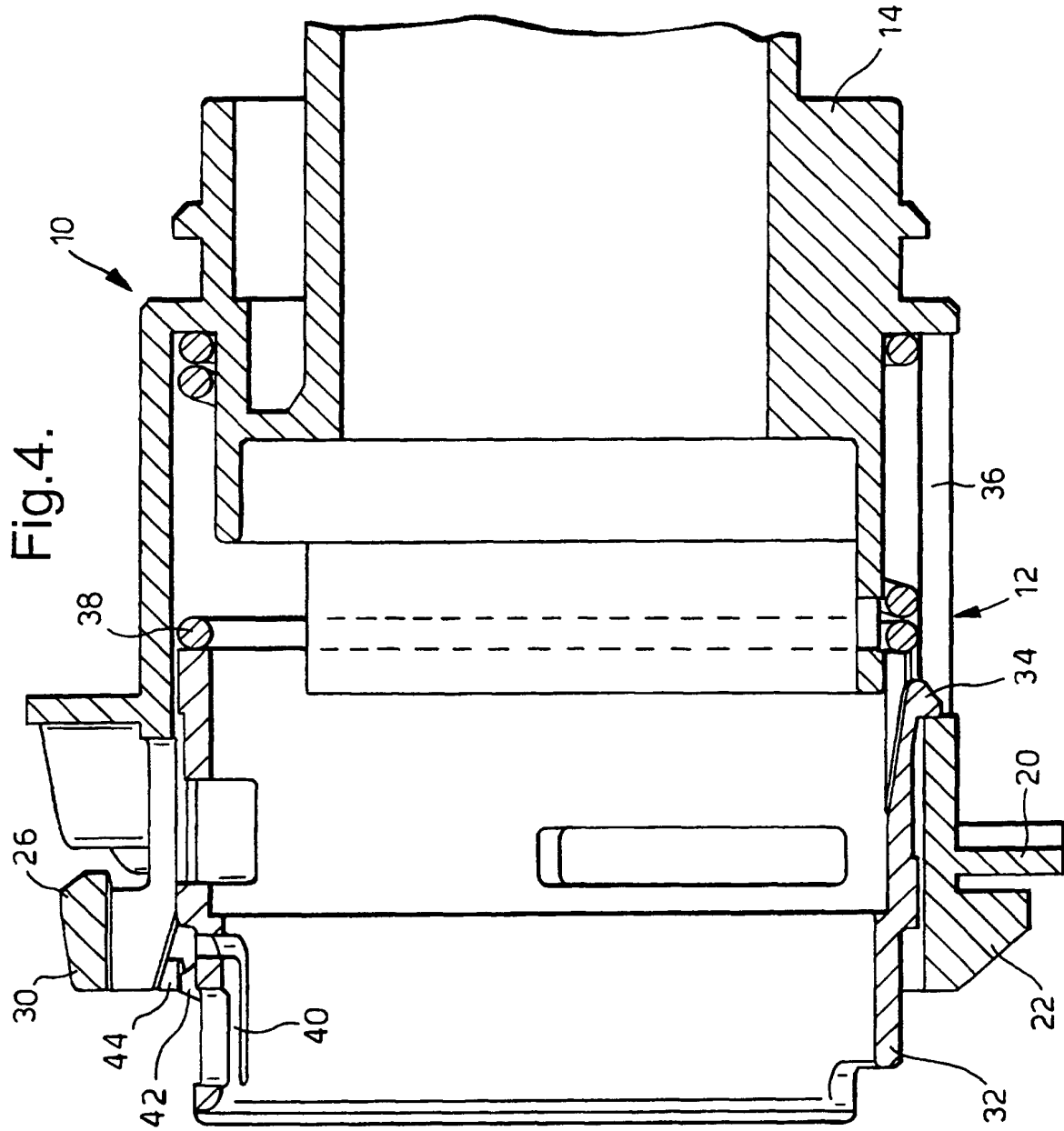


Fig.5.

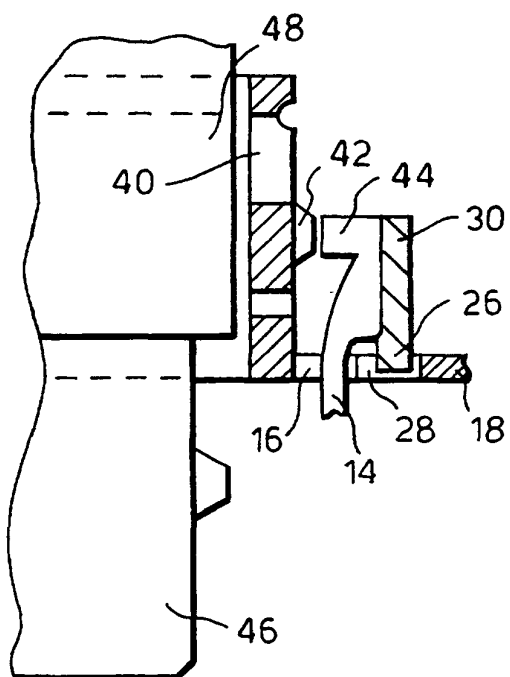


Fig.6.

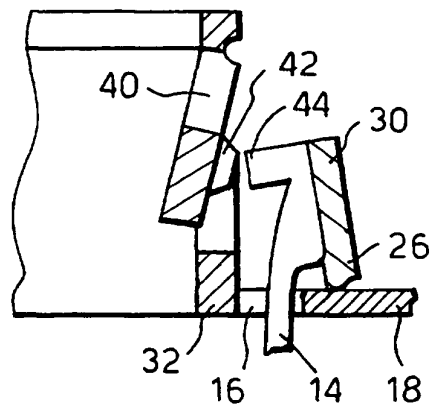


Fig.7.

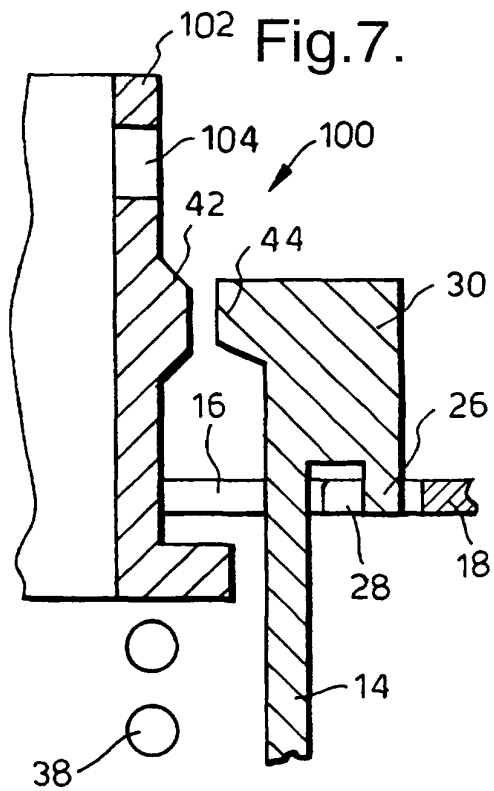


Fig.8.

