



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
28.09.2005 Bulletin 2005/39

(51) Int Cl.7: **F25B 43/00**

(21) Application number: **04425203.9**

(22) Date of filing: **24.03.2004**

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

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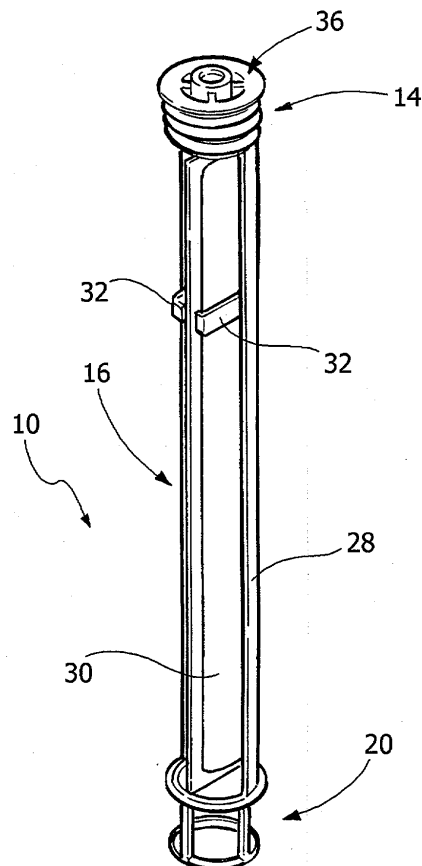
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(54) **Filter cartridge for air conditioning systems for vehicles**

(57) A filter cartridge for air conditioning systems for vehicles, comprising a particle filter (12) borne by a support structure made of plastic material (18, 20), and a cap (14) provided with at least one sealing o-ring (38). The cap (14) comprises a body (36) made of injection moulded plastic material fastened to the support structure of the filter (18, 20) by means of a bayonet coupling (50, 68). The body of the cap (36) has at least one annular seat with substantially U shaped cross section for said o-ring (38) comprising a bottom wall (44), a first radial wall (48) and a second radial wall (60). At least one of said radial walls (60) is formed on the support body of the filter (18, 20).

FIG. 2



Description

[0001] The present invention relates to a filter cartridge for air conditioning systems for vehicles.

[0002] An air conditioning system of a vehicle is generally provided with a filter assembly positioned between the condenser and the expansion valve. The filter assembly comprises a container with an inlet and an outlet and a particle filter positioned between the inlet and the outlet.

[0003] In more recent solutions, the filter assembly comprises a container with tubular shape which extends parallel to one of the distributors of the condenser and is fastened or obtained integrally therewith. In these solutions, the particle filter is generally in the form of an extractable cartridge. Within the container of the filter assembly can also be positioned dehydrator material, usually contained in a permeable bag. The filter assembly is also provided with a removable filter which closes and renders fluid tight an opening through which can be inserted and extracted the cartridge bearing the particle filter and the bag containing the dehydrator material.

[0004] The document EP-A-669506 describes a condenser for an air conditioning system of a vehicle provided with a filter container incorporated with one of the distributors of the condenser, in which the container of the filter assembly is provided with a cap; as a result of the removal of said cap, a cartridge bearing a particle filter can be extracted from the container.

[0005] The document FR-2798456 describes a cap for the container of a filter assembly provided with two o-rings which provide a tangential seal between respective annular seats with U-shaped cross section and the inner cylindrical wall of the container.

[0006] To achieve a seal by means of o-rings, the seat of the o-ring on the cap must have two parallel radial walls and a perfectly smooth bottom wall. This causes some difficulties if the cap is to be obtained by injection moulding. To form an o-ring seat with U-shaped cross section in a monolithic injection moulded piece, the mould must comprise two openable parts to allow the extraction of the finished piece. However, a two-part mould would inevitably form a small projection in correspondence with the plane of closure of the mould. Consequently, there would be a projection on the bottom wall of the o-ring seat which would form a leaking zone.

[0007] The object of the present invention is to provide a filter cartridge for air conditioning systems for vehicles which is simpler and more economical than known cartridges and which allows to overcome said drawbacks.

[0008] According to the present invention, said object is achieved by a filter cartridge having the characteristics set out in the main claim.

[0009] The characteristics and the advantages of the cartridge of the present invention shall become readily apparent from the detailed description that follows, provided purely by way of non limiting example, with reference to the accompanying drawings in which:

- Figure 1 is a lateral view of a first embodiment of a cartridge according to the present invention,
- Figure 2 is a perspective view of the cartridge of Figure 1,
- Figure 3 is a perspective view from a different angle of the body of the filter of the cartridge of Figure 2,
- Figure 4 is an axial section of a second embodiment of a cartridge according to the present invention,
- Figures 5a, 5b and 5c are plan views illustrating the mounting sequence of a part of the cartridge of Figure 4,
- Figures 6a, 6b and 6c are sections according to the lines VI-VI of Figures 5a, 5b and 5c,
- Figures 7a, 7b and 7c are perspective views of a part of the cartridge of Figure 4 during the mounting sequence, and
- Figures 8a, 8b and 8c are details in enlarged scale of the part indicated by the arrow VIII in Figures 6a, 6b and 6c.

[0010] With reference to Figures 1 through 3, the number 10 designates a first embodiment of a filter cartridge according to the present invention. The cartridge 10 comprises a particle filter 12, a cap 14 and an intermediate section 16 with elongated shape which extends between the cap 14 and the filter 12.

[0011] With reference to Figure 3, the cartridge 10 comprises a support body 18 constituted by an injection moulded monolithic element of plastic material. The support body 18 comprises at an end a support section of the filter 20 whereon is applied a net 24 forming a cylindrical filtering surface. The net 24 is fastened to the support structure of the filter 20, preferably by means of heat sealing. The support structure of the filter 20 comprises an annular sealing element 26 which comes in sealing contact against the inner wall of the container of the filter. The support structure 18 comprises the intermediate section 16 which is preferably formed by a semi-cylindrical wall 28 able to receive a permeable bag 30 containing dehydrator material. The semi-cylindrical wall 28 is preferably provided with two integral clips 32 whose purpose is to hold the bag 30 as shown in Figure 2. The support structure 18 further comprises, at the opposite end relative to the support section of the filter 20, a coupling section 34 whereto is fastened the cap 14 in the manner described below.

[0012] With reference to Figures 1 and 2, the cartridge 10 comprises a body of the cap 36 of injection moulded plastic material fastened to the coupling section 34 by means of a bayonet coupling. The body of the cap 36 has two cylindrical surfaces with different diameter. On the cylindrical surface with smaller diameter is inserted an o-ring 38. The surface with greater diameter 40 forms a first radial shoulder for retaining the o-ring 38. A second radial shoulder for retaining the o-ring is formed by a front surface 42 of the coupling section 34. The body of the cap 36 is provided with two axially projecting integral teeth which establish a bayonet coupling with cor-

responding openings 44 of the coupling section 34. The manner in which the bayonet coupling is obtained between the body of the cap 36 and the coupling section 34 will be described hereafter with reference to a second embodiment of the present invention.

[0013] Figure 4 shows a second embodiment of a filter cartridge according to the present invention. The details corresponding to those described above are designated by the same numeric references. In this second embodiment, the filter cartridge 10 comprises only the filter 12 and the cap 14. With respect to the version described above, there is no intermediate section 16 bearing the bag of dehydrator material.

[0014] The filter 12 comprises a support structure of the filter 20 formed by a monolithic element made of injection moulded plastic material, including an annular sealing element 26 and a coupling section 34. A net of plastic material 24 is fastened on the support structure of the filter 20 which forms a cylindrical filtering surface, coaxial to the axis of the cartridge.

[0015] In this second variant, the cap 14 of the cartridge 10 comprises two coaxial sealing o-rings, axially distanced from each other. This second variant of the cartridge 10 could be provided with a single o-ring as in the case described above. Similarly, the cartridge described with reference to Figures 1 through 3 could be provided with one or two sealing o-rings.

[0016] The body of the cap 36 comprises two cylindrical surfaces 44 with equal diameter separated from each other by a shoulder 46 having two radial walls 48 which delimit the respective cylindrical surfaces 44.

[0017] The body of the cap 36 is provided with a first pair of coupling teeth 50 which project from a first planar surface 52, and with a second pair of coupling teeth 54 which project from a second planar surface 56. The first pair of teeth 50 establishes a bayonet coupling with the coupling section 34 and the second pair of teeth 54 establishes a bayonet coupling with a shoulder body 58. The coupling section 34 has a front wall 60 facing the radial wall 48 of the shoulder 46. The shoulder body 58 has a front wall 62 facing the other radial wall 48 of the shoulder 46. A first seat with U shaped cross section is defined between the radial walls 48, 60 and the segment of the cylindrical surface 44 included between said radial walls. Similarly, a second seat for the second o-ring 38 is defined between the radial walls 48 and 62 and the corresponding portion of cylindrical surface 44.

[0018] The body of the cap 36 is also provided with a projection 64 which extends from the planar surface 56 and is provided with a transverse hole 66 usable to extract the cartridge 10.

[0019] Figures 6 through 8 show the manner in which the bayonet coupling is achieved between the body of the cap 36 and the shoulder body 58.

[0020] The bayonet coupling is achieved in similar fashion between the body of the cap 36 and the coupling section 34. In the case of cartridge with a single o-ring, only the bayonet coupling between the body of the cap

36 and the coupling section 34 is provided.

[0021] With reference to Figures 5a, 6a, 7a and 8a, the shoulder body 58 has an opening 68 with a radial projection 70 having a first radial wall 72, a second radial wall 74 and a tangential wall 76. Each tooth 54 has a radial surface 78 and a tangential surface 80.

[0022] As shown in particular in Figures 5a, 5b, 5c, on the tangential wall 76 of the projection 70 are formed two arresting ramps 82 which serve the arresting and checking function for the bayonet coupling.

[0023] With reference to Figures 5a, 6a, 7a and 8a, in the position of insertion the teeth 54 have a certain play relative to the projection 70 both in the axial direction (distance between the walls 78 and 72 in Figure 8a) and in the tangential direction (distance between the walls 76 and 80). The teeth 54 pass into the opening through the projection 74 only with a very slight interference which causes no substantial deformation of the teeth.

[0024] In the subsequent step, shown in Figures 5b, 6b, 7b and 8b, the body of the cap 36 is rotated counterclockwise relative to the shoulder body 58. These figures show an intermediate position of the mounting in which the teeth 54 are in correspondence with the ramps 82. The thickness of the projection 70 (distance between the walls 71, 74) progressively grows counterclockwise. Comparing Figures 8a and 8b, it can be noted that during the relative rotation between the body of the cap 36 and the shoulder body 58 both the tangential play and the axial play are progressively reduced.

[0025] Figures 5c, 6c, 7c and 8c show the position of the components once the mounting operation is complete. The teeth 54 have overtaken the respective check ramps 82 and are locked against the rotation between the arresting surfaces of the ramps 82 and the bottom surfaces of the opening 68. As shown in particular in Figure 8c, in the completely mounted position the play in the axial direction is completely eliminated. There is a slight interference between the surfaces 78-72 and 56-74, so the shoulder body 58 is fastened in stable fashion and without play to the body of the cap 36.

[0026] As stated above, the cartridge according to the invention can be provided with a single o-ring. In this case, a single bayonet coupling is provided between the body of the cap 36 and the monolithic body bearing the filter. If instead the cap 14 is provided with two o-rings, two bayonet couplings are provided as shown in Figure 4. Both in the version with one o-ring, and in the version with two o-rings, the cartridge can be of the type with extension between the filter and the cap (Figures 1-3) or of the type in which the filter is immediately adjacent to the cap.

Claims

1. A filter cartridge for air conditioning systems for vehicles, comprising a particle filter (12) borne by a support structure made of plastic material (18, 20),

and a cap (14) provided with at least one sealing o-ring (38),

characterised in that the cap (14) comprises a body (36) made of injection moulded plastic material fastened to the support structure of the filter (18, 20) by means of a bayonet coupling (50, 68), the body of the cap (36) having at least one annular seat with substantially U shaped cross section in which is housed said o-ring (38), said annular seat comprising a bottom wall (44), a first radial wall (48) and a second radial wall (60), at least one of said radial walls (60) being formed on the support body of the filter (18, 20).

2. A filter cartridge as claimed in claim 1, **characterised in that** the support body of the filter (18, 20) has a coupling section (34) provided with at least one opening able to receive a pair of teeth (50) of the body of the cap (36).
3. A filter cartridge as claimed in claim 2, **characterised in that** the coupling section (34) has a front surface (60) forming the wall of said seat of the o-ring (38).
4. A filter cartridge as claimed in claim 2, **characterised in that** said teeth (54) engage a projection (70) provided with at least one check ramp (82).
5. A filter cartridge as claimed in claim 4, **characterised in that** said projection (70) has a progressively growing thickness in the direction of coupling of the bayonet coupling to establish a condition of final coupling that is substantially free of play.
6. A filter cartridge as claimed in claim 1, **characterised in that** the body of the cap (36) is provided with a second bayonet coupling for fastening a shoulder body (58) having a surface (62) which defines a radial wall for a second o-ring seat (38).
7. A filter cartridge as claimed in claim 1, **characterised in that** it comprises an intermediate section (16) between the cap (14) and the filter (12), said intermediate section being shaped in such a way as to receive a bag (30) containing dehydrator material.
8. A filter cartridge as claimed in claim 7, **characterised in that** the intermediate section (16) is provided with a pair of integral clips (32) able to hold said bag (30).

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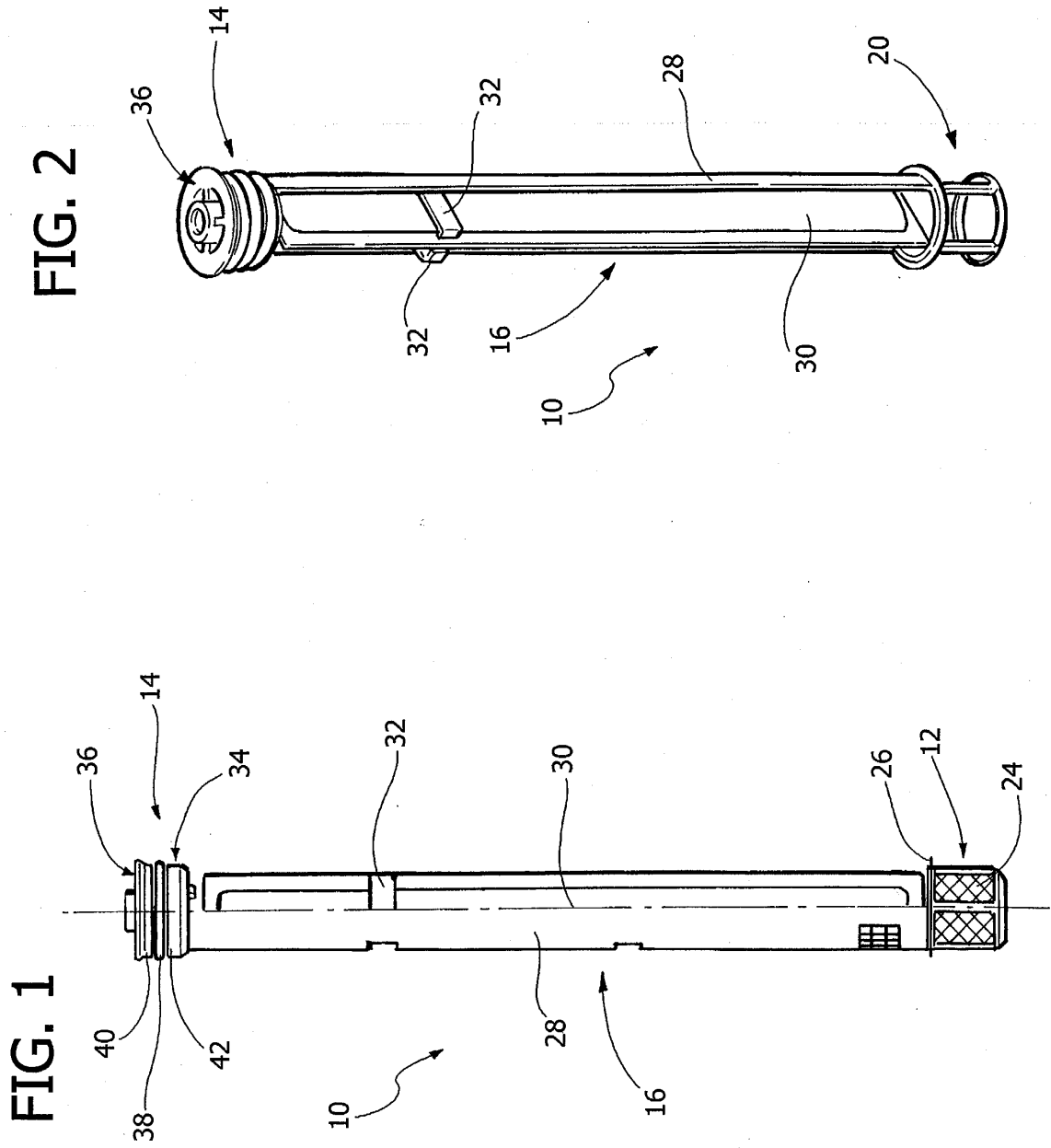


FIG. 3

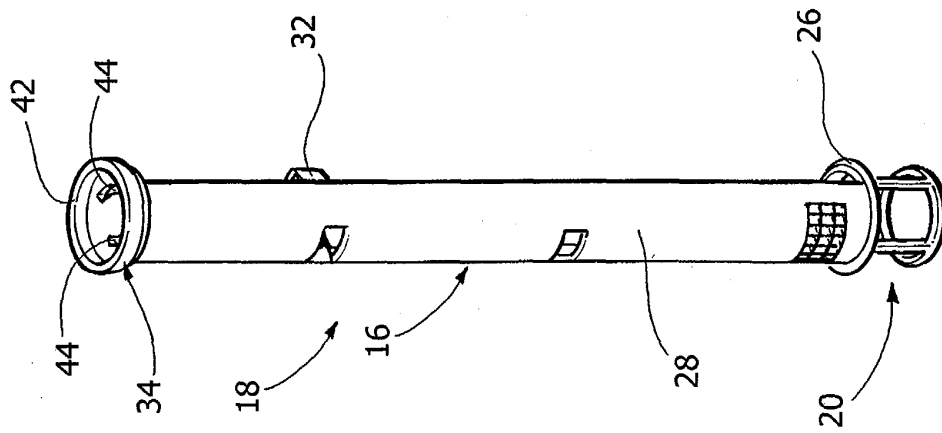


FIG. 4

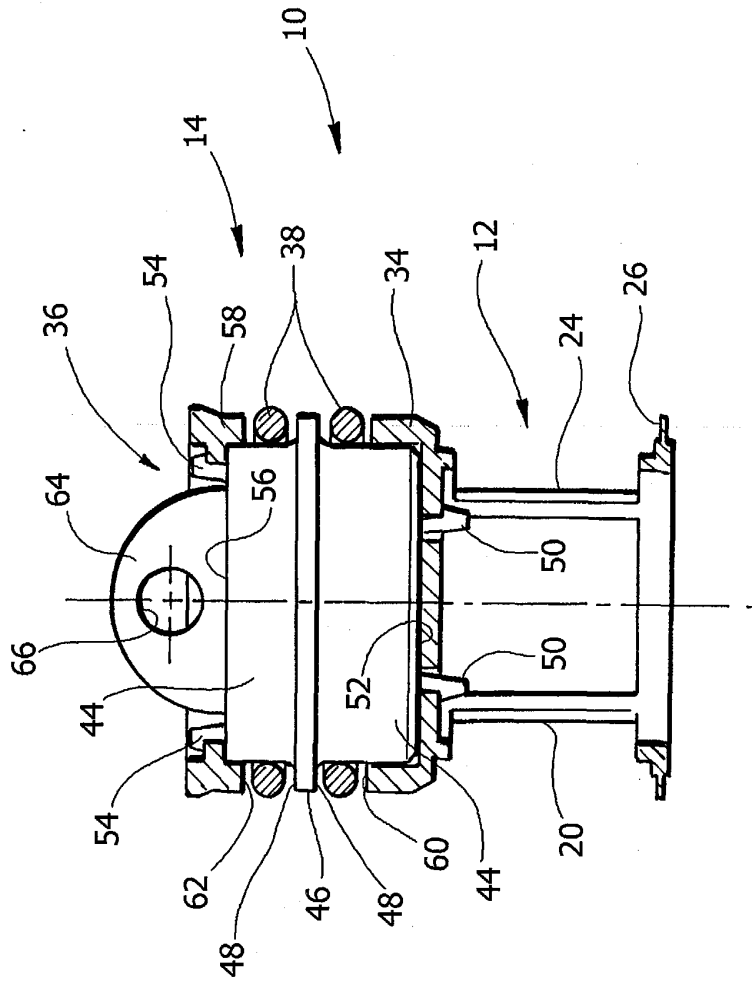


FIG. 5B

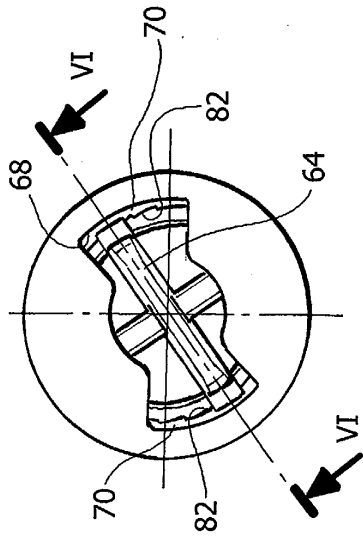


FIG. 6B

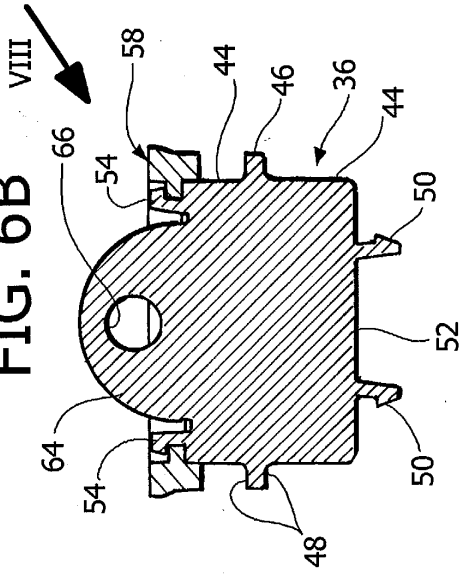


FIG. 7B

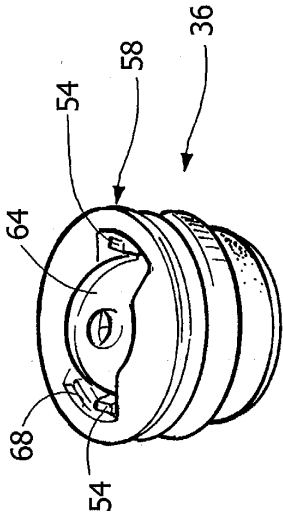
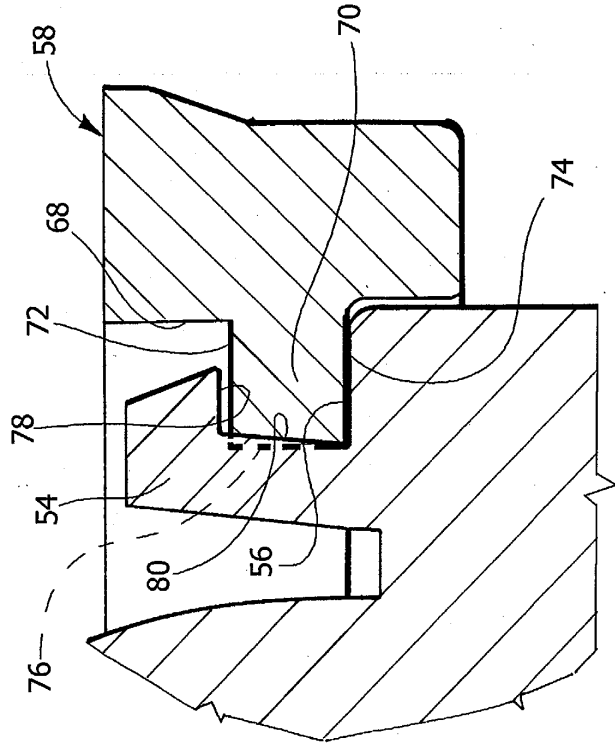
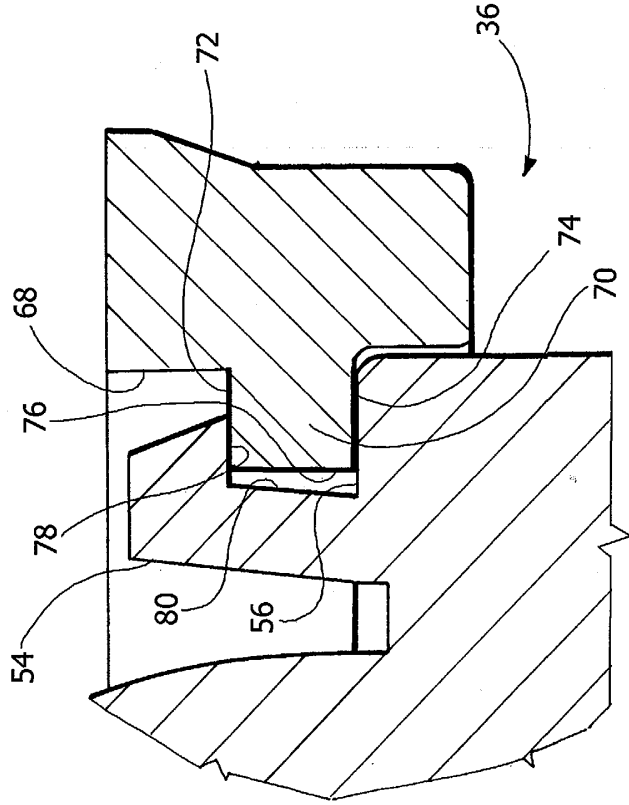
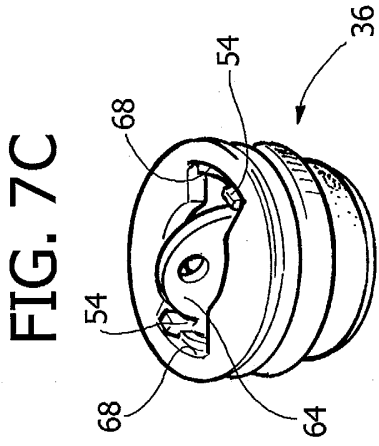
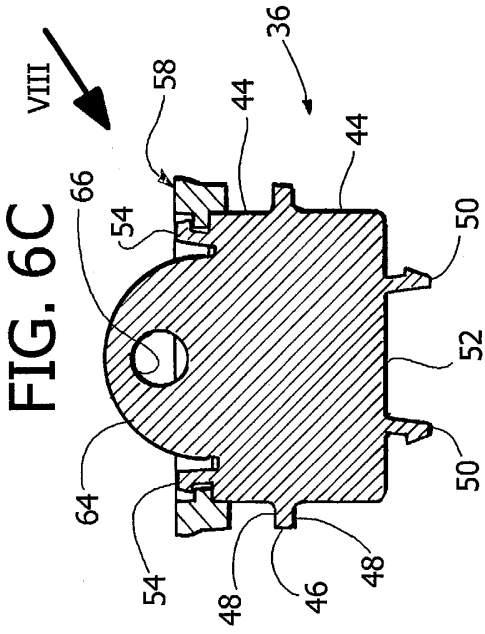
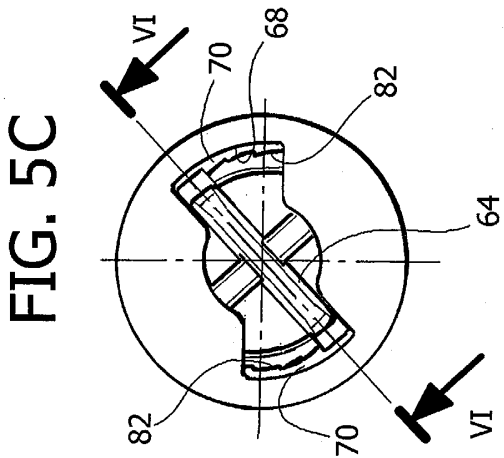


FIG. 8B







DOCUMENTS CONSIDERED TO BE RELEVANT			
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			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			B01D B60H F25B
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		12 August 2004	Hilt, D
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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 04 42 5203

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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12-08-2004

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82