



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
10/25/2006 Bulletin 2006/43

(51) Int Cl.:
B01D 29/21^(2006.01) B01D 35/153^(2006.01)

(21) Application number: **06290584.9**

(22) Date of filing: **04/11/2006**

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

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(30) Priority: **04/20/2005 FR 0503960**

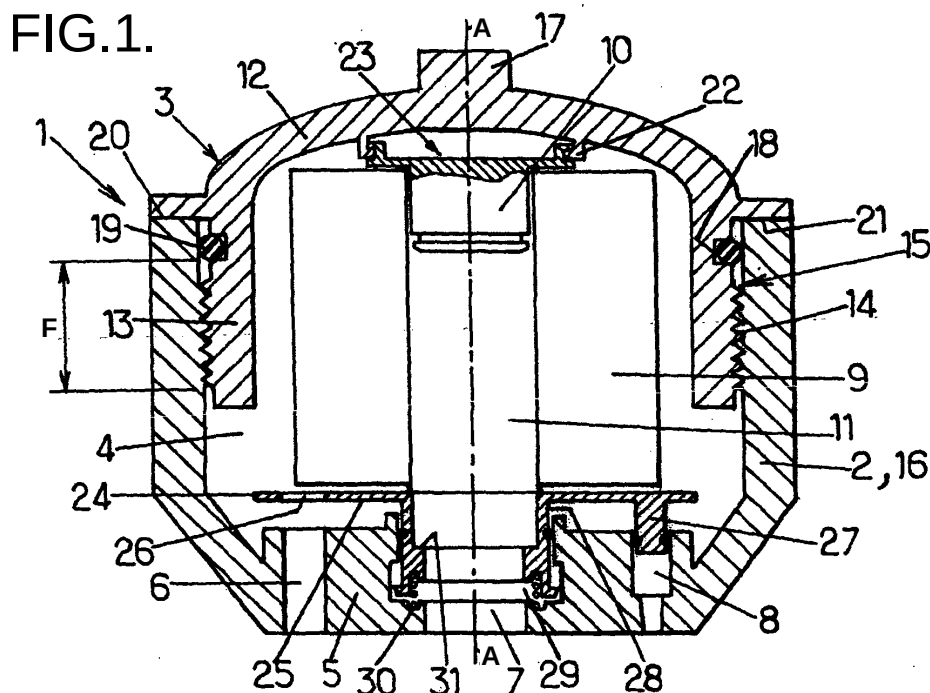
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Remarks:
Claims amended in accordance with Rule 86 (2)
EPC.

(54) **Self-draining oil filter**

(57) Oil filter defining a filtration chamber (4) in which a filter insert (9) is housed, comprising a tank (2) and a removable cover (3), a filter insert (9) defining an inner space in communication with a drain pipe (7) for the filtered oil and an outer space in communication with an inlet pipe (6) for oil to be filtered, a drain channel (8) that is closed when the cover (3) is in the mounted position, this drain channel (8) being opened by removing the cover

(2), a plate (24) provided with a tubular part (28) sliding along the axis of the drain pipe (7) for the filtered oil, this plate (24) comprising a protrusion (27) sliding along the axis of the drain channel (8), the tubular part (28) and the protrusion (27) sliding simultaneously when the cover (3) is fitted or removed, with the drain channel (8) closing and opening when the protrusion (27) slides along the axis of the drain channel (8).



Description

[0001] The present invention relates to the technical field of oil filters for internal combustion engines.

[0002] When an operator wants to change a filter element, he should not get splattered with oil and the oil should not leak onto the outer walls of the filter housing and onto the other engine components.

[0003] Moreover, a minimum amount of oil should be lost when changing a filter element.

[0004] Protecting the environment also means ensuring that changing a filter element does not result in the disposal of a large amount of material and that the material discarded when changing the filter can be recycled and/or reused before being disposed of as end waste.

[0005] Conventional filter elements are ring-shaped cartridges containing pleated filter paper or similar material, often mounted on a rigid cylindrical holder.

[0006] The oil to be filtered is fed against the pleated paper and passes through this filter wall.

[0007] The filtered oil drains into the hollow space defined by the cartridge holder, which is provided with holes for this purpose.

[0008] The cartridge is conventionally housed in a crankcase or housing comprising a tank and a cover removably attached to this tank, typically by screwing, with sealing means ensuring that the cover is tightly fitted to the tank.

[0009] There are known means in the prior art for draining the housing when changing the filter cartridge.

[0010] According to a first type of design, draining is carried out axially: in this design, the drain channel is positioned as an extension of the filtered oil drain pipe.

[0011] The idea of axially draining an oil filter when changing the cartridge is in itself common knowledge and is illustrated, for example, in document GB 1 502 469, which provides for draining through an axial pin fastening the cover to the tank of the filter housing.

[0012] An example of this first type of design can be found in the applicant's document FR 2 834 650, which describes an oil filter comprising a cylindrical tank with a vertical axis of rotation, onto which a cover is screwed, thereby defining a filtration chamber into which the oil to be filtered is fed through an eccentric pipe, the axial outlet channel for the filtered oil communicating with the drain channel.

[0013] Resilient means are placed between the cover and the filter cartridge made of paper pleated in a zigzag pattern or other similar material.

[0014] The filter cartridge has an annular upper flange and an annular lower flange.

[0015] When the cover is screwed onto the tank, the resilient means, such as a spiral spring, exert an axial stress on the upper flange of the filter cartridge, towards the bottom of the tank.

5 [0016] The first, upper annular part of a piece known as a cap bears against the lower flange of the filter cartridge. This cap comprises a second lower part in the form of a cross-sectional rod, slidably mounted in the axial drain pipe for the filtered oil.

10 [0017] When the cover is screwed on or off, the cap slides between two end positions. A first, closing end position is reached when the cover is in the screwed on position on the tank. The cap is then in the lower operating position of the filter and forms a closing plug
15 for the orifice connecting the filtered oil outlet channel and the drain channel. The cap reaches its second end position when the cover is removed. The cap, which is no longer held in place by the filter cartridge, is permanently pushed by a second resilient means, for example a spiral spring, towards its upper position
20 opening the drain channel orifice. The remaining oil in the housing thus flows naturally through the axial drain pipe and runs through the drain channel.

[0018] It should be noted that the cap remains
25 permanently inside the housing. Indeed, when the cap is pushed upwards by the second resilient means, the cap is provided in its second lower part with resilient prongs that abut against a rigid inner flange extending radially into the axial drain pipe.

30 [0019] In its lower operating position in the filter, the cap also creates a seal between the inlet for oil to be filtered and the axial drain channel for the filtered oil. It is therefore unnecessary to provide for an additional seal to ensure radial tightness between the cap and the
35 tank, as the cap is provided with an elastically-deformable flange that bears against an annular protrusion on the bottom of the tank when the cover is screwed onto the tank.

[0020] This first type of axial self-draining design is also described in the applicant's document EP 1 106 795, which also describes a cap that slides axially
40 between two end positions.

[0021] Since the cap remains attached inside the tank, removing the cover requires very little space above the
45 tank. In one variant embodiment, the cap is clipped onto the filter insert, such that removing this insert causes the cap to rise to its second, highest end position.

[0022] In the embodiment in document FR 2 816 985, also by the applicant, the cap remains attached to the
50 filter insert when the insert is changed. See also document EP 612 549.

[0023] Document WO 02/11854 describes an assembly much like the one described in document EP 1 137 470; however, the outlet pin is not spring-loaded to assume its open position but is moved by sliding, before abutment, by snapping onto the filter support, in a way that is altogether similar to the assembly disclosed by the applicant in document EP 1 106 795.

[0024] According to a second type of self-draining filter housing design, when the filter cartridge is changed, draining is described as off-center, as the drain channel is not in communication with the axial drain pipe for the filtered oil.

[0025] Self-draining takes place when the cartridge is changed, via a non-axial valve held in the closed position by pressure applied from the cartridge by a spring placed between the filter cover and the cartridge. This action is already common knowledge and is described, for example, in document FR 2 566 045.

[0026] Many earlier patent documents describe filters with off-center draining. See, for example, documents EP 314 915, EP 421 080, EP 1 210 164, WO 98/32517, US 4 906 365, US 6 572 768, DE 3 933 794, DE 29 815 023 U.

[0027] The invention relates more specifically to an oil filter for internal combustion engines provided with means of self-draining when the insert is changed, of the second type described above.

[0028] The applicant has focused on providing an oil filter for internal combustion engines with a structure that is simpler and less costly than existing filters and that enables quick, clean draining, even when the filter is steeply inclined.

[0029] To these ends, the invention relates, according to a first aspect, to an oil filter, in particular for internal combustion engines in motor vehicles, this filter defining a filtration chamber in which a filter insert is housed, the filtration chamber being in fluid communication with an inlet pipe for oil to be filtered and a drain pipe for the filtered oil, this filter comprising a tank and a removable cover on this tank, the filter insert defining, in its active filtration position in the filtration chamber, an inner space and an outer space, the inner space being in fluid communication with a drain pipe for the filtered oil and the outer space being in fluid communication with the inlet pipe for oil to be filtered, a drain channel that is closed when the cover is in the mounted position on the tank, this drain channel being opened by unscrewing the cover, this filter comprising a plate provided with a tubular part sliding along the axis of the drain pipe for the filtered oil, this plate further comprising a protrusion sliding along the axis of the drain channel, the tubular part and the protrusion sliding simultaneously when the cover is fitted on or removed from the tank, the sliding of the protrusion along the axis of the drain channel closing this channel when the cover is in the position in which it closes the chamber, and opening this drain channel when the cover is removed from the tank.

[0030] According to the various embodiments, the filter has the following characteristics, which may be combined where applicable.

5 [0031] The plate is permanently mounted in the tank, and will therefore not be among the pieces removed when the filter insert is changed.

10 [0032] For example, when the cover is removed from the tank, the plate abuts against a bearing edge on the tank. To this end, the plate comprises, in one embodiment, protrusions on its sliding tubular part, these protrusions bearing against said edge of the tank. In one particular embodiment, said protrusions are external and substantially radial to the sliding tubular part and abut against said edge of the tank when the cover is removed from the tank. In another embodiment, a piece attached to the tank forms said bearing edge. For example, said attached piece is press-fitted into the tank and has an angled longitudinal section.

15 [0033] Advantageously, the filter includes means for preventing the plate from rotating around the slide axis in the filtered oil drain channel on the tubular part when the cover is removed from the tank. This thereby ensures that the protrusion that is to slide into the drain channel is always in the correct position relative to the channel.

20 [0034] In one embodiment, said plate rotation prevention means comprise walls fitted on the sliding protrusion in the drain channel, these walls remaining at least partially inside the drain channel when the cover is removed from the tank, these walls not preventing draining. Said walls impart, for example, a cruciform cross-section to the sliding protrusion in the drain channel.

25 [0035] The filter has the following additional characteristics, which may be combined where applicable:

- the drain channel and the drain pipe for the treated oil are substantially parallel;
- 40 – the drain pipe for the treated oil is substantially axial, meaning that it extends along the axis of rotation of the filter insert;
- the filter comprises a by-pass clip-mounted under the cover, the filter insert being pushed against the plate by the by-pass when the cover is in the mounted position on the tank.
- 45 – no resilient means are placed between the by-pass and the filter insert, but resilient means slide the plate relative to the tank when the cover is removed, these resilient means being permanently mounted in the tank;
- 50 – the sliding protrusion in the drain channel is provided with axial or radial sealing means.

55 [0036] Further purposes and advantages of the invention will become apparent from the following description of embodiments, which will be described with reference to the appended drawings in which:

- Figure 1 is a schematic longitudinal cross-sectional view of a filter according to one embodiment of the invention, with the cover in the closed position;
- Figure 2 is a figure similar to Figure 1, with the cover in the open position;
- Figure 3 is a top view of the closing plate, with a dotted line showing a variant embodiment of the closing plate;
- Figures 4 and 5 are views of sealing means arranged on the closing plate;
- Figure 6 is a schematic view of a variant embodiment;
- Figure 7 is a longitudinal cross-sectional view of a filter according to another embodiment of the invention;
- Figure 8 is a detailed view of the filter shown in Figure 7, with the drain channel in the closed position;
- Figure 9 is a figure similar to Figure 8, with the drain channel in the open position;
- Figure 10 is a detailed longitudinal cross-sectional view of the drain channel of a filter as shown in Figures 7 to 9.

[0037] We first refer to Figures 1 and 2, which show a non-limiting exemplary embodiment of the invention.

[0038] The oil filter 1 shown in these figures comprises a tank 2 and a cover 3, defining a filtration chamber 4.

[0039] The tank 2 comprises a bottom part 5 through which three through-holes are formed, defining an inlet pipe 6 for oil to be filtered, a drain pipe 7 for the filtered oil, and a drain channel 8 for draining the oil remaining in the chamber 4 when the filter insert 9 is changed.

[0040] In the embodiment shown, the three through-holes defining the pipes 6, 7 and the channel 8 are substantially parallel, with the filtered oil drain pipe 7 being axial.

[0041] The term “axial” is used here to refer to the rotational symmetries of the parts around an axis AA as seen in Figure 1:

- the filter insert 9, for example made of paper folded in a zigzag pattern;
- the jumper/by-pass valve assembly 10 bearing on the upper part of the filter insert 9 and extending into the axial inner space 11 formed by this filter insert 9;
- the cover 3 which comprises a domed upper part 12 extended by an annular skirt 13 provided with an external thread 14 that matches an internal thread 15 of the annular skirt 16 of the tank 2.

[0042] It is understood here that the cover could be provided with an internal thread that matches an external thread of the tank's annular skirt.

- 5 **[0043]** In a manner known per se, the external protrusion of the cover 3 has, for example, a hexagonal shape 17, making it easier to screw/unscrew the cover 3 onto and off of the tank 2.

- 10 **[0044]** The cover 3 is provided, on its annular skirt 13, with an outer groove 18 housing a gasket 19. When the cover 3 is in the screwed-on position on the tank 2, this groove 18 housing the gasket 19 is positioned at a height comprised between the threaded area F of the cover and tank and the annular abutment 20 of a protrusion 21 on the cover 3 against the upper edge of the tank skirt 16.

[0045] In this way, the closing position of the cover 3 on the tank is perfectly determined.

- 20 **[0046]** When the cover 3 is fully screwed onto the tank 2, the gasket 19 is positioned at a short distance from the upper edge of the skirt 16 of the tank 2. The point at which the filtration chamber 4 is vented when the cover 3 is unscrewed is thus predetermined.

- 25 **[0047]** On its inner side, the cover 3 is provided with means 22 for fastening the jumper/by-pass 10 assembly, for example by clipping. These means 22 are themselves common knowledge and will not be described in detail herein.

- 30 **[0048]** It should be noted that, unlike conventional assemblies, no resilient means are required in the space 23 delimited by the cover 3 and the jumper/by-pass 10 assembly. This results in fewer parts and a simplified structure.

- 35 **[0049]** In addition, the absence of any resilient means eliminates any dead travel of the cover relative to plate 24. In fact, in accordance with the present invention, the compression spring 29 presses the plate 24 against the filter element 9, which itself bears axially against the jumper/by-pass assembly, which is in direct contact with the cover.

- 40 **[0050]** As a result, the plate begins to move as soon as the cover is unscrewed, and the plate 24 has the same axial displacement amplitude as the cover. Thus, 45 the protrusion 27 which extends axially from the plate 24 to close the drain channel 8 begins to move as soon as the cover 24 is unscrewed and also undergoes the same axial displacement as the cover, enabling the drain channel to be quickly opened when the cover is 50 unscrewed.

- 55 **[0051]** In conventional assemblies using a resilient element between the cover and the filter element to press said filter element against the bottom of the tank, the axial travel of the cover is divided into two parts. As the cover is first unscrewed, the first part of the cover's travel is dead travel since it does not enable any axial displacement of the filter element and of the drain cap, which bears directly or indirectly on the filter element.

The second part of the travel is active travel, as it generates axial displacement of the filter element and the cap to open the drain channel. The transition from dead travel to active travel of the cover takes place when the cover, by means of an axial stop, contacts the filter element and pulls on it. In conventional assemblies, opening the drain channel is therefore delayed by the dead travel of the cover.

[0052] When the cover is in the closed position, as shown in Figure 1, the plate 24 exerts, through the compression spring 29, an axial force on the filter element 9 to press it axially against the jumper/by-pass assembly, which is itself in axial abutment with the cover. In the absence of a jumper/by-pass assembly, the filter element would be pressed axially by plate 24 directly on the cover.

[0053] The axial force exerted by the plate 24 on the filter insert 9 against the jumper 10 guarantees the seals between the plate 24 and the filter insert 9 on one hand, and between the by-pass jumper and the filter insert 9 on the other.

[0054] The sealing means used to obtain the seals between the plate 24 and the filter insert 9 on one hand, and between the by-pass jumper and the filter insert 9 on the other hand, can be, for example:

- elastomer O-rings;
- annular felt gaskets made of non-woven material, welded or bonded to the radial sides of the flanges, or even;
- annular hot-melt beads protruding axially from the radial sides of the flanges as described in patent application EP 1 312 405 A1, said beads being produced when the flanges are manufactured. As a result of the axial force exerted by the plate 24 on the filter insert 9 and the stresses thus generated, the annular beads creep when hot (oil temperature), one against the plate 24 and the other against the by-pass jumper. The creep of the annular beads makes it possible to obtain perfect sealing.

[0055] The plate 24 has a substantially flat upper part 25, against which the filter insert 9 abuts when the cover 3 is in the screwed-on position.

[0056] A through hole 26 is formed in this upper part 25, opposite the axis of the inlet pipe 6 for oil to be filtered.

[0057] Facing the drain channel 8 and sliding in this drain channel 8, the plate 24 is provided with a protrusion 27 provided with sealing means, the structure of which will be described in detail below by reference to Figures 4 and 5. For the moment, it is merely stated that these means can be radial or axial seals.

[0058] The plate 24 is also provided with a tubular protrusion 28 which slides into the drain pipe 7 for the filtered oil. This sliding takes place between two end positions, namely a first position in which the drain channel 8 is closed, shown in Figure 1, and a second position in which the drain channel 8 is open, shown in Figure 2.

[0059] An annular gasket provides an outer seal between the tubular part 28 and the wall of the drain pipe 7.

[0060] Resilient means, such as a spiral compression spring 29, have their opposite ends housed respectively in an annular groove 30 in the tank 2, and an annular groove 31 arranged opposite the groove 30, in the tubular part 28 of the plate 24.

[0061] These resilient means 29 permanently press the plate 24 towards the filter insert 9. It should be noted that, when the filter insert 9 is changed, the plate 24 remains in the tank 2, with radial hooks 32 on the tubular part 28 coming into abutment, in the second position of the plate 24, against one edge 33 of the tank 2.

[0062] Once the cover 3 has begun to unscrew, a short axial travel of the cover 3 is sufficient for the gasket 19 to reach the top of the abutment 20, the matching threads 14, 15 being at an axial height such that the cover 3 is not yet completely unscrewed from the tank 2. The filtration chamber is thus vented before the cover 3 can be removed from the filter 1.

[0063] It should be noted that the drain channel is opened shortly before, or at substantially the same time as, the filtration chamber is vented. Unscrewing by just a few turns can be sufficient to open the drain channel 8. Draining thus starts very quickly and before the cover 3 is completely unscrewed, the volume of oil contained in the filtration chamber is completely drained off. As a result, when the filter insert 9 is removed, the risks of oil splashing onto the operator and of oil leaking onto the outer walls of the filter housing and onto the other engine components are considerably reduced.

[0064] The resilient means, such as a compression spring 29, have the dual function of ensuring the movement of the plate 24 while the cover 3 is being unscrewed and of pressing this plate 24 firmly against the filter insert 9 when the cover 3 is in the screwed-on position on the tank 2.

[0065] In an advantageous embodiment, the cover 3, the tank 2 and the plate 24 are made of plastic or composite material.

[0066] We now refer to Figure 3. The solid lines in Figure 3 correspond to the contours of the plate 24 as used in the embodiments shown in Figures 1 and 2.

[0067] In the variant shown as a dotted line in Figure 3, the plate 24 comprises a flat upper part 34 that is smaller in size than in the embodiment shown in Figures 1 to 3.

[0068] In certain embodiments, the plate 24 is provided with means 37 to prevent it from pivoting inside the chamber 4 when the cover 3 is unscrewed.

[0069] These means are, for example, crosspieces 37 placed on the protrusion 27, as schematically depicted in Figures 5 and 6, these crosspieces 37 remaining housed in the drain channel 8, when the plate 24 is at its uppermost open position, with the oil being easily able to flow between these crosspieces to drain into the drain channel 8.

[0070] We now refer to Figures 4 and 5.

[0071] In a first embodiment, the plate 24 is provided with radial sealing means 35 mounted on the protrusion 27 sliding in the drain channel 8. For example, an O-ring is fitted in an annular groove of this protrusion 27. It should be noted that this protrusion 27 can be solid or have a cruciform cross-section, as shown in Figure 4.

[0072] In a second embodiment, the plate 24 is provided with radial and axial sealing means 36, the lower part of the protrusion 27 having a cruciform cross-section 37 as described above, this section 37 preventing the plate 24 from rotating, around the axis AA, when changing the filter insert 9. A flexible sealing lip 36 can therefore be mounted on the protrusion 27 so as to abut the bottom wall 38 of the tank, around the drain channel 8.

[0073] We now refer to Figure 6.

[0074] In this particular embodiment, an annular piece 39 is press-fitted into the tank 2, this piece 39 having, in longitudinal cross-section, an angled shape forming a radial stop against which the plate 24 abuts in its second position. It should be noted that, in this embodiment shown in Figure 6, when the cover 3 is in the unscrewed position, the plate abuts against an annular protrusion 40 on the tank 2, this protrusion 40 bordering the drain pipe 7 for the filtered oil.

[0075] The axial distance between this annular protrusion 40 and the insert 39 is such that the protrusion 27, of the type shown in Figures 4 to 6, remains partly housed in the drain channel 8, when the plate 24 is in the upper position. This avoids the risk of the plate 24 rotating around axis AA when changing the filter insert 9.

[0076] We now refer to Figures 7 to 10.

[0077] Elements common to those already described are designated by the same reference numbers in these Figures 7 to 10, and are not described again.

[0078] As shown in these Figures 7 to 10, the bottom part 5 of the tank 2 is provided with an axial protrusion 50 slidably mounted in a tubular part 28 of the plate 24.

[0079] When the cover 3 is screwed onto the tank 2, the plate 24 abuts against an annular protrusion 40 and the filtered oil flows through the openings 51 in this plate

24 (arrows E in Figure 8).

[0080] The drain channel 8 is closed by the protrusion 27 on the plate 24, as shown in Figures 8 and 10.

[0081] Unscrewing the cover 3 enables the protrusion 27 to slide into the drain channel 8. An annular gasket 52 of elastomer or similar material ensures the seal between the protrusion 27 and the drain channel 8.

[0082] This annular gasket 52 can also be used to compensate for variations in dimensional chains.

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Claims

1. An oil filter, in particular for internal combustion engines in motor vehicles, this filter defining a filtration chamber (4) in which a filter insert (9) is housed, the filtration chamber (4) being in fluid communication with an inlet pipe (6) for oil to be filtered and a drain pipe (7) for the filtered oil, this filter comprising a tank (2) and a removable cover (3) on this tank (2), the filter insert (9) defining, in its active filtration position in the filtration chamber (4), an inner space and an outer space, the inner space (11) being in fluid communication with a drain pipe (7) for the filtered oil and the outer space being in fluid communication with an inlet pipe (6) for oil to be filtered, a drain channel (8) that is closed when the cover (3) is in the mounted position on the tank (2), this drain channel (8) being opened by removing the cover (3), **characterized in that** it comprises a plate (24) provided with a tubular part (28) sliding along the axis of the drain pipe (7) for the filtered oil, this plate (24) further comprising a protrusion (27) sliding along the axis of the drain channel (8), the tubular part (28) and the protrusion (27) sliding simultaneously when the cover (3) is fitted on or removed from the tank (2), the sliding of the protrusion (27) along the axis of the drain channel (8) closing this channel (8) when the cover (3) is in the position in which it closes the chamber (4), and opening this drain channel (8) when the cover (3) is removed from the tank (2).
2. The filter according to claim 1, **characterized in that** the plate (24) is permanently mounted in the tank (2).
3. The filter according to claim 2, **characterized in that** when the cover (3) is removed from the tank (2), the plate (24) abuts against a bearing edge on the tank (2).

4. The filter according to claim 3, **characterized in that** the plate has protrusions on its sliding tubular part (28), these protrusions bearing against said edge of the tank.
5. The filter according to claim 4, **characterized in that** said protrusions are external and substantially radial to the sliding tubular part (28) and abut against said edge of the tank (2) when the cover is removed from the tank (2).
6. The filter according to any one of claims 2 to 5, **characterized in that** a piece (39) attached to the tank (2) forms said bearing edge.
7. The filter according to claim 6, **characterized in that** said attached piece (39) is press-fitted into the tank and has an angled longitudinal section.
8. The filter according to any one of the preceding claims, **characterized in that** it includes means for preventing the plate (24) from rotating around the slide axis in the filtered oil drain channel (7) on the tubular part (28) when the cover (3) is removed from the tank (2).
9. The filter according to claim 8, **characterized in that** said plate (24) rotation prevention means comprise walls fitted on the sliding protrusion (27) in the drain channel (8), these walls remaining at least partially inside the drain channel (8) when the cover (3) is removed from the tank (2), these walls not preventing draining.
10. The filter according to claim 9, **characterized in that** said walls impart a cruciform cross-section to the sliding protrusion (27) in the drain channel.
11. The filter according to any one of the preceding claims, **characterized in that** the drain channel (8) and the drain pipe (7) for the treated oil are substantially parallel.
12. The filter according to claim 11, **characterized in that** the drain pipe (7) for the treated oil is substantially axial, meaning that it extends along the axis of rotation of the filter insert (9).
13. The filter according to any one of the preceding claims, **characterized in that** it comprises a by-pass (10) clip-mounted under the cover (3), the filter insert (9) being pushed against the plate (24) by this by-pass (10) when the cover (3) is in the mounted position on the tank (2).

14. The filter according to claim 13, **characterized in that** no resilient means are placed between the by-pass (10) and the filter insert (9), and **in that** resilient means (29) slide the plate (24) relative to the tank (2) when the cover (3) is removed, these resilient means (29) being permanently mounted in the tank (2).

15. The filter according to any one of the preceding claims, **characterized in that** the sliding protrusion (27) in the drain channel (8) is provided with axial or radial sealing means.

15 Claims amended in accordance with Rule 86(2) EPC.

1. An oil filter, in particular for internal combustion engines in motor vehicles, this filter defining a filtration chamber (4) in which a filter insert (9) is housed, the filtration chamber (4) being in fluid communication with an inlet pipe (6) for oil to be filtered and a drain pipe (7) for the filtered oil, this filter comprising a tank (2) and a removable cover (3) on this tank (2), the filter insert (9) defining, in its active filtration position in the filtration chamber (4), an inner space and an outer space, the inner space (11) being in fluid communication with a drain pipe (7) for the filtered oil and the outer space being in fluid communication with an inlet pipe (6) for oil to be filtered, a drain channel (8) that is closed when the cover (3) is in the mounted position on the tank (2), this drain channel (8) being opened by removing the cover (3), **characterized in that** it comprises a plate (24) that is separate from the filter insert (9) and provided with a tubular part (28) sliding along the axis of the drain pipe (7) for the filtered oil, this plate (24) further comprising a protrusion (27) sliding along the axis of the drain channel (8), the tubular part (28) and the protrusion (27) sliding simultaneously when the cover (3) is fitted on or removed from the tank (2), the sliding of the protrusion (27) along the axis of the drain channel (8) closing this channel (8) when the cover (3) is in the position in which it closes the chamber (4), and opening this drain channel (8) when the cover (3) is removed from the tank (2), **and in that** said plate (24) is permanently mounted in the tank (2).
2. The filter according to claim 1, **characterized in that** when the cover (3) is removed from the tank (2), the plate (24) abuts against a bearing edge on the tank (2).

3. The filter according to claim 2, **characterized in that** the plate has protrusions on its sliding tubular part (28), these protrusions bearing against said edge of the tank.
4. The filter according to claim 3, **characterized in that** said protrusions are external and substantially radial to the sliding tubular part (28) and abut against said edge of the tank (2) when the cover is removed from the tank (2).
5. The filter according to any one of claims 1 to 4, **characterized in that** a piece (39) attached to the tank (2) forms said bearing edge.
6. The filter according to claim 5, **characterized in that** said attached piece (39) is press-fitted into the tank and has an angled longitudinal section.
7. The filter according to any one of the preceding claims, **characterized in that** it includes means for preventing the plate (24) from rotating around the slide axis in the filtered oil drain channel (7) on the tubular part (28) when the cover (3) is removed from the tank (2).
8. The filter according to claim 7, **characterized in that** said plate (24) rotation prevention means comprise walls fitted on the sliding protrusion (27) in the drain channel (8), these walls remaining at least partially inside the drain channel (8) when the cover (3) is removed from the tank (2), these walls not preventing draining.
9. The filter according to claim 8, **characterized in that** said walls impart a cruciform cross-section to the sliding protrusion (27) in the drain channel.
10. The filter according to any one of the preceding claims, **characterized in that** the drain channel (8) and the drain pipe (7) for the treated oil are substantially parallel.
11. The filter according to claim 10, **characterized in that** the drain pipe (7) for the treated oil is substantially axial, meaning that it extends along the axis of rotation of the filter insert (9).
12. The filter according to any one of the preceding claims, **characterized in that** it comprises a by-pass (10) clip-mounted under the cover (3), the filter insert (9) being pushed against the plate (24) by this by-pass (10) when the cover (3) is in the mounted position on the tank (2).

13. The filter according to claim 12, **characterized in that** no resilient means are placed between the by-pass (10) and the filter insert (9), and **in that** resilient means (29) slide the plate (24) relative to the tank (2) when the cover (3) is removed, these resilient means (29) being permanently mounted in the tank (2).
14. The filter according to any one of the preceding claims, **characterized in that** the sliding protrusion (27) in the drain channel (8) is provided with axial or radial sealing means.

FIG.1.

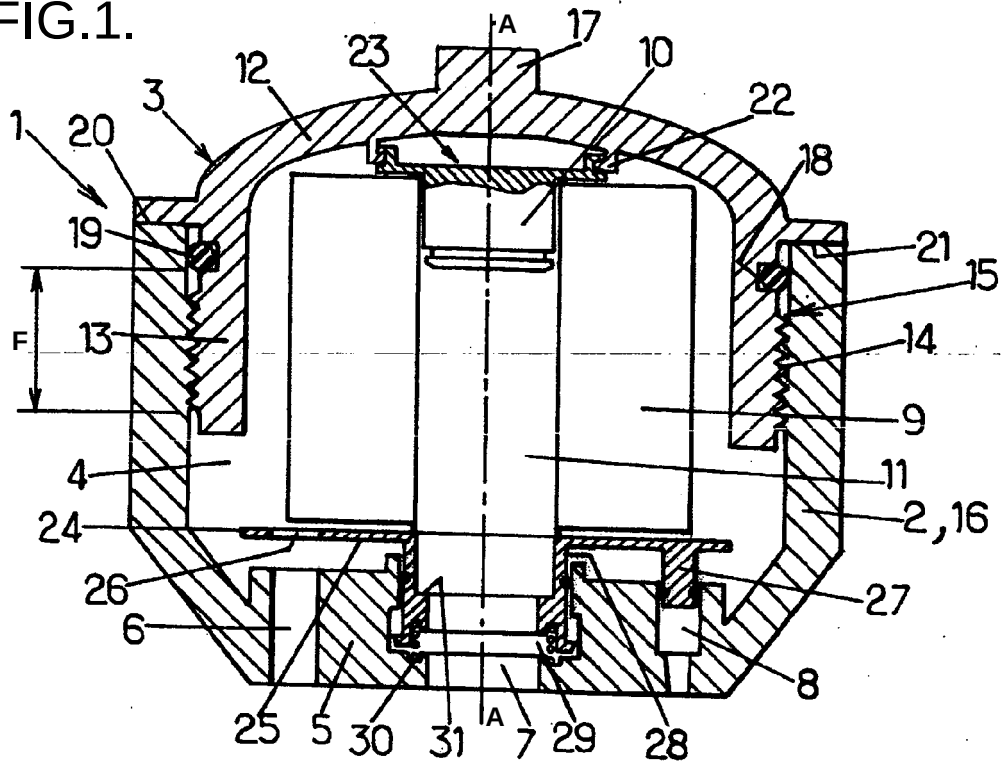
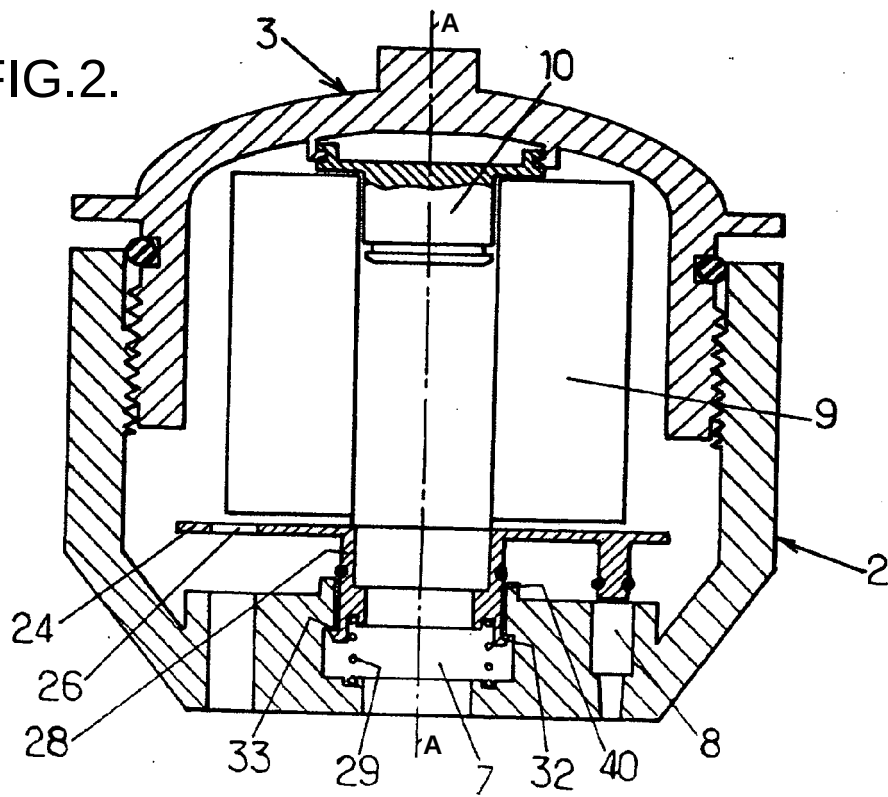


FIG.2.



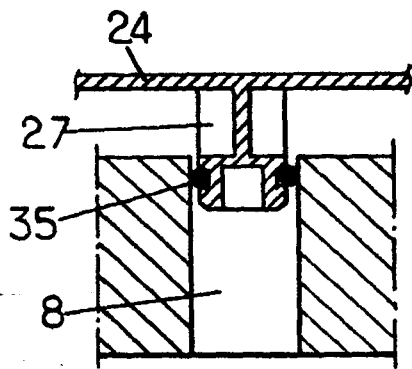
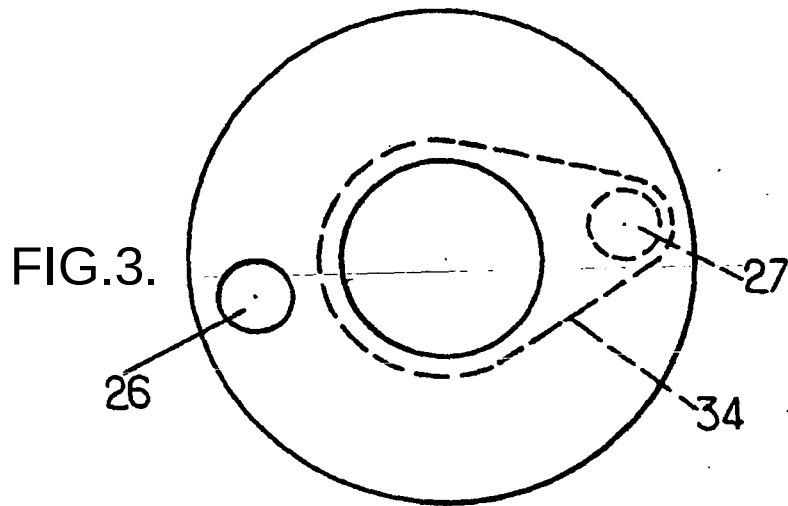


FIG.4.

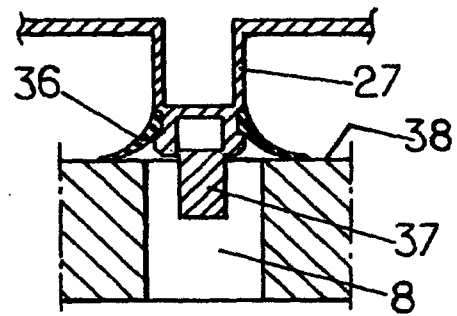


FIG.5.

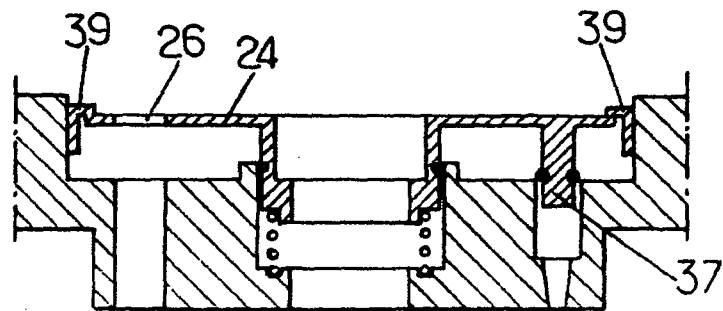


FIG.6.

FIG.10.

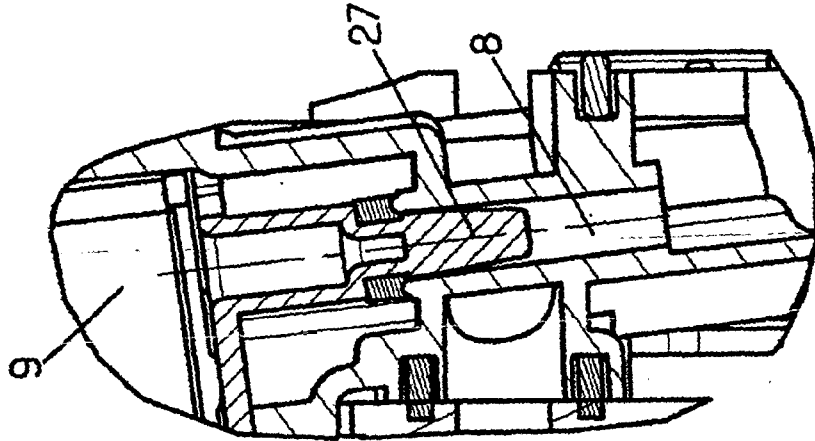


FIG.7.

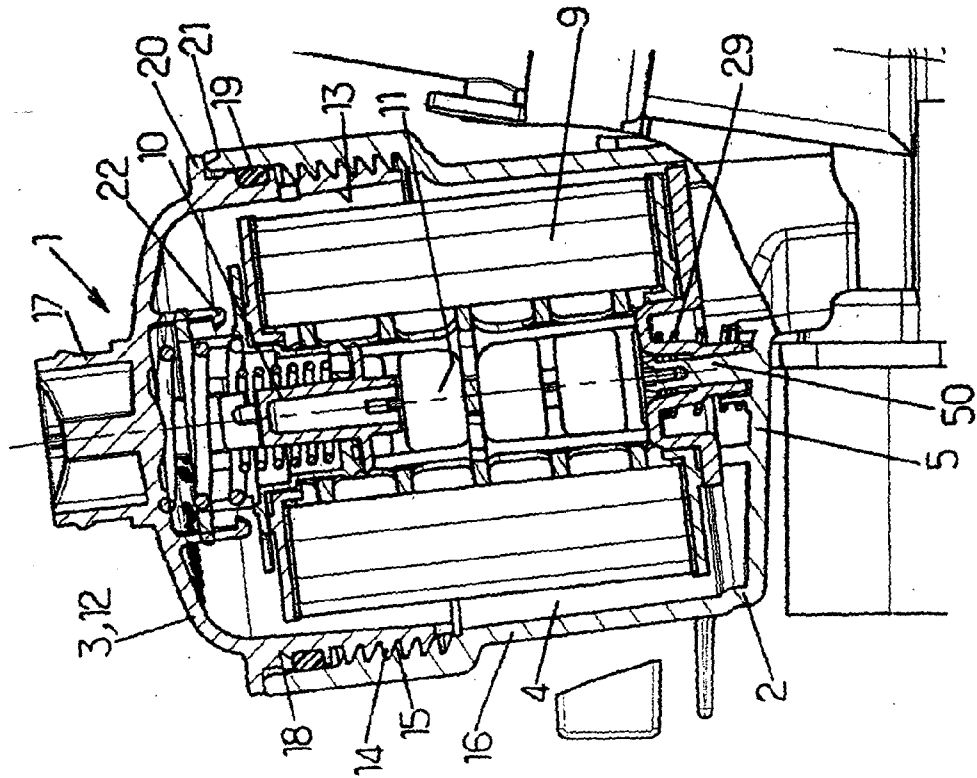


FIG.8.

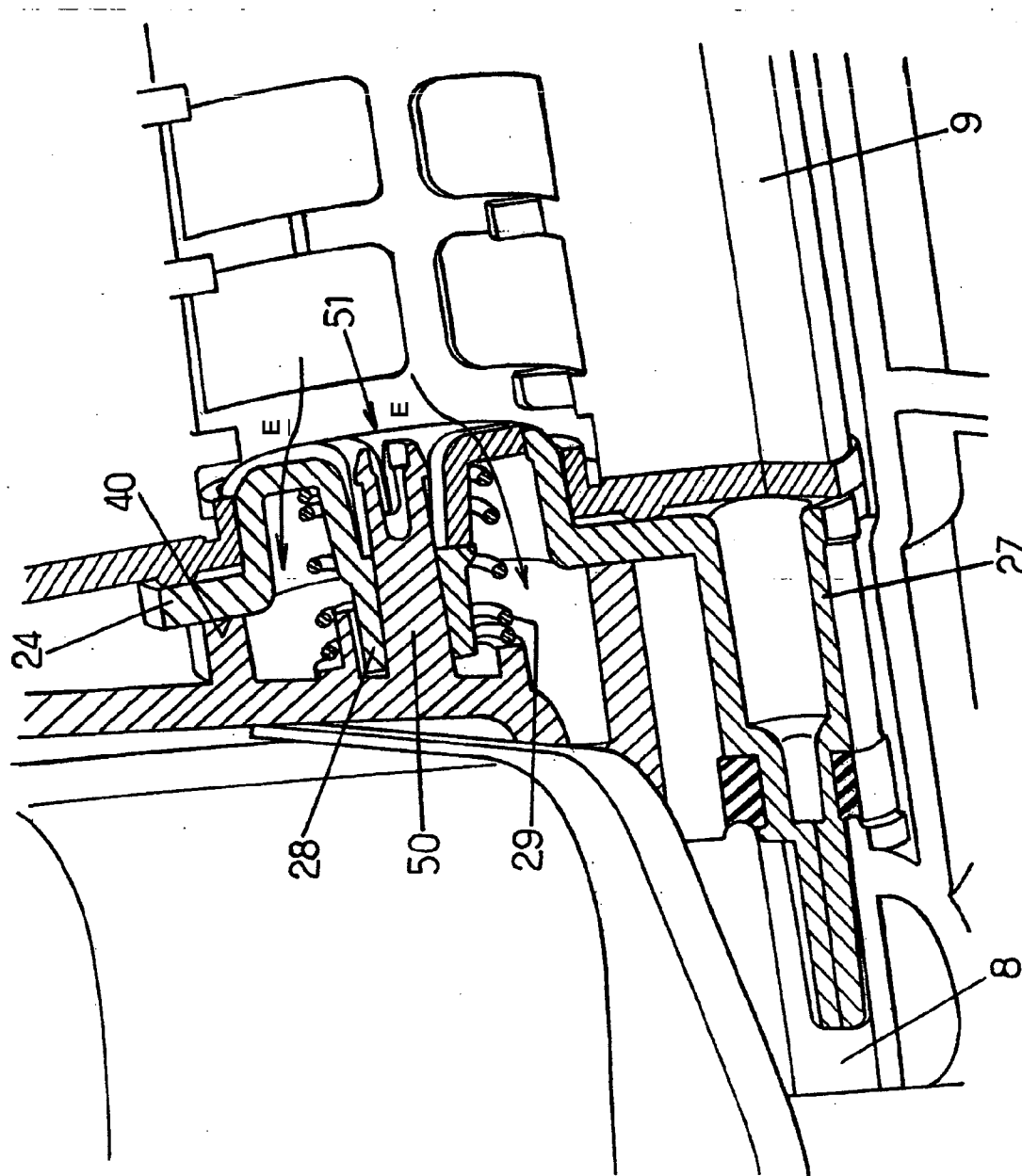
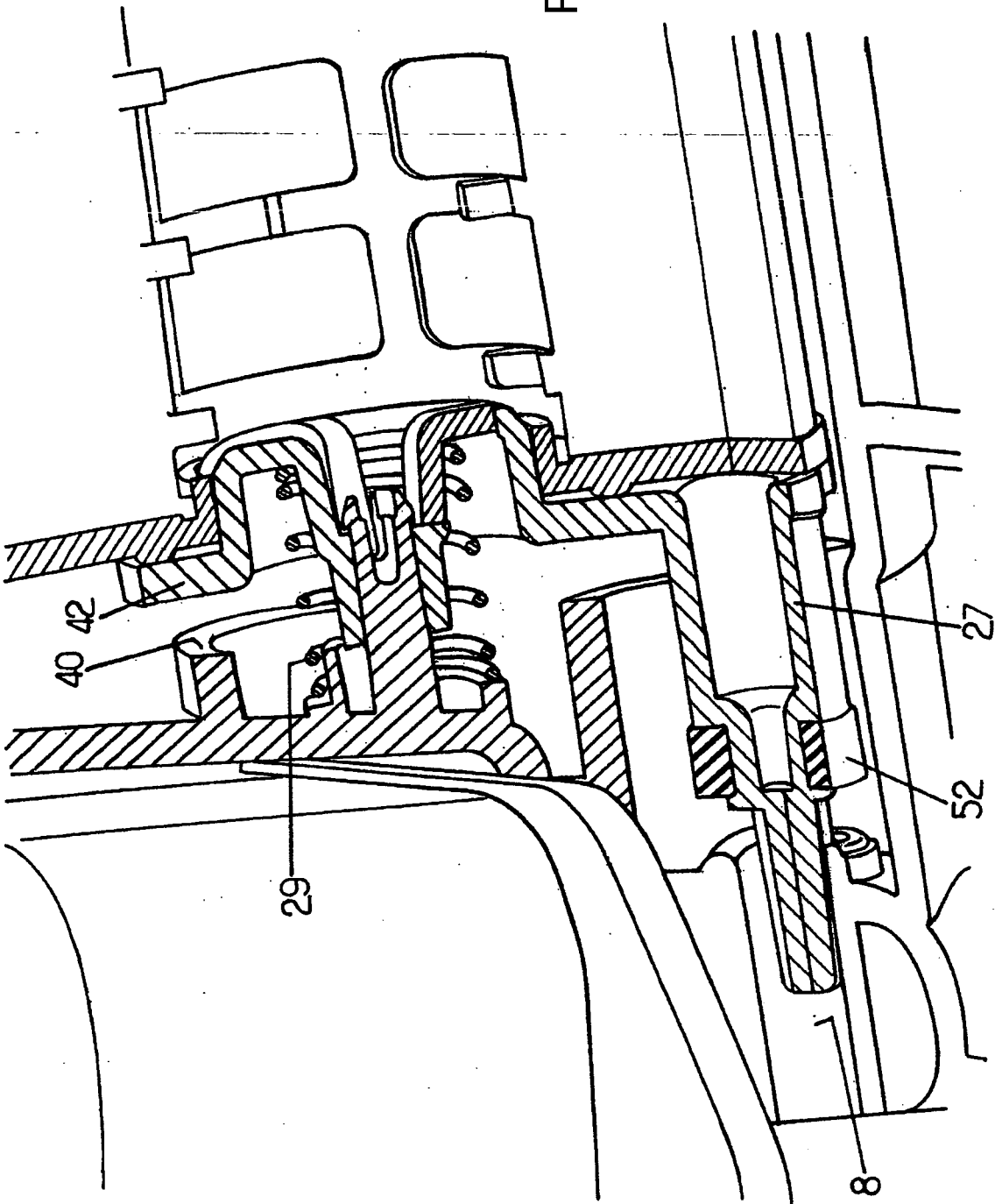


FIG.9.





DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 39 03 675 A1 (KNECHT FILTERWERKE GMBH, 7000 STUTTGART, DE) August 9, 1990 (08/09/1990) * Abstract; Figure 1 *	1, 11, 12, 15	INV. B01D29/21 B01D35/153
X	US 6 706 181 B1 (BAUMANN PETER ET AL) March 16, 2004 (03/16/2004) * Abstract; Figures 1, 9 *	1, 11, 12, 15	
X	EP 1 479 427 A (ARVIN TECHNOLOGIES, INC) November 24, 2004 (11/24/2004) * Abstract; Figure 11 *	1, 11, 12, 15	
X	WO 2004/031542 A (MAHLE FILTERSYSTEME GMBH; BRIEDEN, THOMAS; MONZIE, BENOIT) April 15, 2004 (04/15/2004) * Abstract; Figure 2 *	1, 11, 12, 15	
A	US 6 569 326 B1 (BAUMANN DIETER ET AL) May 27, 2003 (05/27/2003) * Figures 2, 3 *	1	
A	US 6 685 829 B1 (BAUMANN DIETER ET AL) February 3, 2004 (02/03/2004) * Figures 4, 6 *	1	TECHNICAL FIELDS SEARCHED (IPC) B01D
3 The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search June 22, 2006	Examiner Hoffmann, A
CATEGORY OF CITED DOCUMENTS X: particularly relevant if taken alone Y: particularly relevant if combined with another document of the same category A: technological background O: non-written disclosure P: intermediate document		T: theory or principle underlying the invention E: earlier patent document, but published on, or after the filing date D: document cited in the application L: document cited for other reasons &: member of the same patent family, corresponding document	

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ANNEX TO THE EUROPEAN SEARCH REPORT ON
EUROPEAN PATENT APPLICATION NO.

EP 06 29 0584

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.

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06/22/2006

Patent document cited in search report			Publication date	Patent family member(s)		Publication date
DE	3903675	A1	08/09/1990	NONE		
US	6706181	B1	03/16/2004	BR	0014977 A	06/18/2002
				WO	0130480 A1	05/03/2001
				DE	19951085 A1	04/26/2001
				EP	1229985 A1	08/14/2002
				ES	2206334 T3	05/16/2004
				JP	2003512165 T	04/02/2003
				MX	PA02001860 A	08/12/2002
EP	1479427	A	11/24/2004	BR	0304799 A	05/17/2005
				JP	2004346929 A	12/09/2004
				MX	PA04000423 A	11/25/2004
				US	2004232063 A1	11/25/2004
WO	2004031542	A	04/15/2004	DE	10246151 A1	04/15/2004
				EP	1546513 A1	06/29/2005
				JP	2006501398 T	01/12/2006
				US	2005126964 A1	06/16/2005
US	6569326	B1	05/27/2003	BR	0007048 A	07/31/2001
				WO	0121278 A2	03/29/2001
				EP	1140320 A2	10/10/2001
				JP	2003509201 T	03/11/2003
US	6685829	B1	02/03/2004	BR	0007088 A	08/07/2001
				WO	0117657 A2	03/15/2001
				EP	1137470 A2	10/04/2001
				JP	2003508210 T	03/04/2003

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

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- GB 1502469 A [0011]
- FR 2834650 [0012]
- EP 1106795 A [0020] [0023]
- FR 2816985 [0022]
- EP 612549 A [0022]
- WO 0211854 A [0023]
- EP 1137470 A [0023]
- FR 2566045 [0025]
- EP 314915 A [0026]
- EP 421080 A [0026]
- EP 1210164 A [0026]
- WO 9832517 A [0026]
- US 4906365 A [0026]
- US 6572768 B [0026]
- DE 3933794 [0026]
- DE 29815023 U [0026]
- EP 1312405 A1 [0054]

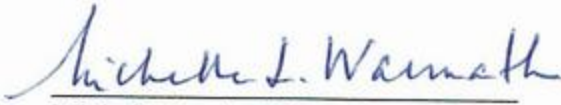
DECLARATION OF MICHELLE LOUISE WARMATH

I, Michelle Louise Warmath, pursuant to 28 U.S.C. § 1746, hereby declare as follows:

1. I am a Certified Linguist at TransPerfect, Inc.
2. I submit this declaration to certify the accuracy of the English translation of Brisson EP1714688A1.
3. My statements are based on personal knowledge and my review of Brisson EP1714688A1 and its English translation. If called as a witness about the facts contained in these statements, I could testify competently based on such personal knowledge and the investigation I have conducted.
4. Attached as Exhibit A is a true and accurate copy of Brisson EP1714688A1.
5. Attached as Exhibit B is a true and accurate copy of an English translation Brisson EP1714688A1.
6. Brisson EP1714688A1 Translation is a true and accurate translation of Brisson EP1714688A1 from French.
7. All statements made herein of my own knowledge are true, and all statements made on information and belief are believed to be true. Further, I am aware that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. § 1001. I declare under penalty of perjury that the foregoing is true and correct.
8. I also understand that by submitting this declaration I may be asked to appear for a deposition asking me questions limited to the material in my declaration. With my signature below, I agree to make reasonable efforts to make myself available for such a deposition at a reasonable place and time of my choosing.

* * *

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge. Executed on January 2, 2024 in Orlando, Florida.


Michelle Louise Warmath


Signature, Notary Public



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Notary Public
State of Florida
Comm# HH471427
Expires 12/10/2027

Stamp, Notary Public