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(54) Motor vehicle fuel supply assembly

(57) A fuel supply assembly of a motor vehicle has a box body (2) having a number of seats (12, 13, 34) for housing a pump unit (16) for drawing fuel from a tank, a filtering unit (20) for filtering the fuel, and a pressure regulating unit (35) for controlling the pressure of the fuel supplied to at least one injector of the vehicle; a hydraulic circuit (14, 22) being formed through the box body (2) to connect the pump unit (16), the filtering unit (20), and the pressure regulating unit (35) hydraulically to one another.

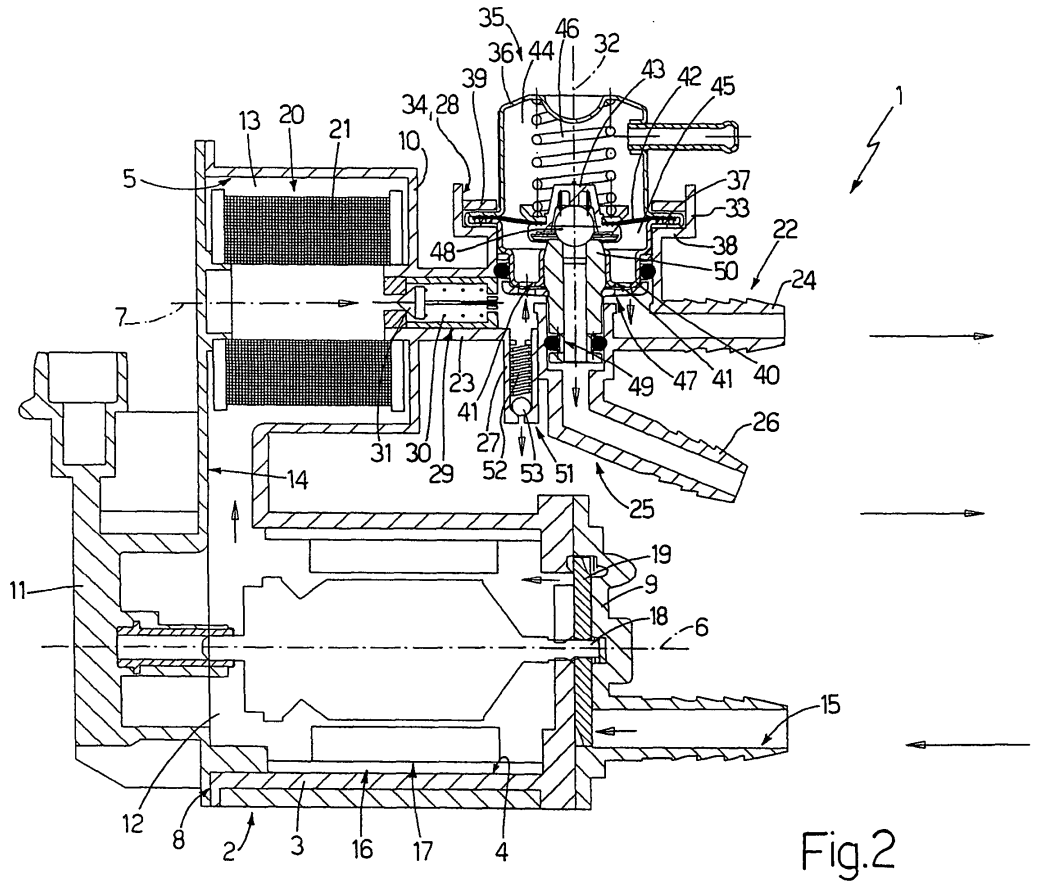

Fig.2

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Description

[0001] The present invention relates to a motor vehicle fuel supply assembly.

[0002] A motor vehicle fuel supply assembly is known comprising a pump unit for drawing fuel from a tank and feeding it firstly through a filtering unit, then through a pressure regulating unit, and finally to at least one injector of the vehicle engine.

[0003] The pump unit, filtering unit, and pressure regulating unit are each housed in a respective seat formed in the vehicle body, and are each connected to the other units by relative connecting pipes.

[0004] Known fuel supply assemblies of the type described above have several major drawbacks, mainly due to being fairly complex and expensive, particularly in the case of mass production, by requiring a vehicle body with a seat for each of the pump, filtering, and pressure regulating units.

[0005] Known fuel supply assemblies of the type described above also have the drawback of potential fuel leakage along the pipes connecting the pump, filtering, and pressure regulating units, and of the pipes at any rate being located in parts of the vehicle that are difficult to reach, and so being difficult and taking a relatively long time to install.

[0006] It is an object of the present invention to provide a motor vehicle fuel supply assembly designed to eliminate the aforementioned drawbacks.

[0007] According to the present invention, there is provided a motor vehicle fuel supply assembly as claimed in the accompanying Claims.

[0008] A non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a schematic view in perspective, with parts removed for clarity, of a preferred embodiment of the fuel supply assembly according to the present invention;

Figure 2 shows a schematic, partly sectioned view, for clarity, of the Figure 1 fuel supply assembly;

Figure 3 is similar to Figure 2, and shows a variation of the Figure 1 and 2 fuel supply assembly.

[0009] Number 1 in Figures 1 and 2 indicates as a whole a fuel supply assembly, which is fitted to a body (not shown) of a motor vehicle (not shown) to feed fuel from a tank (not shown) to at least one injector (not shown) of the vehicle.

[0010] Assembly 1 comprises a box body 2, in turn comprising a container 3 having two cylindrical, substantially cup-shaped cavities 4, 5, which communicate with each other, have respective longitudinal axes 6, 7 substantially parallel to each other, are open outwards at an end surface 8 of container 3 crosswise to axes 6, 7, and are bounded axially by respective end walls 9, 10 opposite and parallel to surface 8.

[0011] Cavities 4 and 5 are closed by a cover 11, which, when positioned contacting surface 8, defines:

a first chamber 12, together with cavity 4;

a second chamber 12, together with cavity 5; and

together with container 3, a conduit 14 hydraulically connecting chambers 12 and 13.

[0012] Chamber 12 communicates hydraulically with the tank (not shown) by means of an inlet conduit 15 projecting from end wall 9 of cavity 4, and houses a known pump unit 16 comprising an electric motor 17 having an output shaft 18, which is coaxial with axis 6 and fitted with an impeller 19, which draws fuel from the tank (not shown) and feeds the fuel firstly along conduit 15, then through chamber 12, and finally along conduit 14 to chamber 13.

[0013] Chamber 13 houses a known filtering unit 20 comprising, in the example shown, an annular, substantially cylindrical filtering element 21 mounted coaxially with axis 7 inside chamber 13, and communicates hydraulically with the injector (not shown) by means of a tubular appendix 22 projecting from end wall 10 of cavity 5 and comprising an initial portion 23; an end portion 24 defining an outlet conduit for the fuel from assembly 1; and an intermediate portion 25 located between portions 23 and 24, and defining two hydraulic conduits 26, 27 - of which, conduit 26 is connected hydraulically to the tank (not shown) - and a cavity 28 opposite conduits 26, 27.

[0014] Portion 23 houses a non-return valve 29 comprising a spring 30, and a substantially conical shutter 31 pushed by spring 30 onto a relative seat formed in portion 23. Spring 30 is calibrated to push shutter 31 onto the relative seat, and hence close portion 23, with a force that is always less than that exerted, in the opposite direction, on shutter 31 by the fuel fed by pump unit 16 through filtering element 21.

[0015] Cavity 28 has a longitudinal axis 32 substantially crosswise to axes 6 and 7, is bounded laterally by a stepped wall 33 coaxial with axis 32, and defines - together with an initial portion of conduit 26 coaxial with axis 32 - a seat 34 for a known pressure regulating unit 35.

[0016] Unit 35 comprises a substantially cylindrical outer casing 36, which is mounted coaxially with axis 32 inside cavity 28, has a flange 37 projecting radially outwards from casing 36 to rest on a shoulder 38 defined by wall 33, and is locked axially along cavity 28 by an annular lock member 39 fitted onto casing 36 and fixed to wall 33.

[0017] Casing 36 is bounded axially by a bottom wall 40, which extends crosswise to axis 32, is positioned facing conduits 26, 27, and has a number of holes 41 formed, parallel to axis 32, through wall 40 and for hydraulically connecting casing 36 to appendix 22.

[0018] Flange 37 has an annular groove coaxial with axis 32 and for retaining a peripheral edge of a deformable annular membrane 42 mounted coaxially with axis 32 and engaged centrally by a bell 43, which is positioned

with its concavity facing appendix 22, is fixed to an inner edge of membrane 42, and, together with membrane 42 and casing 36, defines two chambers 44, 45; chamber 44 houses a spring 46 interposed between casing 36 and bell 43; and chamber 45 communicates hydraulically with appendix 22 through holes 41 and with the interposition of a filter 47 mounted facing holes 41.

[0019] Bell 43 is fitted with a ball 48, which is pushed by spring 46 onto a spherical annular seat defining the end portion of a conduit 49 formed in a tubular sleeve 50, which is mounted coaxially with axis 32, extends through wall 40, and engages the initial portion of conduit 26 to connect conduit 49 to conduit 26. Spring 46 is calibrated to push ball 48 onto the spherical seat, and hence close conduit 49, with less force that that exerted, in the opposite direction, on membrane 42, and hence on ball 48, by a pressure threshold value of the fuel inside chamber 45.

[0020] In actual use, fuel is fed by pump unit 16 along conduit 14, through filtering element 21, through non-return valve 29 and, finally, into both chamber 45, via filter 47 and holes 41, and along end portion 24 of appendix 22 to the injector (not shown). When the fuel pressure in appendix 22 and chamber 45 reaches said threshold value, membrane 42 and, therefore, ball 48 are moved by the fuel, in opposition to spring 46, into an open position (not shown) opening conduit 49 to drain the fuel along conduits 49 and 26 and into the tank (not shown).

[0021] Conduit 27 houses a control valve 51 comprising a spring 52, and a ball 53 pushed by spring 52 onto a spherical annular seat defining the end portion of conduit 27. Spring 52 is calibrated to push ball 53 onto the spherical seat, and so close conduit 27, with less force than that exerted, in the opposite direction, on ball 53 by inserting a known pressure measuring device (not shown) inside conduit 27.

[0022] The pressure measuring device (not shown) is used at the vehicle post-production stage and/or when servicing the vehicle, to determine correct fuel pressure inside appendix 22.

[0023] Supply assembly 1 has several advantages, mainly on account of pump unit 16, filtering unit 20, and pressure regulating unit 35 all being housed and integrated in box body 2, and on account of conduit 14 and appendix 22 defining a hydraulic circuit connecting units 16, 20 and 35 to one another, and itself formed and integrated in box body 2.

[0024] Another advantage of supply assembly 1 lies in the location of non-return valve 29, i.e. between filtering unit 20 and pressure regulating unit 35, maintaining the fuel in appendix 22 at a given pressure at all times, to ensure correct start-up of the vehicle.

[0025] Finally, the location of pressure regulating unit 35, i.e. between non-return valve 29 and the injector (not shown), ensures correct fuel pressure in appendix 22 when the vehicle is stationary. That is, when the vehicle is stationary, the heat given off by the vehicle engine (not shown), and therefore by the injector (not shown), increases the temperature, and therefore the volume and pressure, of the fuel in appendix 22. When the pressure in appendix 22 reaches said threshold value, ball 48 is moved into the open position (not shown) opening conduit 49, thus draining the fuel into the tank (not shown) and restoring the correct pressure in appendix 22.

[0026] The Figure 3 variation differs from the Figure 1 and 2 embodiment simply by hydraulic conduit 26, cavity 28, and pressure regulating unit 35 being eliminated and replaced with a hydraulic conduit 54 connected hydraulically to the tank (not shown) and housing a pressure regulating valve 55.

[0027] Valve 55 comprises a spring 56, and a ball 57 pushed by spring 56 onto a spherical annular seat defining the end portion of conduit 54. Spring 56 is calibrated to push ball 57 onto the spherical seat, and so close conduit 54, with less force than that exerted, in the opposite direction, on ball 57 by said pressure threshold of the fuel inside appendix 22. Consequently, when the pressure in appendix 22 substantially equals said threshold value, ball 57 is pushed by the fuel into an open position (not shown) opening conduit 54, and so draining the fuel into the tank (not shown).

Claims

1. A motor vehicle fuel supply assembly, the supply assembly comprising a pump unit (16) for drawing fuel from a relative tank; a filtering unit (20) for filtering the fuel; a pressure regulating unit (35) for controlling the pressure of the fuel supplied to at least one injector; and a hydraulic circuit (14, 22) for connecting said pump unit, said filtering unit, and said pressure regulating unit (16, 20, 35) hydraulically to one another; and being **characterized by** also comprising a box body (2) having a number of seats (12, 13, 34) for housing said pump unit, said filtering unit, and said pressure regulating unit (16, 20, 35); said hydraulic circuit (14, 22) being formed in said box body (2).

2. A supply assembly as claimed in Claim 1, wherein said pump unit, said filtering unit, and said pressure regulating unit (16, 20, 35) are arranged in succession in that order.

3. A supply assembly as claimed in Claim 1 or 2, wherein the hydraulic circuit (14, 22) comprises a first portion (14) for connecting said pump unit and said filtering unit (16, 20) hydraulically to each other; and a second portion (22) for connecting said filtering unit and said pressure regulating unit (20, 35) hydraulically to each other; a non-return valve (29) being mounted between said filtering unit (20) and said pressure regulating unit (35) to keep the fuel in said second portion (22) pressurized.

4. A supply assembly as claimed in Claim 3, wherein said non-return valve (29) is housed in said box body (2) .

5. A supply assembly as claimed in any one of the foregoing Claims, wherein the hydraulic circuit (14, 22) comprises a first portion (14) for connecting said pump unit and said filtering unit (16, 20) hydraulically to each other; and a second portion (22) for connecting said filtering unit and said pressure regulating unit (20, 35) hydraulically to each other; a control valve (51) being connected hydraulically to said second portion (22), and being connectable to a pressure measuring device to determine the pressure of the fuel in the second portion (22).

6. A supply assembly as claimed in Claim 5, wherein said control valve (51) is housed in said box body (2).

7. A supply assembly as claimed in any one of the foregoing Claims, wherein said pressure regulating unit (35) is connected hydraulically to said tank.

8. A supply assembly as claimed in any one of the foregoing Claims, wherein said pressure regulating unit (35) comprises a membrane-type pressure regulator fitted removably inside the relative said seat (34).

9. A supply assembly as claimed in any one of Claims 1 to 7, wherein the box body (2) comprises a hydraulic conduit (54) connected hydraulically to said hydraulic circuit (14, 22) and to said tank, and defining the seat of said pressure regulating unit (55); the pressure regulating unit (55) comprising a ball (57), and a spring (56) which normally maintains the ball (57) in a closed position closing said hydraulic conduit (54).

10. A motor vehicle comprising a vehicle body; a fuel tank; at least one injector; and a fuel supply assembly as claimed in any one of the foregoing Claims and fitted to the vehicle body.

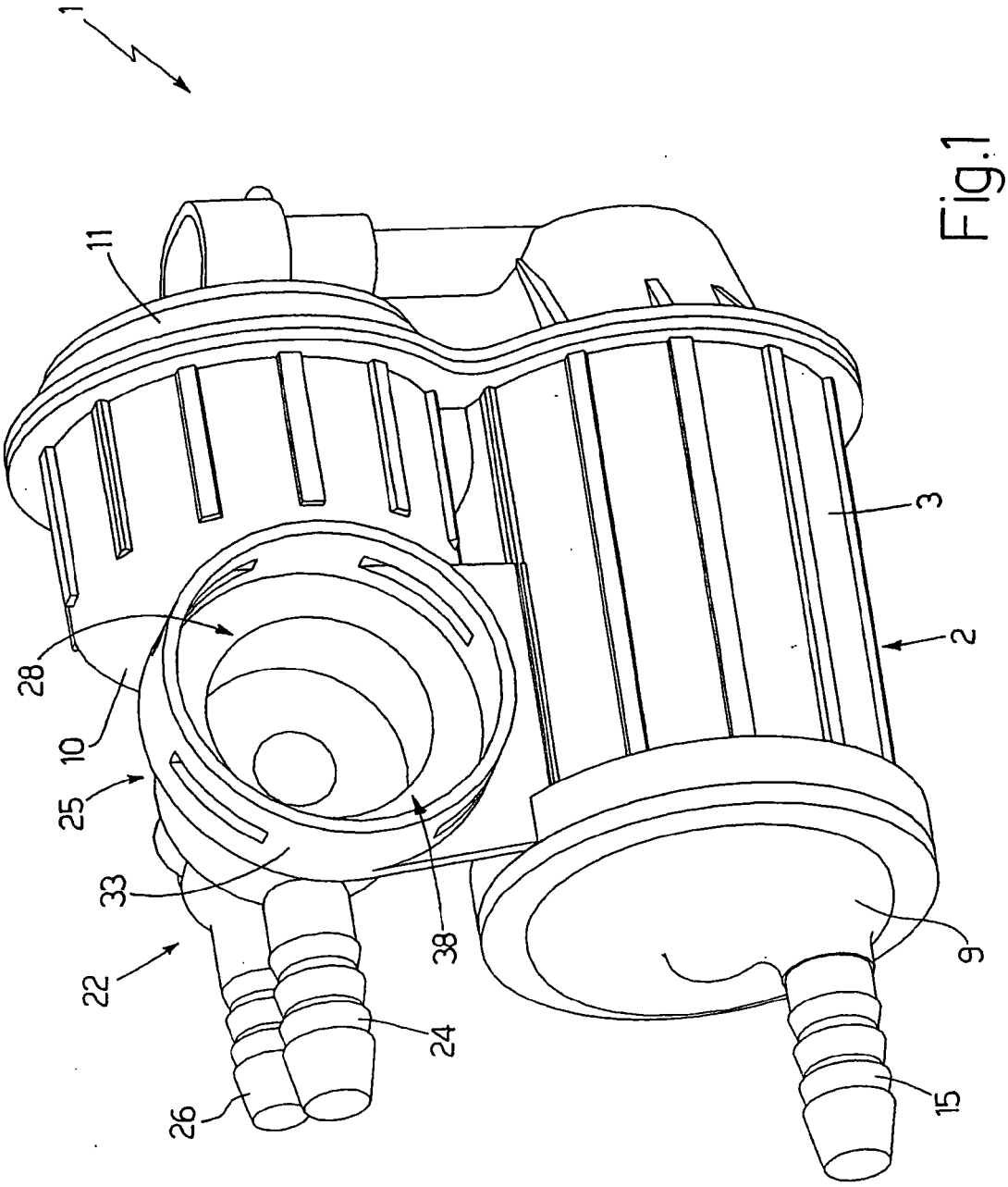

Fig.1

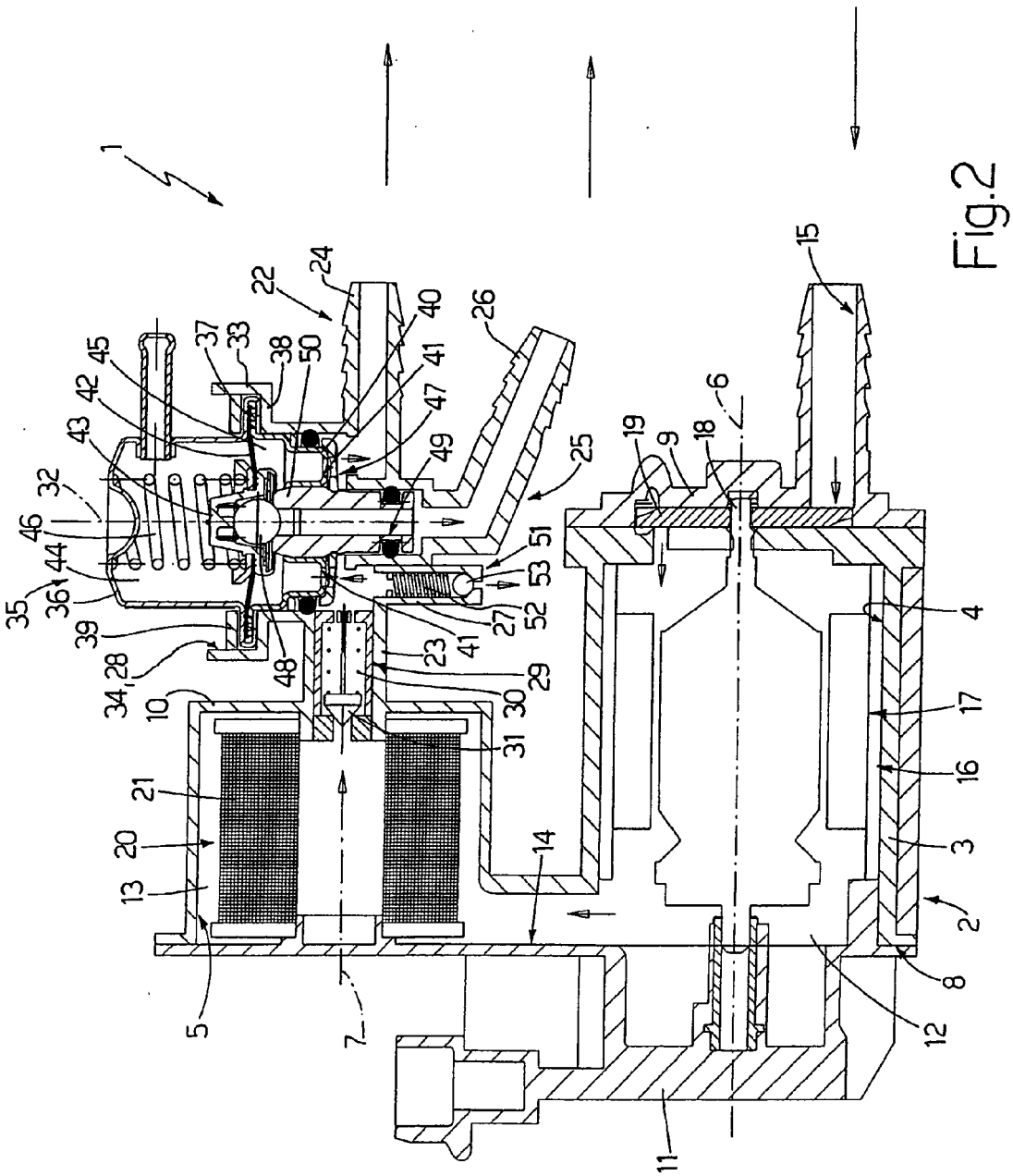
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Fig.2

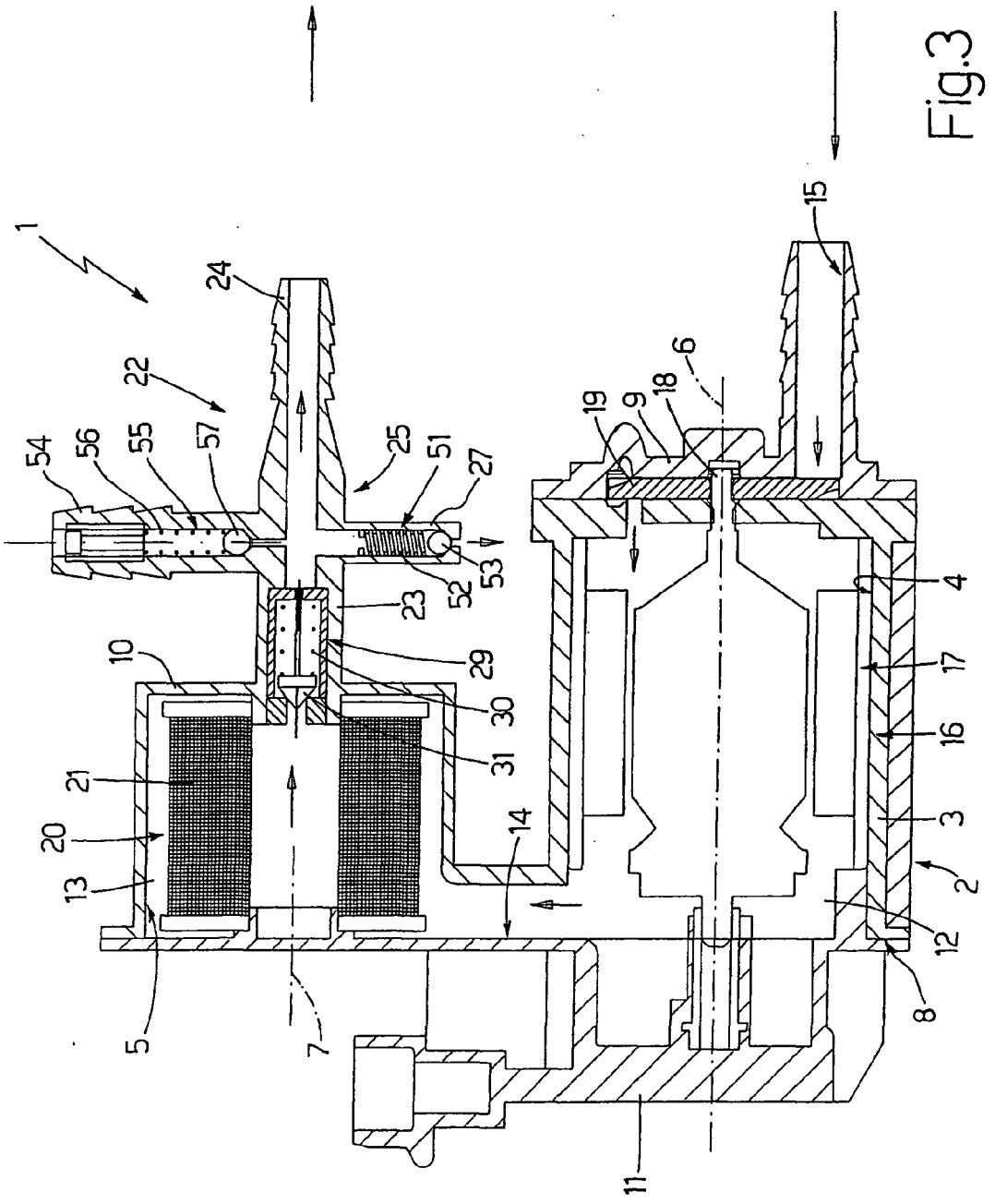
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Fig.3

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EUROPEAN SEARCH REPORT

Application Number
EP 05 42 5783

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 Y	US 6 298 832 B1 (YAMAZOE ET AL) 9 October 2001 (2001-10-09) * the whole document * -----	1,2,7-10 5,6	INV. F02M37/14 F02M37/04
Y	US 5 148 792 A (TUCKEY ET AL) 22 September 1992 (1992-09-22) * abstract; figure 2 * -----	5,6	ADD. F02M37/22 F02M69/54
X	US 5 908 020 A (BOUTWELL ET AL) 1 June 1999 (1999-06-01) * the whole document * -----	1,3,4, 8-10	
X	US 5 103 793 A (RIESE ET AL) 14 April 1992 (1992-04-14) * the whole document * -----	1,8,10	
X	US 5 482 021 A (ROCHE ET AL) 9 January 1996 (1996-01-09) * the whole document * -----	1,8,10	

TECHNICAL FIELDS SEARCHED (IPC)

F02M

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	12 April 2006	Van Zoest, A

CATEGORY OF CITED DOCUMENTS

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12-04-2006

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6298832 B1	09-10-2001	JP 2000179422 A	27-06-2000
US 5148792 A	22-09-1992	DE 4231731 A1	08-07-1993
		FR 2685938 A1	09-07-1993
		FR 2700188 A1	08-07-1994
		JP 2581876 B2	12-02-1997
		JP 6050230 A	22-02-1994
US 5908020 A	01-06-1999	CA 2335621 A1	20-01-2000
		EP 1097301 A2	09-05-2001
		JP 2002520539 T	09-07-2002
		MX PA01000465 A	20-08-2003
		WO 0003137 A2	20-01-2000
US 5103793 A	14-04-1992	NONE	
US 5482021 A	09-01-1996	DE 4440205 A1	18-05-1995
		IT RM940680 A1	11-05-1995
		JP 2673105 B2	05-11-1997
		JP 7180641 A	18-07-1995
		SE 509027 C2	30-11-1998
		SE 9403858 A	12-05-1995

EPO FORM P0459

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