(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 426 226 A2**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **90202777.0**

(51) Int. Cl.5: **B05B 9/03**, B05B 12/02

(22) Date of filing: **18.10.90**

(30) Priority: **02.11.89 IT 4688089**

(43) Date of publication of application:
08.05.91 Bulletin 91/19

(84) Designated Contracting States:
AT BE CH DE DK ES FR GB GR IT LI LU NL SE

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(54) Distribution apparatus for spray devices.

(57) A distribution apparatus for delivery devices of the type comprising means (22) for connecting a pump exit duct (6) alternatively to discharge (7) and/or to a duct (5) which via a distribution valve feeds at least two delivery ducts (121), (122), there being located in the discharge duct a venturi tube (9), into the main duct of which there extend a bypass duct controlled by a valve (8), and, controlled by a proportional constriction (12), a duct (11) which is normally closed but is opened when one or other of the delivery ducts (121) or (122) is closed, there being also provided two branches which connect the delivery ducts (121) and (122) to the suction region of the venturi tube (9) via two disc-and-spring valves which are normally closed when the delivery ducts are fed with pressurized liquid, and open when the feed to said ducts is interrupted.

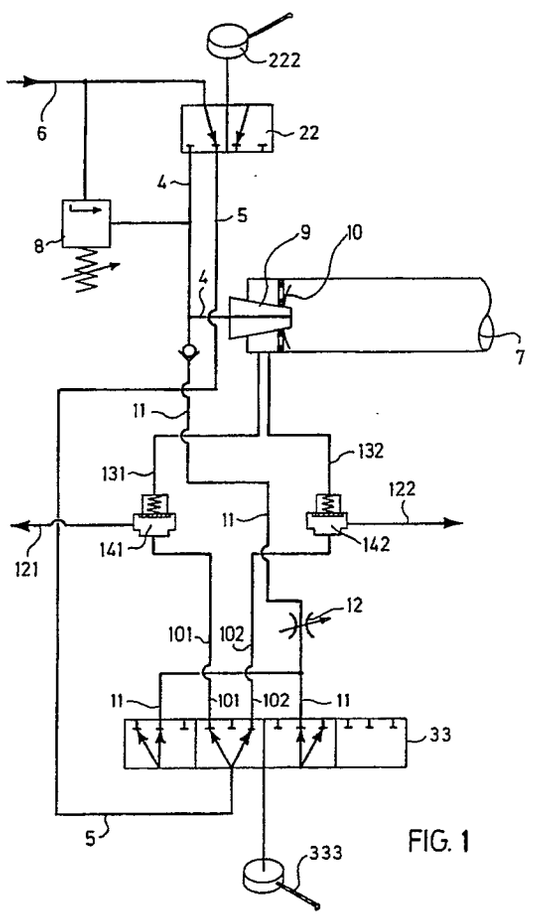

FIG. 1

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DISTRIBUTION APPARATUS FOR SPRAY DEVICES

Spray devices for anti-cryptogamous liquids or the like for use on cultivated agricultural land or woodland are known, comprising a rear sprayline composed of two independent sections, each provided with nozzles. Each of said two sections represents one user.

Said sprayline is positioned transversely in the rear of the machine and is fed with pressurized liquid.

It can take various forms, and extend a greater or lesser distance along the sides of the machine path, or lie within the overall outline of the machine; its particular form has no influence on the present invention.

The devices of the said type comprise downstream of the pump a distribution valve which can assume four different positions, namely a 1st position in which it feeds both the right hand and left hand users, a 2nd position in which it feeds only the right hand user, a 3rd position in which it feeds only the left hand user, and a 4th position in which it feeds no user.

Known distribution valves have two drawbacks, namely that if the valve is preset for a certain pressure and flow rate with both users open, an undesirable pressure surge occurs when one of the two users is closed, and in addition when one of the two users is closed it remains filled with liquid, which continues to drip from the user.

The object of the present invention is to provide a distribution valve which obviates the aforesaid drawbacks.

This object is attained according to the invention basically by a valve arrangement which combines the following characteristics:

- an inlet valve arranged to connect the pump delivery side to the discharge to the tank or alternatively to the users;
- a venturi tube connected into the duct leading to discharge, and with a relative non-return valve in the main passage;
- a distribution valve with three exits and four operating positions, arranged to exclude both users, feed both users, or feed one or other of the users, and to exclude or feed a duct which opens upstream of the venturi tube via a proportional constriction;
- a branch from each of said ducts and leading to the suction region of said venturi tube via a disc valve and spring, which is closed when the user is fed.

The merits and operational and constructional characteristics of the invention will be apparent from the detailed description of a preferred embodiment thereof given hereinafter by way of non-limiting example with reference to the accompanying drawings in which:

Figure 1 shows the hydraulic schematic diagram of the distribution valve.

Figure 2 is a side view of the valve.

Figure 3 is a section on the line III-III of Figure 2.

Figure 4 is a view in the direction IV of Figure 2.

Figure 5 is a view in the direction V of Figure 3, with the lower piece removed.

Figure 6 is a section on the line VI-VI of Figure 5.

Figure 7 is a sectional view of the distributor (the same section as Figure 3).

Figure 8 is a plan view of the distributor, seen from the right in Figure 7.

In Figure 9, Figure 10, Figure 11 and Figure 12, the distributor of Figure 7 is shown superimposed on the plane of Figure 5, in the four respective operating situations.

Figure 13 shows a possible equivalent embodiment of the circuit of Figure 1.

Figure 14 shows a further possible embodiment of the circuit of Figure 1.

The figures show a central outer valve body 1 (Figure 2) carrying at its top and base two casings 2 and 3 containing two ball distributors 22 and 33 respectively.

The central body 1 comprises two ducts 4 and 5 (best seen in Figure 3) which are either closed or opened by the ball distributor 2 contained in the casing 2.

Said distributor 22 is operated by an external lever 222 which rotates so as to connect the liquid inlet duct 6 either to the duct 4 which communicates with the discharge and recirculation duct 7, or to the duct 5 which opens within the casing 3.

Between the water inlet duct 6 and discharge duct 7 there is a usual externally adjustable bypass relief valve 8 which for simplicity is shown only in the schematic diagram of Figure 1, but is visible in Figures 2 and 4.

Into the duct 7 there also extends the main duct of a venturi tube 9 which also comprises a diaphragm non-return valve, these being visible in the schematic diagram of Figure 1 and being partly shown in Figure 3.

As stated,, the duct 5 opens within the casing 3 which contains the ball distributor 33 operated by the external lever 333.

Said ball distributor 33, which is described in detail hereinafter, is shown in Figures 7 to 12 and is arranged to connect the interior of the casing 3 to three ducts 101, 102 and 11 (see also the schematic diagram of Figure 1).

Figure 3 shows the situation in which the duct 101 is connected to the interior of the casing, the duct 102 is isolated from the casing by one of the balls contained in the distributor 33, and the duct 11 is connected to the interior of the casing. This situation is also shown in Figure 12.

The ducts 101 and 102 lead to the users 121 and 122 respectively, and from each of them there extends a branch 131 and 132 leading to the suction region of the venturi tube 9.

At the node between the duct 101, the user 121 and the branch 131 there is a preset disc valve 141, controlled by a spring 141, which assumes two positions (see Figure 3).

When the duct 101 is connected to the interior of the casing 3, the liquid pressure maintains the valve 141 in its upper position so as to close the branch 131 and connect the ducts 101 and 121 together.

When the duct 101 is closed by one of the balls of the distributor 33 (situation not illustrated in Figure 3) the valve 141 assumes its lower position and connects the duct 121 and the branch 131 together.

Likewise, at the node between the duct 102, the user 122 and the branch 132 there is a preset disc valve 142 which operates exactly as the valve 141.

The duct 11, which is not visible in Figure 3 but can be seen in Figures 5, 6, 7, 9, 10, 11 and 12 and in the schematic diagram of Figure 1, leads to the main venturi duct via a proportional passage valve or constriction 12 visible only in the schematic diagram of Figure 1.

The valve 12 is nothing more than an adjustable throttle for constricting the cross-section of the individual user 121 or 122.

The distributor 33 is shown in Figures 7 and 8. It consists of a body comprising four through housing holes 331 to 334 and one blind cavity 335 of bean shape.

Each of the housing holes and the cavity contain one ball.

The arrangement of the holes and cavity is such that, in relation to the duct arrangement shown in Figure 5, in rotating the body 33 through approximately a right angle the four aforesaid situations occur, at successive rotations of about 30 degrees each.

These situations are shown in Figures 9 to 12, in which within each hole 331 to 334 there are shown by fine dotted lines the impressions of the respective balls for covering the ducts which open into the plane of Figure 5.

Figure 9 shows the situation in which the ducts 101, 102 and 11 are all closed.

Figure 10 shows the situation in which the duct 101 is closed and the ducts 102 and 11 are open.

Figure 11 shows the situation in which the ducts 101 and 102 are open and the duct 11 is closed.

Figure 12 shows the situation in which the ducts 101 and 11 are open and the duct 102 is closed.

The operation of the device is as follows.

In the situation illustrated in the schematic diagram of Figure 1 and in Figure 11, the pumped liquid enters the duct 6 and is deviated into the duct 5 which feeds the distributor 33, which in its turn distributes it to the ducts 101 and 102 and to tbe relative users.

The excess pumped liquid which does not leave the users is bypassed to discharge 7 via the relief valve 8, which can be adjusted from the outside by the knob 88 to set the desired delivery pressure.

The duct 11, which leads to discharge via the proportional passage valve 12, is closed by the distributor 33.

The disc valves 141 and 142 are both in their raised position to close the passage between the delivery ducts 121 and 122 and the branches 131 and 132 which lead to the suction regions of the venturi tube 9.

When one of the two delivery ducts is to be closed, for example the duct 122 as shown in Figure 3, the distributor is set into the position shown in Figure 12, in which the ducts 11 and 101 are open and the duct 102 is closed.

In this situation two events occur. Firstly, the liquid which cannot leave the user 122 passes via the proportional constriction 12 into the main venturi duct 9.

Here, the excess fluid is added to the fluid from the bypass valve 8 to create suction in the restricted region of the venturi tube 9.

Secondly, as pressure is now lacking in the duct 102 (see Figure 3), the disc valve 142 lowers to connect the duct 12 and the relative delivery duct to the suction region of the venturi tube 9.

By this means, the liquid in the duct 122 and in the relative delivery duct is drawn in by the venturi tube and fed to discharge.

An identical but reverse situation occurs when the distributor 33 closes the duct 101 and opens the ducts 102 and 11 as in Figure 10.

If it is desired to simplify the distributor 33, the device can be constructed in accordance with the schematic diagram of Figure 13, in which in place of the proportional passage constriction 12 fed by the distributor 33, a relief valve 212 is provided directly connected to the duct 5 via a branch 55.

In this case the valve 212 is opened by the overpressure created when one of the two users 121 or 122 is closed.

A more simplified version of the distribution

apparatus is shown in Figure 14.

In this scheme the flow return ducts 11 which are intended to operate when one or other of the users 121 or 122 is closed are totally lacking, and thus delivery overpressure in the remaining user cannot be avoided.

However in both these alternative embodiments the residual liquid is drawn out of the inactive user, with elimination of dripping.

The invention is not limited to the described embodiments, and modifications and improvements can be made thereto but without leaving the scope of protection of the following claims.

Claims

1. A distribution apparatus for delivery devices of the type comprising means (22) for connecting a pump exit duct (6) alternatively to discharge (7) and/or to a duct (5) which via a distribution valve (33) feeds at least two delivery ducts (101), (102), characterised in that in the discharge duct (7) there is located a venturi tube (9), into the main duct of which there extend a duct which bypasses the means (22) and is controlled by a relief valve (8), and an exit duct (11) from the distribution valve (33) and controlled by a proportional constriction (12), the duct (33) being normally closed by the distributor (33) when the ducts (101) and (102) are both open or both closed by the distributor (33), the duct (11) being opened by the distributor (33) when one of the ducts (101) or (102) is closed, there being also provided two branches (131) and (132) which connect the delivery ducts (101) and (102) to the suction region of the venturi tube (9) via two disc-and-spring valves (141) and (142) which are normally closed when the respective delivery ducts (101) and (102) are fed with pressurized liquid, and open when the feed to said ducts is interrupted.

2. A distribution apparatus for delivery devices of the type comprising means (22) for connecting a pump exit duct (6) alternatively to discharge (7) and/or to a duct (5) which via a distribution valve (33) feeds at least two delivery ducts (101), (102), characterised in that in the discharge duct (7) there is located a venturi tube (9), into the main duct of which there extend a duct which bypasses the means (22) and is controlled by a relief valve (8), and a duct (11) which branches from the duct (5) upstream of the distribution valve (33) and is controlled by a normally closed relief valve (212) arranged to open when an overpressure arises due to the closure of one or the other of the delivery ducts (101) or (102) by the distributor (33), there being also provided two branches (131) and (132) which connect the delivery ducts (101) and (102) to the suction region of the venturi tube (9) via two disc-and-spring valves (141) and (142) which are normally closed when the respective delivery ducts (101) and (102) are fed with pressurized liquid, and open when the feed to said ducts is interrupted.

3. A distribution apparatus for delivery devices of the type comprising means (22) for connecting a pump exit duct (6) alternatively to discharge (7) and/or to a duct (5) which via a distribution valve (33) feeds at least two delivery ducts (101), (102), characterised in that in the discharge duct (7) there is located a venturi tube (9), into the main duct of which there extend a duct which bypasses the means (22) and is controlled by a relief valve (8), and two branches (131) and (132) which extend from the delivery ducts (101) and (102) via two disc-and-spring valves (141) and (142) which are normally closed when the respective delivery ducts (101) and (102) are fed with pressurized liquid, and open when the feed to said ducts is interrupted.

4. An apparatus as claimed in the preceding claims, characterised in that a unidirectional diaphragm valve is provided immediately downstream of the venturi tube (9).

5. An apparatus as claimed in the preceding claims, characterised in that the means (22) for alternatively connecting the exit duct (6) to discharge (7) and/or to the duct (5) consist of a casing (2) into which the duct (5) opens, and in which there rotates a body (22) provided with a blind cavity containing a spring and a ball, said ball being arranged, when the body (22) is in two different angular positions, to close the front end of one or the other of two underlying ducts (4) or (5), of which the first is connected to discharge (7) and the second feeds the users (121) and (122).

6. An apparatus as claimed in the preceding claims, characterised in that the distributor (33) is contained within a casing (2) into which the duct (50 feeding the liquid destined for the users opens and which consists of a body comprising at least three cavities (331), (334) and (335) containing a ball which, depending on the particular angular position assumed by the body as it is rotated through successive unit rotations, closes the underlying mouth of one, the other or both the two ducts which lead to the users (101) and (102).

7. An apparatus as claimed in claim 6, characterised in that at least one (335) of the at least three cavities (331), (34) and (335) is of bean shape to enable the ball contained therein to keep the mouth of the underlying duct closed even when the body (33) is rotated through a unit rotation.

8. A distribution apparatus for spray devices, as heretofore described and illustrated for the objects indicated.

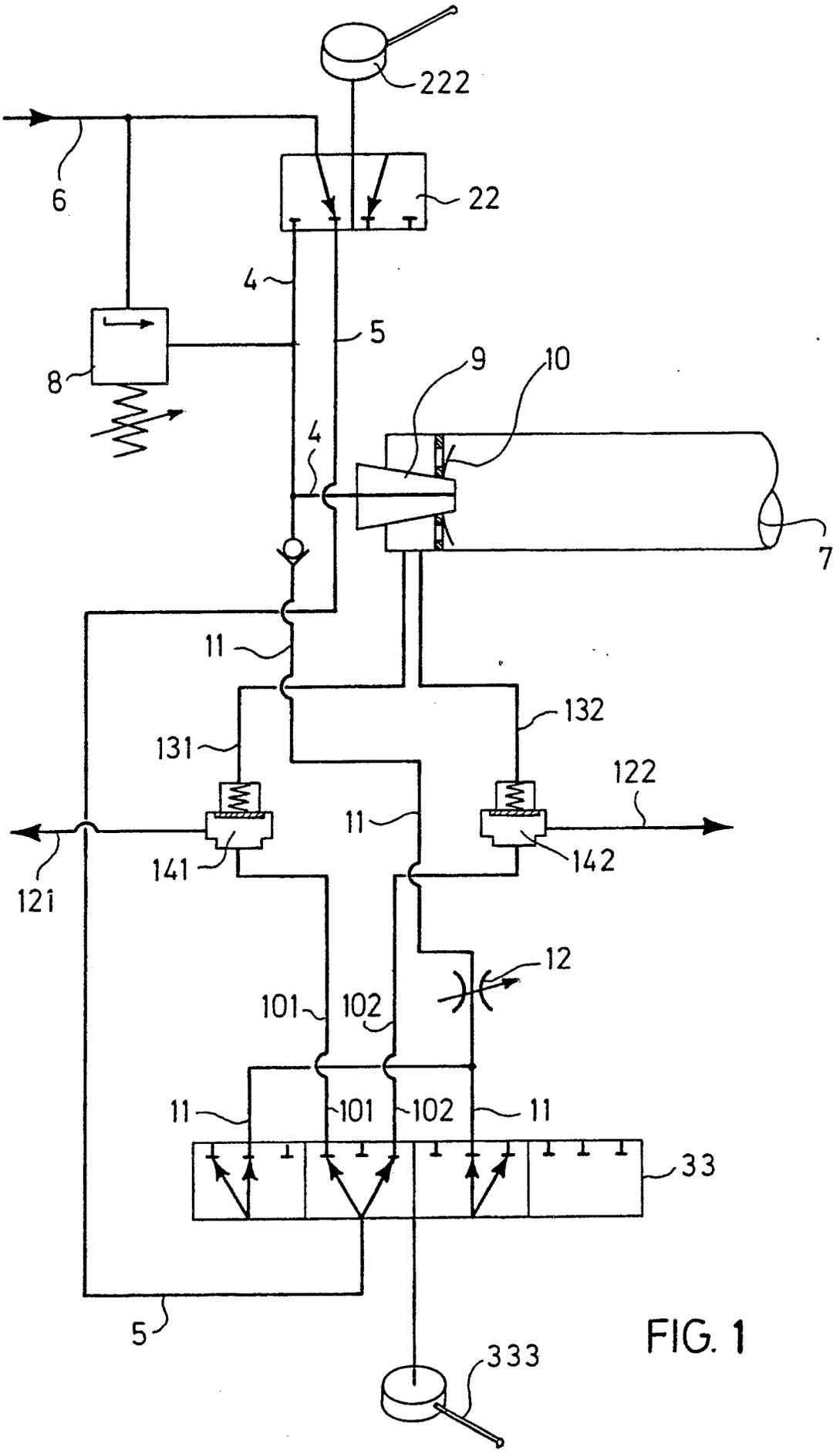
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FIG. 1

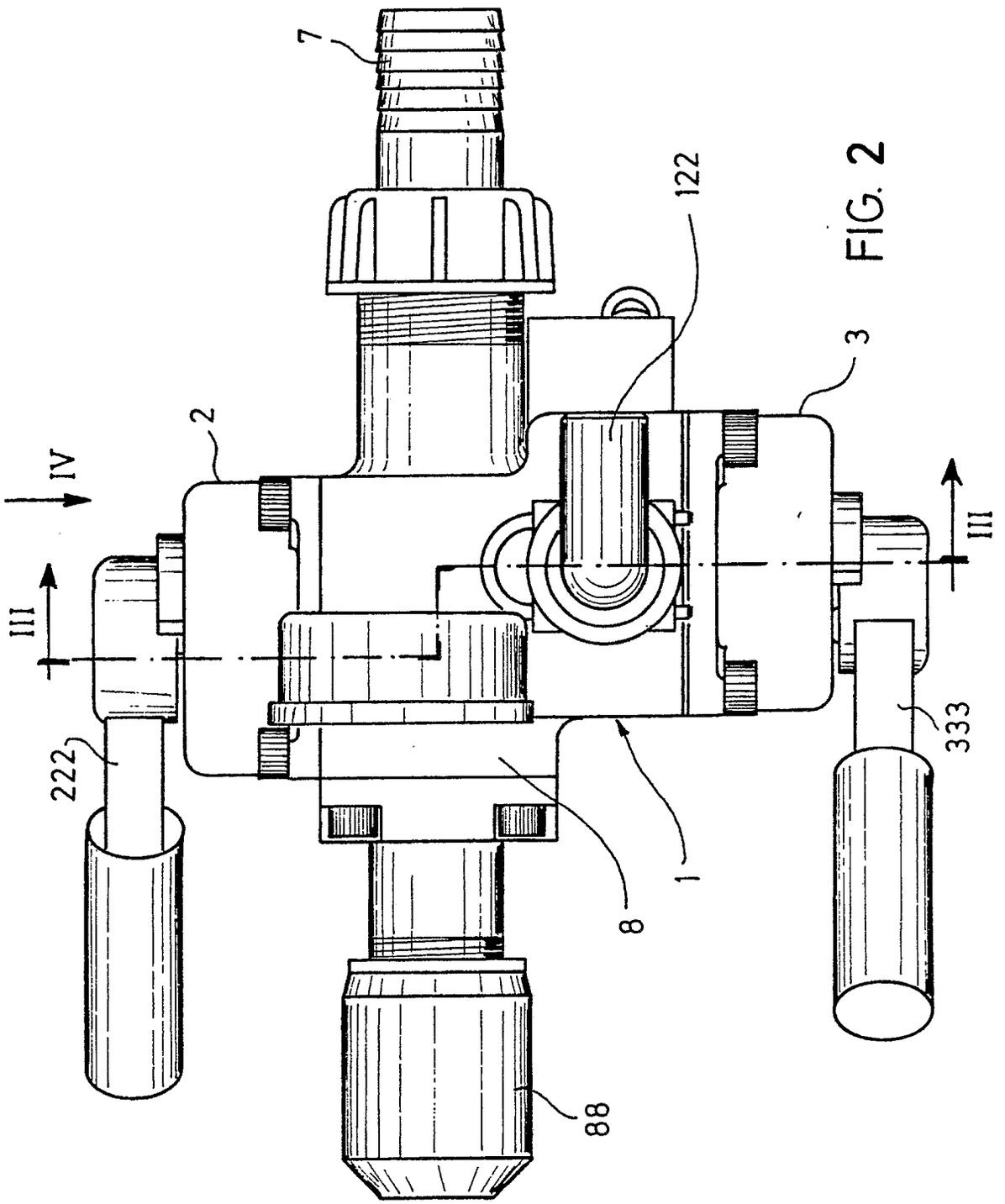


FIG. 2

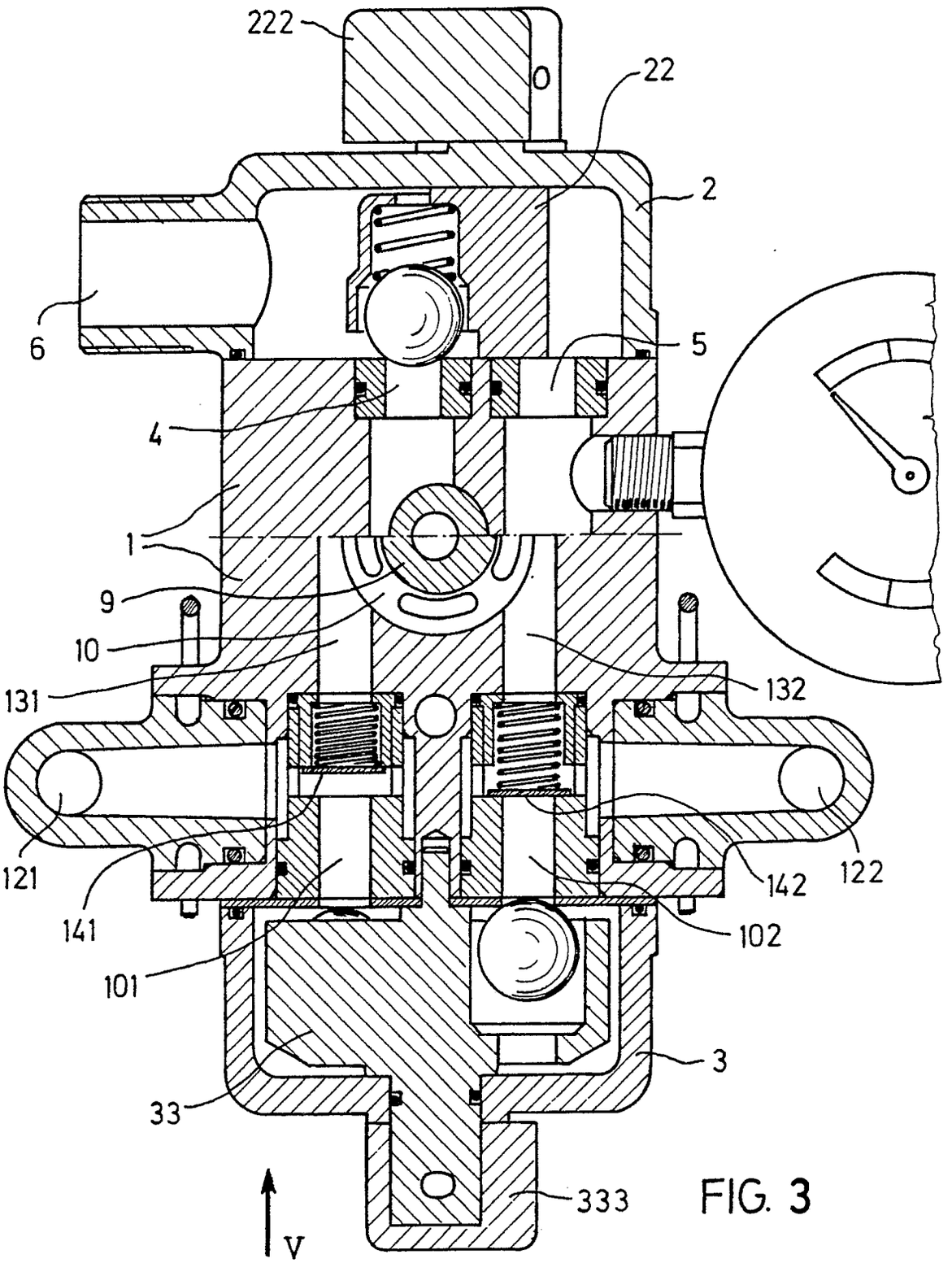


FIG. 3

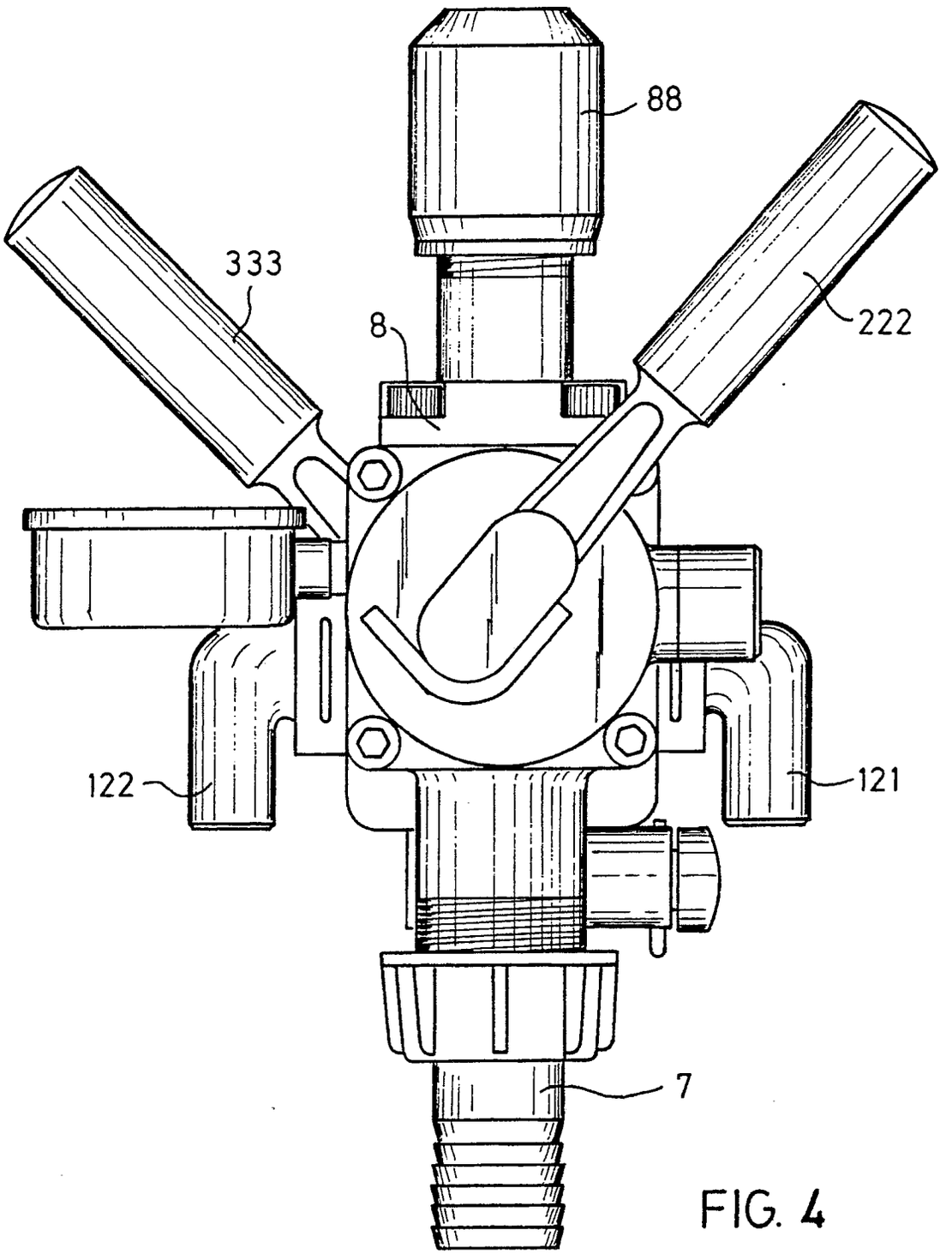


FIG. 4

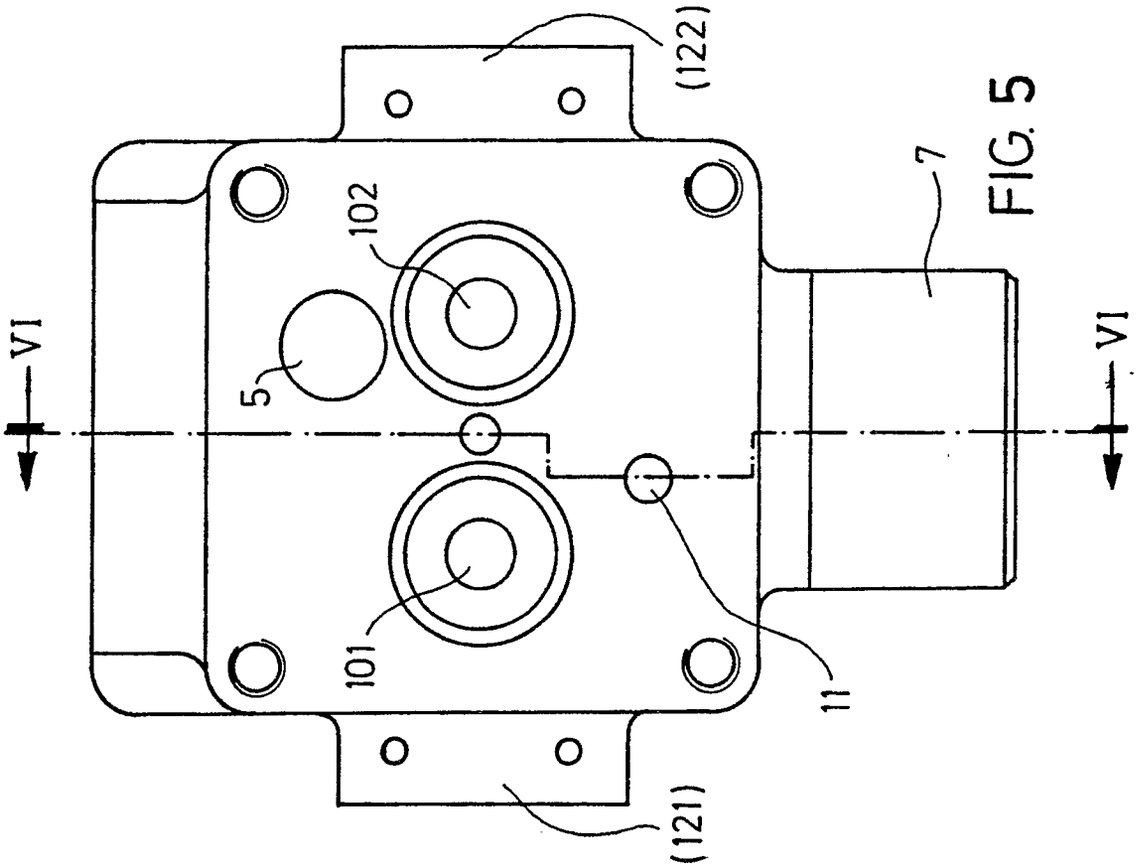


FIG. 5

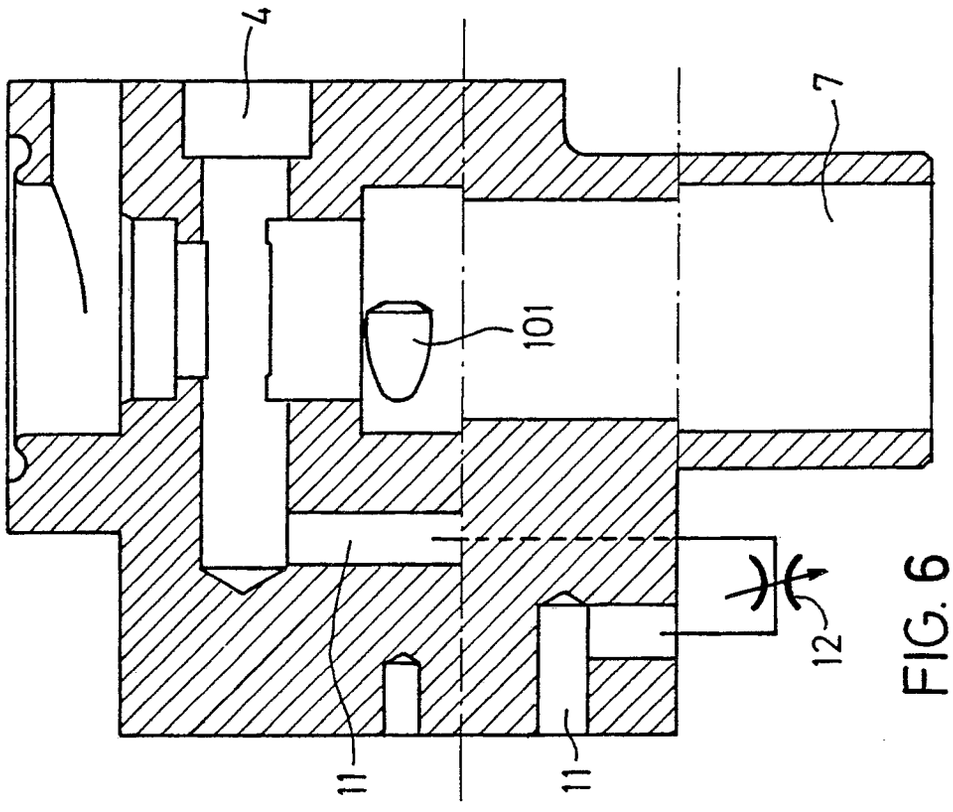


FIG. 6

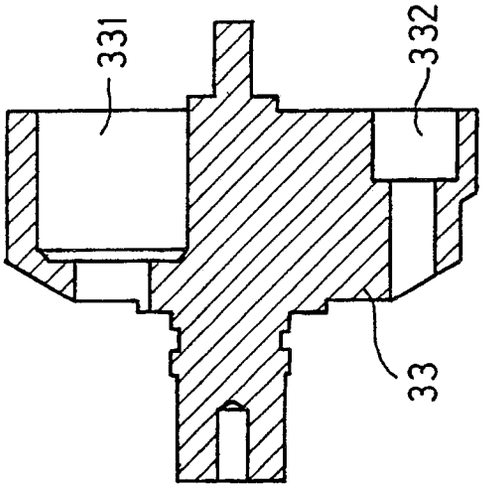


FIG. 7

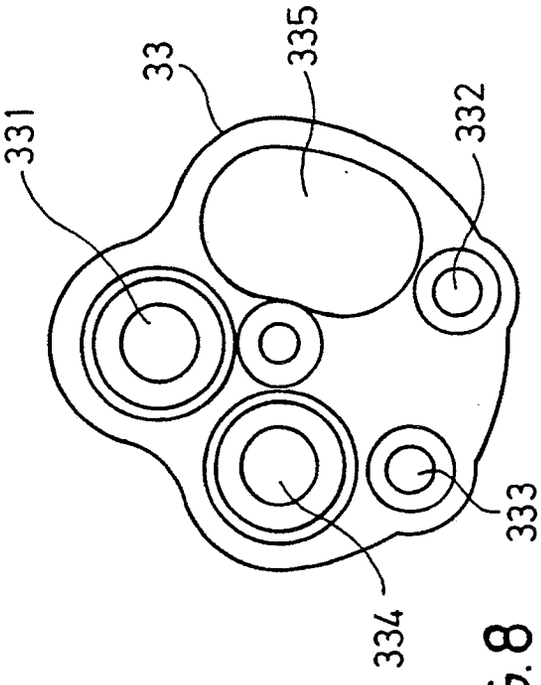
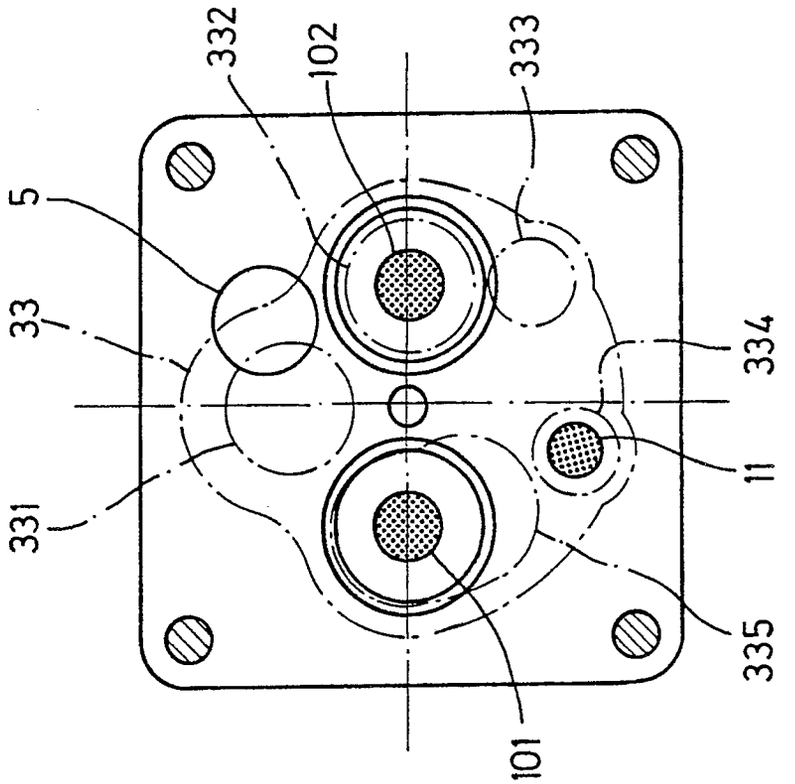


FIG. 8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101

FIG. 9

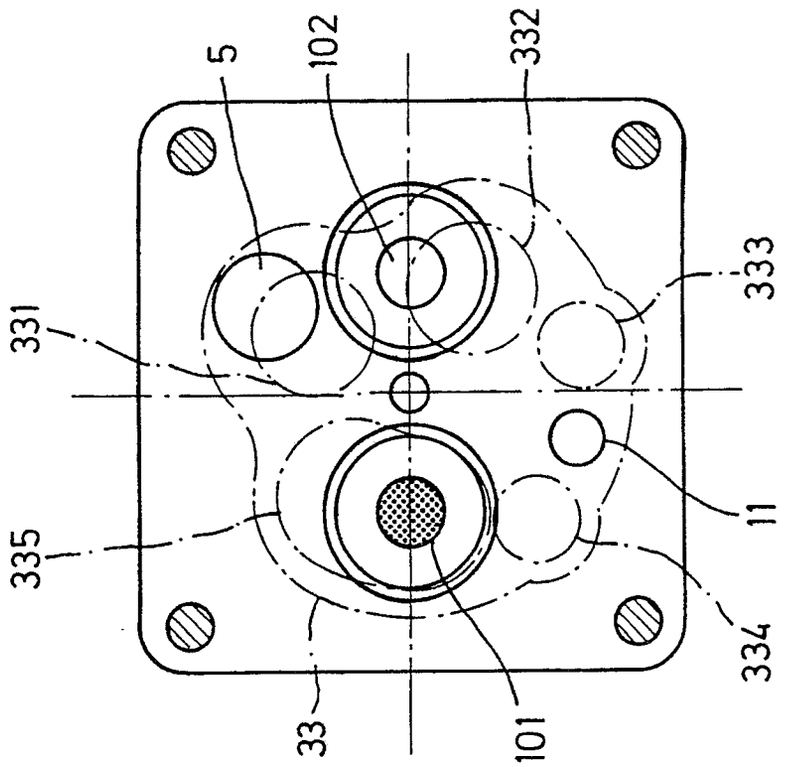
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FIG. 10

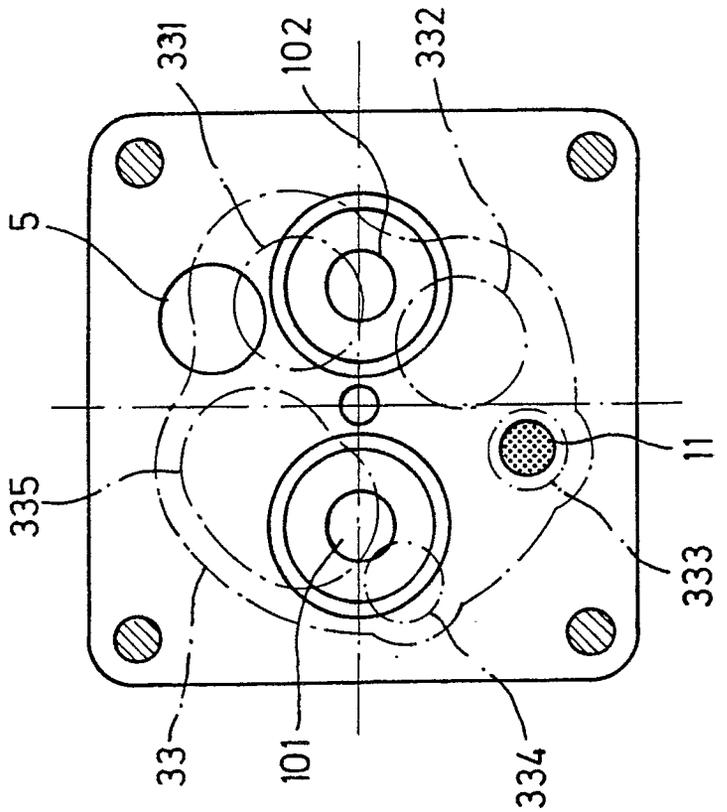
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FIG. 11

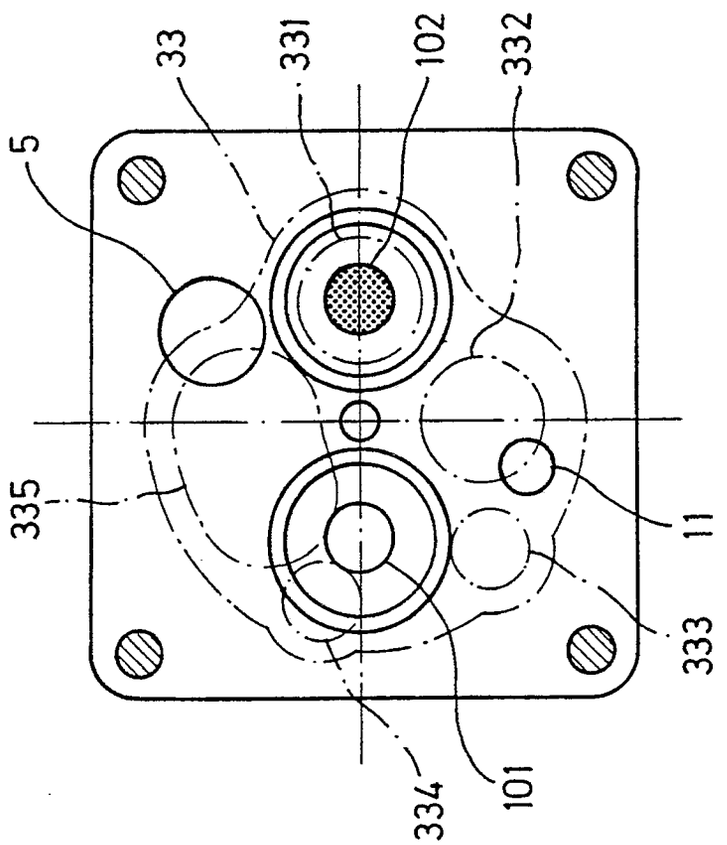
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FIG. 12

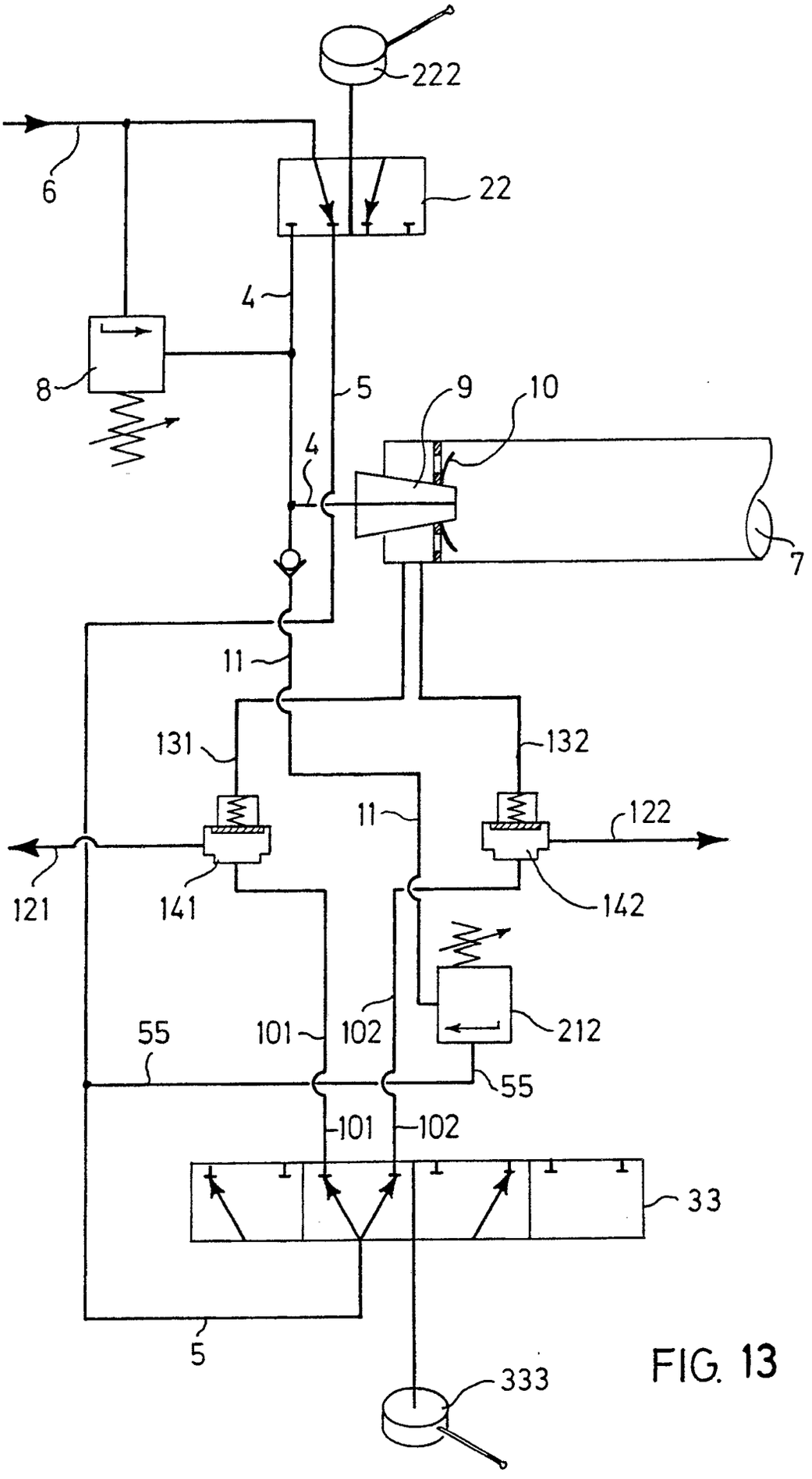
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FIG. 13

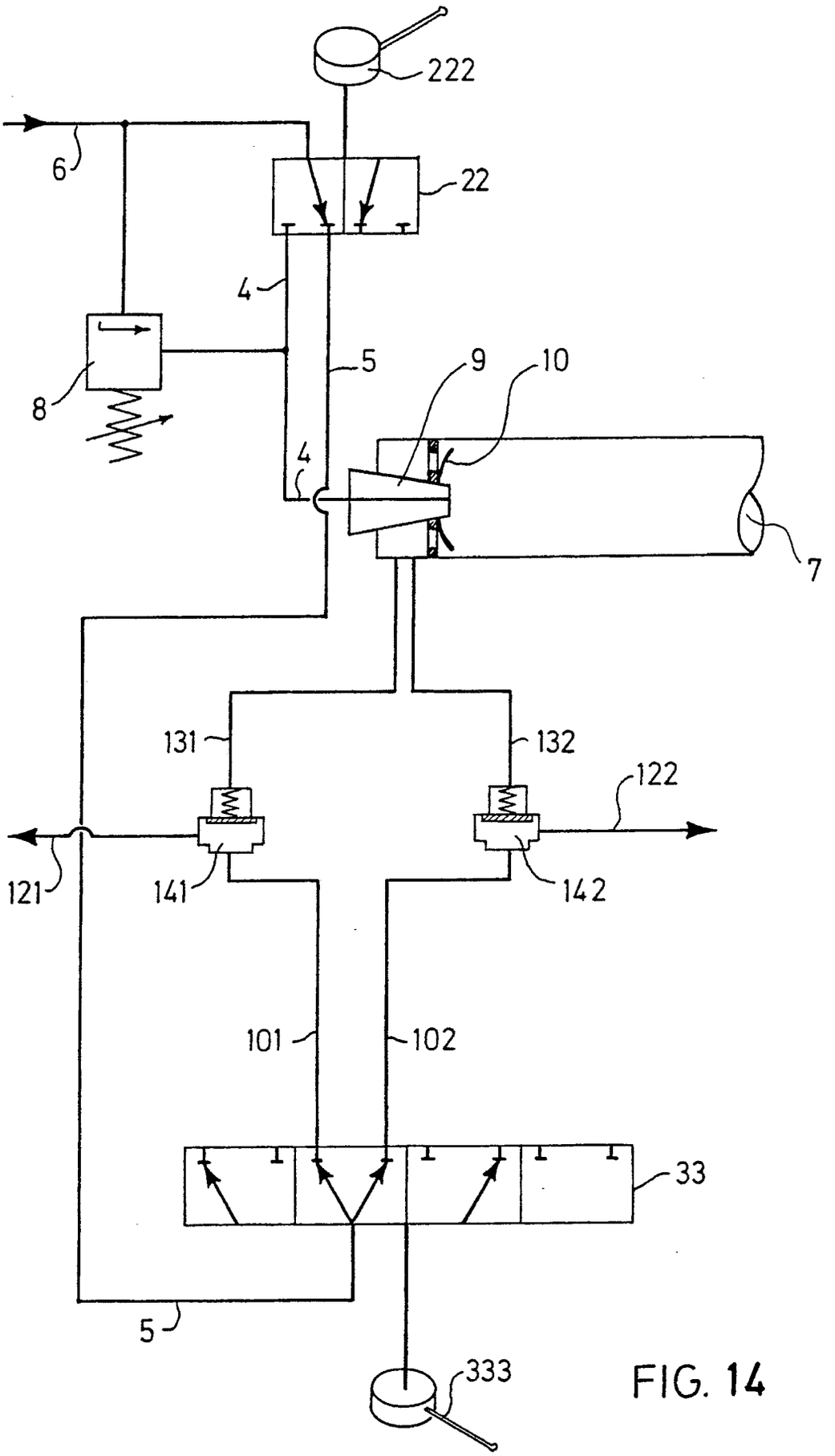

FIG. 14