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(54) Dosage pump

(57) A dosage pump, of the type comprising a hollow body (11) which is adapted to be interposed between pipe portions of a hydraulic circuit and is provided internally with a rotating element (12) provided with vanes, which rotates as a consequence of the flowing fluid and is associated with means (13) for transmission and speed reduction and with means (14) for converting the rotary motion into reciprocating rectilinear motion, which in turn are connected to means (15) for drawing and pumping the liquid to be dosed, the latter means being provided, inside a container (16) for the liquid which is fixed to the hollow body (11), by an injection stem (17) which is moved by the motion conversion means (14) so as to enter and exit with its end (18) from a dosage chamber (19), which on the opposite side with respect to the entry side for the injection stem (17) is closed by a flow control element (20), which is pushed closed by elastic means (21); the chamber (19) is connected to the inside of the container (16) on the side of the stem (17) and to a channel (22) for connection to a tube (23) for the rise of the dosed liquid on the side of the flow control element (20) toward the hollow body (11). The chamber (19) and the connection channel (22) are formed in a single body (24), inside which the flow control element (20) with its elastic closure means (21) is also fitted.

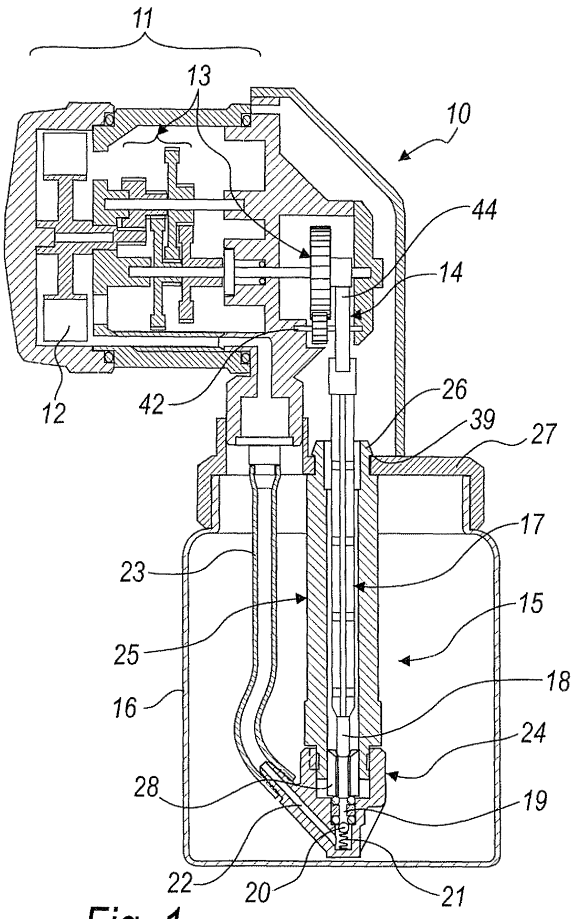

Fig. 1

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Description

[0001] The present invention relates to a dosage pump.

[0002] The pump is adapted particularly but not exclusively for dosing proportionally small amounts of liquids to introduce them in a hydraulic circuit or a system for generating hot water.

[0003] It is known that heating systems particularly for generating sanitary water are subject to the danger of deposits and corrosion due to the presence of calcium and magnesium salts.

[0004] For this reason, it is usual to introduce in the water circuits substances which are adapted to suspend the calcium and magnesium salts, preventing them from precipitating upon heating.

[0005] Dosage pumps, such as the one disclosed and claimed in Italian patent No. 1336867 in the name of this same Applicant, are currently known which comprise, inside a hollow body to be interposed between portions of piping of a hydraulic circuit, an impeller with vanes, which rotates as a consequence of the flowing fluid and, by way of transmission means and means for mechanical reduction of the rotary motion and means for converting the rotary motion into reciprocating rectilinear motion, moves mechanically associated means for drawing and pumping the liquid to be dosed.

[0006] Such means for drawing and pumping the liquid to be dosed are arranged inside a containment vessel, which is fixed to the hollow body, for said liquid, and are provided by an injection stem which is moved by the motion conversion means so as to enter and exit with its end from a dosage chamber.

[0007] Such chamber is closed by a flow control element, which is pushed closed by elastic means, on the opposite side with respect to the entry side of the injection stem.

[0008] Moreover, the chamber is connected to the inside of the containment vessel on the side of the injection stem and to a channel for connection to a tube for the rise of the dosed liquid toward the hollow body on the side of the flow control element.

[0009] Although these known dosage pumps are extensively used and highly appreciated by the market, they have aspects which can be improved.

[0010] The drawing and pumping means in fact comprise, in addition to the injection stem, an inverted cup-shaped body, with which a tubular element, in which the stem slides, ends in a lower region; the cup-shaped body contains a block with a hole in which the end of the injection stem is suitable to enter without play; the cup-shaped body is closed in a lower region by a cover.

[0011] The block forms a seal against the surface of the cup-shaped body which lies opposite the cover by means of annular gaskets.

[0012] The cup-shaped body, the block and the cover, together with the gaskets, form the dosage chamber and the channel for connection to the liquid riser tube.

[0013] Such dosage pump is therefore structurally complex, since it is constituted by numerous components which, in addition to constituting a cost in themselves, force a certain assembly time, which despite being small, in any case affects assembly costs.

[0014] The aim of the present invention is to provide a dosage pump which is simpler and easier to assemble than known types of dosage pump.

[0015] Within this aim, an object of the present invention is to provide a dosage pump in which most of the components can be obtained by molding plastic material.

[0016] Another object of the present invention is to provide a dosage pump which can be manufactured cheaply with known systems and technologies.

[0017] This aim and these and other objects, which will become better apparent hereinafter, are achieved by a dosage pump, of the type which comprises a hollow body which is adapted to be interposed between pipe portions of a hydraulic circuit and is provided internally with a rotating element provided with vanes, which rotates as a consequence of the flowing fluid and is associated with transmission means and speed reduction means and with means for converting the rotary motion into reciprocating rectilinear motion, which in turn are connected to means for drawing and pumping the liquid to be dosed, said means being provided, inside a container for said liquid which is fixed to said hollow body, by an injection stem which is moved by said motion conversion means so as to enter and exit with its end from a dosage chamber, which on the opposite side with respect to the entry side for said injection stem, is closed by a flow control element which is pushed closed by elastic means, said chamber being connected to the inside of said container on the side of said injection stem and to a channel for connection to a tube for the rise of the dosed liquid on the side of said flow control element toward said hollow body, said dosage pump being characterized in that said chamber and said connection channel are formed in a single body, inside which said flow control element with its elastic closure means is also fitted.

[0018] Further characteristics and advantages of the invention will become better apparent from the following detailed description of a preferred but not exclusive embodiment thereof, illustrated by way of nonlimiting example in the accompanying drawings, wherein:

Figure 1 is a sectional side view of a pump according to the invention;

Figure 2 is a view of a detail of Figure 1;

Figure 3 is a top view of a component of the pump according to the invention;

Figure 4 is a sectional view of the component of Figure 3, referenced therein by the line IV-IV;

Figure 5 is a sectional side view of another component of the pump according to the invention;

Figure 6 is a bottom view of the additional component of Figure 5;

Figure 7 is a sectional view of the component of Fig-

ure 3, referenced therein by the line VII-VII;
Figure 8 is a side view of the injection stem of the pump according to the invention.

[0019] With reference to the figures, a dosage pump according to the invention is generally designated by the reference numeral 10.

[0020] The pump 10 comprises a hollow body 11, which is adapted to be interposed between pipe portions of a hydraulic circuit, not shown for the sake of simplicity.

[0021] Inside the hollow body 11 there is a rotary element 12 provided with vanes, which rotates as a consequence of the flowing fluid and is associated with means 13 for transmission and mechanical reduction of the rotary motion and with means 14 for converting the rotary motion into a reciprocating rectilinear motion, which in turn are connected to means 15 for drawing and pumping the liquid to be dosed.

[0022] These last means are provided, inside a container 16 for the liquid to be dosed, which is fixed to the hollow body 11, by an injection stem 17, which is moved by the motion conversion means 14 so as to enter, and exit from, a dosage chamber 19 with its end 18.

[0023] The dosage chamber 19 is closed, on the opposite side with respect to the entry side for the injection stem 17, by a flow control element 20, which is pushed closed by elastic means 21.

[0024] The chamber 19 is connected to the inside of the container 16 on the side of the injection stem 17 and to a channel 22 for connection to a tube 23 for the rise of the dosed liquid toward the hollow body 11 on the side of the flow control element 20.

[0025] The chamber 19 and the connecting channel 22 are formed on a single body 24, inside which the flow control element 20 with its elastic closure means 21 is also fitted.

[0026] The single body 24 substantially replaces the various cup-shaped bodies, blocks and corresponding gaskets which form the dosage chamber and the channel for connection to the liquid riser tube in known types of dosage pump mentioned above.

[0027] The production of a single component allows considerable savings both in terms of molds and in terms of assembly operations.

[0028] The injection stem 17 is adapted to move within a tubular guiding element 25, which is rigidly coupled by a first upper end 26 to snap-acting quick-coupling means to a cover 27 of the container 16; the cover 27 in turn is fixed to the hollow body 11.

[0029] A second lower end 28 of the tubular element 25 is arranged so as to press, within the single body 24, against a first annular sealing gasket 29 at the inlet of the dosage chamber 19.

[0030] The flow control element 20 is constituted by a ball and the elastic means 21 which push it are constituted by a helical spring which rests against the bottom of a connecting channel 30 between the dosage chamber 19 and the channel 22 for connection to the riser tube 23.

[0031] The ball is pushed against a second annular sealing gasket 31 arranged at the outlet of the dosage chamber 19.

[0032] Therefore, the dosage chamber 19 contains the first annular sealing gasket 29 arranged at the inlet of the chamber 19, the second annular sealing gasket 31 arranged in abutment against an underlying shoulder 32 at the outlet of the chamber 19, and, interposed between the two gaskets 29 and 31, a spacer ring 33 whose hole allows the passage without play of the end 18 of the injection stem 17.

[0033] The second lower end 28 of the tubular guiding element 25 is formed by protrusions 34 which guide the end 18 of the stem 17.

[0034] These protrusions 34 press against the first gasket 29.

[0035] The tubular guiding element 25 described here by way of nonlimiting example of the invention comprises four of the guiding protrusions 34, which are arranged symmetrically so as to form between them slots 35 for the passage of the liquid to be dosed toward the dosage chamber 19.

[0036] The liquid flows inside the single body 24 through two ports 36 provided in the single body 24 at the slots 35.

[0037] The means for the snap-acting quick connection of the tubular guiding element 25 to the cover 27 of the container 16 are constituted by at least two mutually opposite elastically deformable tabs 37, which protrude in an axial direction.

[0038] The tabs 37 are each provided, at their end, with a tooth 38 which is adapted to snap into engagement against an abutment edge 39 which is formed by the passage hole, provided in the cover 27, for the first end 26 of the tubular guiding element 25.

[0039] Similar quick connection means speed up considerably the assembly of the pump 10 according to the invention, since it is sufficient to push the first end 26 of the tubular element 25 into the corresponding hole of the cover 27 to achieve the coupling of the two components.

[0040] The single body 24 is adapted to be assembled to the tubular guiding element 25 with a quick coupling of the bayonet type.

[0041] The bayonet coupling is constituted by two mutually opposite and symmetrical wings 39, which protrude radially from the second lower end 28 of the tubular element 25.

[0042] The wings 39 enter the single body 24 through two complementary shaped openings 40, which extend in depth along the direction of the axis of the single body 24 until they affect the ports 36 for the inflow of the liquid by a height which is at least equal to the thickness of the wings 39.

[0043] A generic opening 40 is therefore connected to the nearby and underlying port 36; in this manner, the operator who assembles the two components merely inserts the wings 39 of the tubular element 25 in the corresponding openings 40, pushes them to the bottom of

the openings 40 and then turns the single body 24 so that the wings 39 slide at the ports 36 in an extraction-preventing configuration in which they abut against the upper edge 3 6a of said ports.

[0044] The single body 24, the tubular guiding element 25 and the injection stem 17 can be obtained cheaply by molding plastic material.

[0045] The means 14 for converting rotary motion into reciprocating rectilinear motion are constituted by a cam 41, which is keyed on a shaft 42 which is turned by the means 13 for transmission and mechanical reduction of the rotary motion.

[0046] The cam 41 is inserted in a slot 43 which is formed in a head 44 of the injection stem 17.

[0047] The slot 43 has such a width as to allow the complete rotation of the cam 41 inside it without the head 44 of the stem 17 being pushed and moved transversely to the axis of the stem 17; the height of the slot 43 is further such that the cam 41 can push the stem 17 upward and downward.

[0048] In particular, in the embodiment described here by way of nonlimiting example of the invention, the cam 41 is constituted by an eccentric disk, the diameter of which is substantially equal to the height of the slot 43.

[0049] In practice it has been found that the invention thus described solves the problems noted in known types of dosage pump.

[0050] In particular, the present invention provides a dosage pump which is simpler and quicker to assemble than known types of dosage pump.

[0051] Moreover, the present invention provides a dosage pump in which most of the components can be obtained by molding plastic material.

[0052] Moreover, the present invention provides a dosage pump which can be manufactured cheaply with known systems and technologies.

[0053] In practice, the materials employed, so long as they are compatible with the specific use, as well as the dimensions, may be any according to requirements and to the state of the art.

[0054] The disclosures in Italian Utility Model Application No. PD2006U000025 from which this application claims priority are incorporated herein by reference.

[0055] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. A dosage pump, of the type comprising a hollow body (11) which is adapted to be interposed between pipe portions of a hydraulic circuit and is provided internally with a rotating element (12) provided with vanes, which rotates as a consequence of the flowing fluid and is associated with means (13) for transmission and speed reduction and with means (14) for converting the rotary motion into reciprocating rectilinear motion, which in turn are connected to means (15) for drawing and pumping the liquid to be dosed, said means being provided, inside a container (16) for said liquid which is fixed to said hollow body (11), by an injection stem (17) which is moved by said motion conversion means (14) so as to enter and exit with its end (18) from a dosage chamber (19), which on the opposite side with respect to the entry side for said injection stem (17) is closed by a flow control element (20), which is pushed closed by elastic means (21), said chamber (19) being connected to the inside of said container (16) on the side of said injection stem (17) and to a channel (22) for connection to a tube (23) for the rise of the dosed liquid on the side of said flow control element (20) toward said hollow body (11), said dosage pump being **characterized in that** said chamber (19) and said connection channel (22) are formed in a single body (24), inside which said flow control element (20) with its elastic closure means (21) is also fitted.

2. The dosage pump according to claim 1, **characterized in that** said injection stem (17) is adapted to perform a translational motion within a tubular guiding element (25), which is coupled by means of a first upper end (26), with snap-acting quick-coupling means, to the cover (27) of said container (16) which contains the liquid, its second lower end (28) being arranged so as to press, inside said single body (24), against an annular sealing gasket (29) at the inlet of said dosage chamber (19).

3. The dosage pump according to one or more of the preceding claims, **characterized in that** said flow control element (20) is constituted by a ball and said elastic means (21) which push it are constituted by a helical spring which rests against the bottom of a channel (30) for connection between said dosage chamber (19) and said channel (22) for connection to said riser tube (23), said ball being pushed against an annular sealing gasket (31) which is arranged at the outlet of said dosage chamber (19).

4. The dosage pump according to one or more of the preceding claims, **characterized in that** said dosage chamber (19) contains a first annular sealing gasket (29), which is arranged at the inlet of said chamber (19), a second annular sealing gasket (31), which is arranged in abutment against an underlying shoulder (32) at the outlet of said chamber (19), and a spacer ring (33), which is interposed between the two gaskets (29, 31) and whose axial hole allows the passage without play of the end (18) of said injection stem (17).

5. The dosage pump according to one or more of the preceding claims, **characterized in that** said second lower end (28) of said tubular guiding element (25) is formed by guiding protrusions (34) for said end (18) of the injection stem (17), said protrusions (34) being adapted to press against said first gasket (29).

6. The dosage pump according to claim 5, **characterized in that** it comprises four of said guiding protrusions (34) which are arranged symmetrically as so as to form between them slots (35) for the passage of the liquid to be dosed toward said dosage chamber (19).

7. The dosage pump according to one or more of the preceding claims, **characterized in that** said means for the snap-action quick connection of said tubular guiding element (25) to the cover (27) of said container (16) are constituted by at least two mutually opposite elastically deformable tabs (37), which are elongated in an axial direction and are each provided at their end with a tooth (38) which is adapted to snap into engagement against an abutment edge (39) formed by the passage hole, provided in the cover (27), for said first end (26) of the tubular guiding element (25).

8. The dosage pump according to one or more of the preceding claims, **characterized in that** said single body (24) is adapted to be assembled to said tubular guiding element (25) with a quick coupling of the bayonet type.

9. The dosage pump according to one or more of the preceding claims, **characterized in that** said single body (24), said tubular guiding element (25) and said injection stem (17) are each obtained by molding plastic material.

10. The dosage pump according to one or more of the preceding claims, **characterized in that** said means (14) for converting rotary motion into reciprocating rectilinear motion are constituted by a cam (41), which is keyed on a shaft (42) which is turned by said means (13) for transmission and mechanical reduction of rotary motion, said cam (41) being inserted in a slot (43) which is formed in the head (44) of the injection stem (17), said slot (43) having such a width as to allow complete rotation of the cam (41) inside it without said head (44) of the stem (17) being pushed transversely to the axis of said stem (17), said slot (43) also having such a height that said cam (41) can push the stem (17) downward and upward.

11. The dosage pump according to claim 10, **characterized in that** said cam (41) is constituted by an eccentric disk, whose diameter is substantially equal to the height of said slot (43).

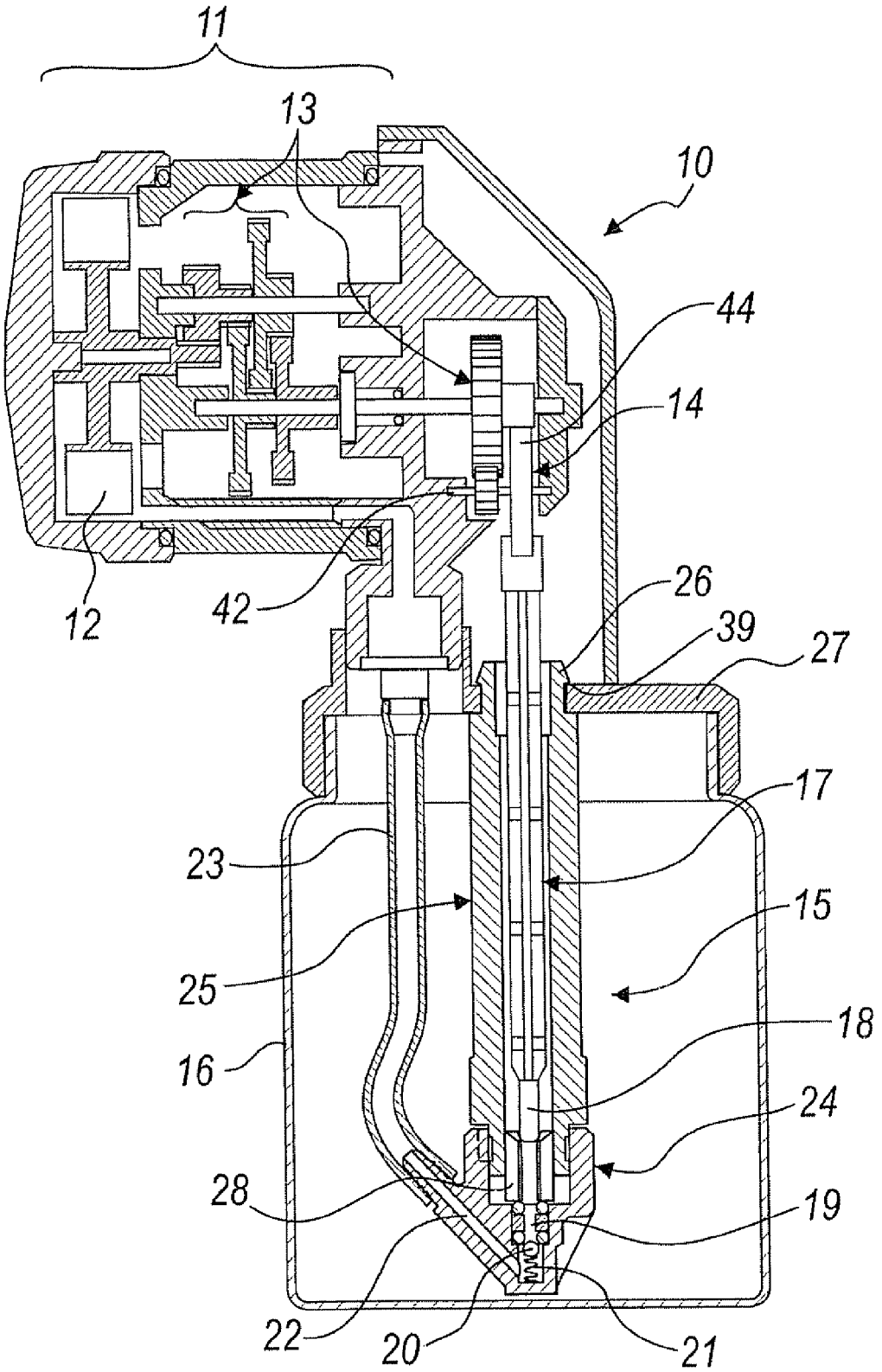

Fig. 1

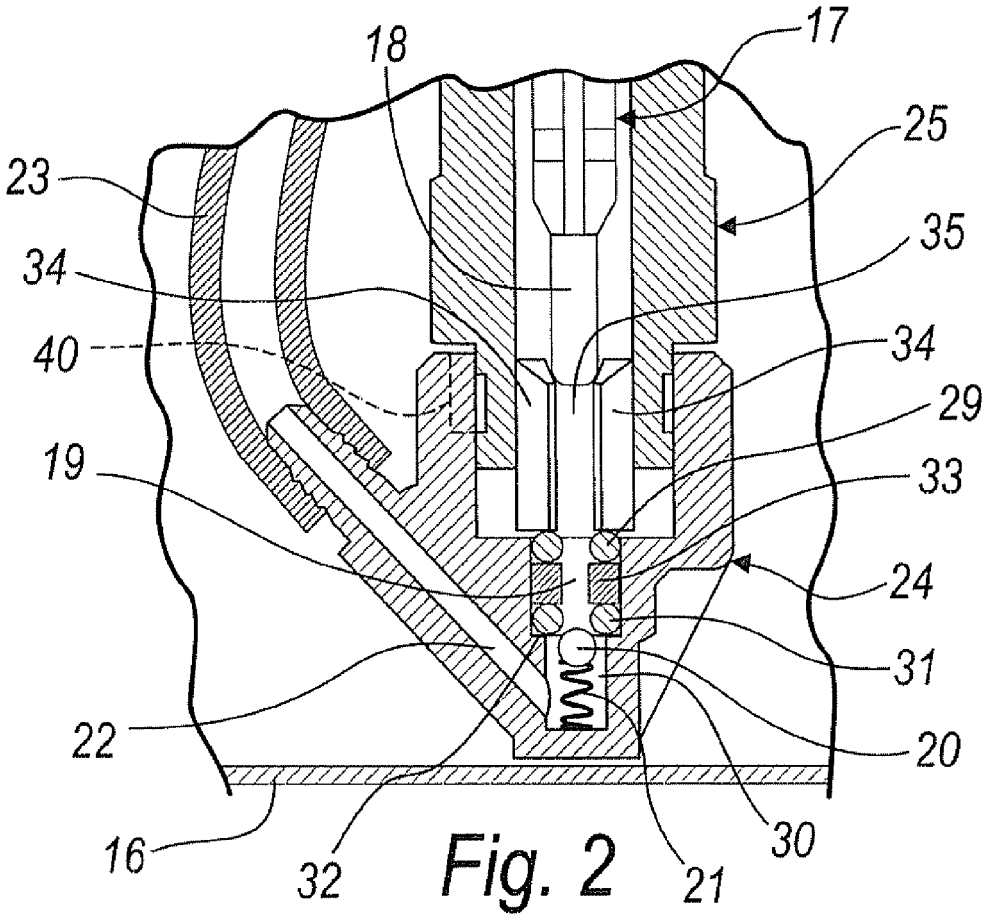

Fig. 2

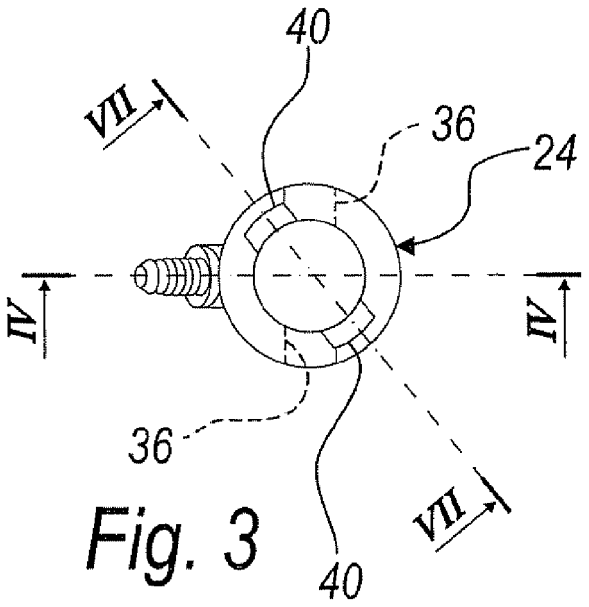

Fig. 3

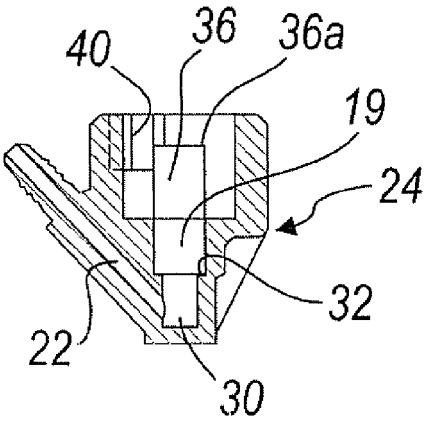

Fig. 4

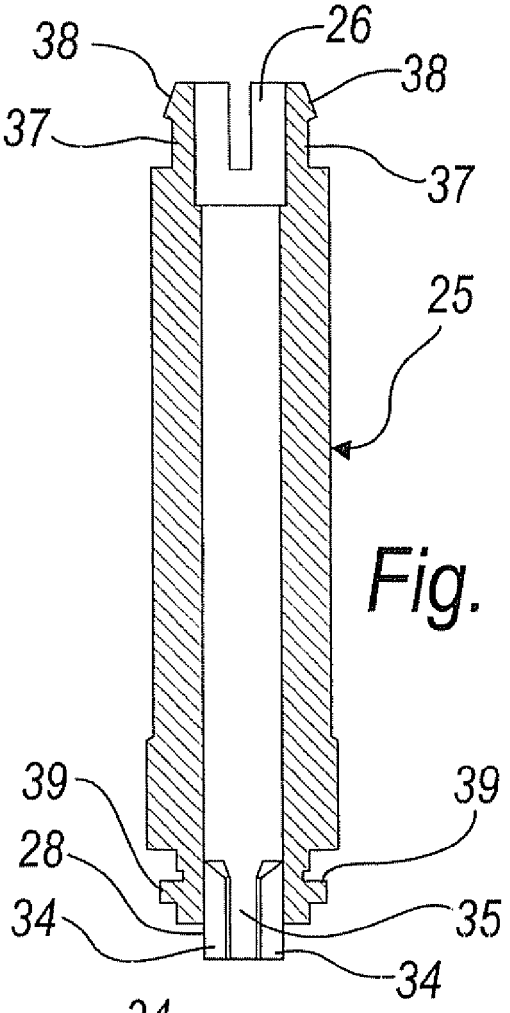

Fig. 5

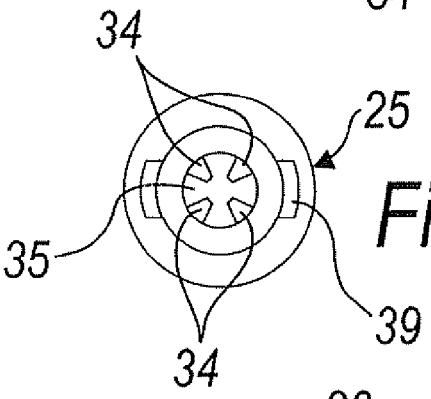

Fig. 6

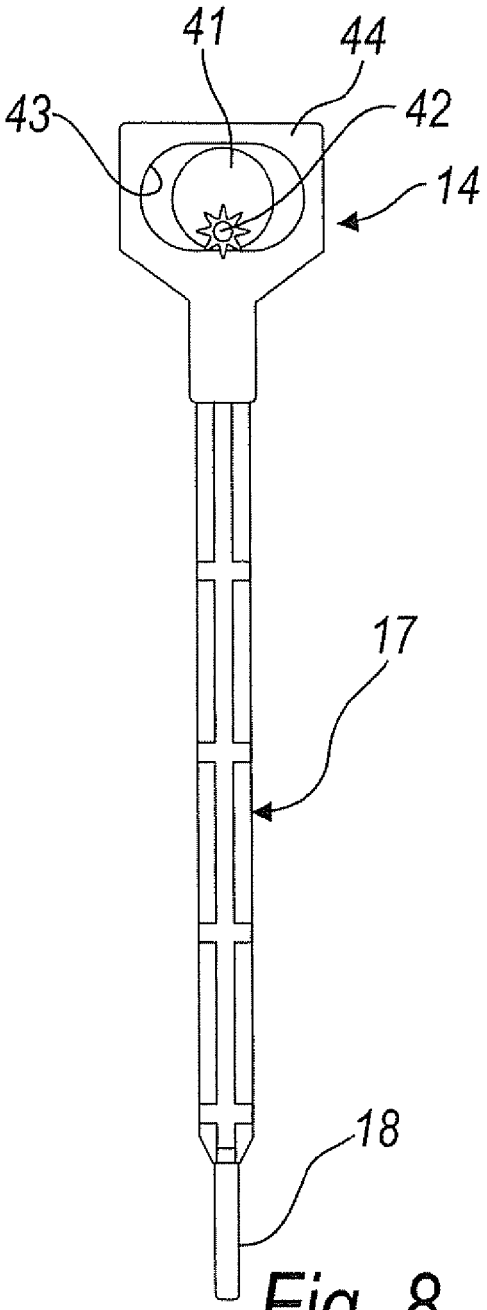

Fig. 8

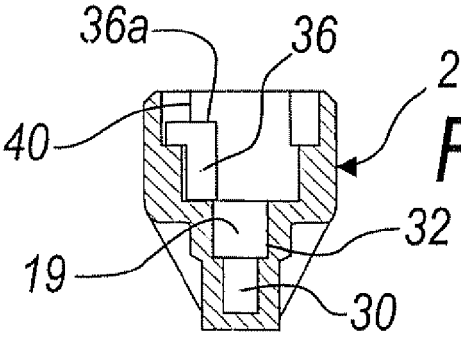

Fig. 7

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- IT 1336867 **[0005]**
- IT PD20060025 U **[0054]**