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(54) **PUMPING DEVICE**

(57) A pumping device comprises means for drawing and pumping (15) disposed inside a container (16) for drawing and pumping the liquid to be dosed, and comprising an injection stem (17) intended to translate inside a tubular guiding element (25); said pumping device (10) comprising a dosage chamber (19) integral with the tubular guiding element (25), and a flow control element (20) held in position by a closure plug (5) adapted to be hermetically engaged at the base of the tubular guiding elements (25) in order to close an outlet (19b) of the dosage chamber (19).

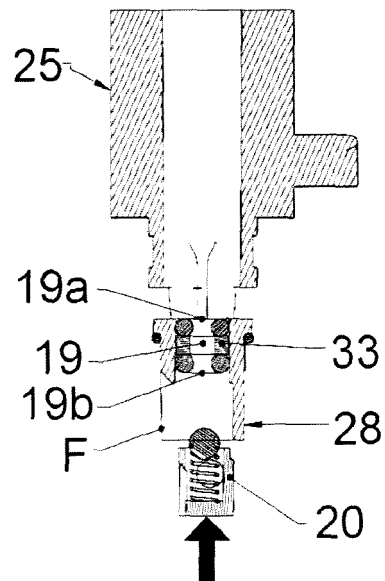


FIG. 3A

Description

[0001] The present patent application for industrial invention relates to a pumping device provided with a dosage unit.

[0002] The reference field is the field of pumping devices intended to pump liquids inside conduits of a hydraulic circuit.

[0003] EP1832746 discloses a dosage pump, shown in Fig. 1, comprising a hollow body (11) which is adapted to be interposed between pipe portions of a hydraulic circuit. The hollow body (11) houses a rotating element (12) provided with vanes, which rotates as a consequence of the fluid flowing between the two pipe portions of the hydraulic circuit.

[0004] The dosage pump comprises means (15) for drawing and pumping the liquid to be dosed and introduced in said hydraulic circuit, and means (14) for converting the motion that connect the rotating element (12) provided with vanes with said means (15) for drawing and pumping, in such manner that a rotation of the rotating element (12) provided with vanes generates a translation of the means (15) for drawing and pumping.

[0005] The means (15) for drawing and pumping are disposed inside a container (16) that contains the liquid to be pumped and is fixed to the hollow body (11); said means (15) for drawing and pumping comprise an injection stem (17) provided with an end (18) that slides inside a dosage chamber (19).

[0006] In particular, the dosage chamber (19) comprises:

- an inlet (19a) for the liquid to be dosed, intended to be crossed by the end (18) of the injection stem (17) in such manner that the injection stem (17) injects the liquid to be dosed inside the dosage chamber (19); and
- an outlet (19b) for the dosed liquid, intended to be closed by a flow control element (20) pushed in closed position by elastic closure means (21).

[0007] More precisely, said flow control element (20) can be in a closing position, wherein the flow control element (20) closes the outlet (19b) of the dosage chamber (19), and in an opening position, wherein the flow control element (20) does not close the outlet (19b) of the dosage chamber (19), allowing a dose of liquid to come out of the dosage chamber (19).

[0008] Moreover, the dosage pump comprises a connecting channel (22) in communication with the dosage chamber (19) and connecting the dosage chamber (19) with a riser tube (23) of the dosed liquid.

[0009] The dosage chamber (19) and the connecting channel (22) are defined in a single body (24), shown in Fig. 1A. The single body (24) also comprises the flow control element (20) and the elastic closure means (21) of the flow control element (20).

[0010] The major drawbacks of the pumping device

disclosed in patent EP1832746 include the fact that the assembly and disassembly of all the components of the single body (24) require certain operating sequences that make the assembly/disassembly operations difficult and prevent said operations from being automated.

[0011] In fact, the replacement, maintenance and cleaning of the flow control element (20) and of the relevant elastic closure means (21) are only possible after disassembling the dosage chamber (19) from the single body (24).

[0012] Moreover, the assembly of the flow control element (20) and of the relevant elastic closure means (21) inside the single body (24) must necessarily take place before the assembly of the dosage chamber (19) inside the single body (24).

[0013] The purpose of the present invention is to eliminate the drawbacks of the prior art by devising a pumping device that is easy to assemble/disassemble and maintain.

[0014] This purpose is achieved according to the invention with the characteristics claimed in the independent claim 1.

[0015] Advantageous embodiments of the invention will appear from the dependent claims.

[0016] The pumping device of the invention comprises:

- a hollow body adapted to be interposed between pipe portions of a hydraulic circuit;
- a rotating element provided with vanes disposed inside the hollow body and intended to be driven into rotation by the fluid flowing between the two pipe portions of the hydraulic circuit,
- kinematic reduction means disposed inside the hollow body and connected to the rotating element provided with vanes to reduce the rotational speed of the rotating element provided with vanes,
- means for drawing and pumping disposed inside a container fixed to the hollow body for drawing and pumping the liquid to be dosed; said means for drawing and pumping comprising an injection stem adapted to translate inside a tubular guiding element;
- motion conversion means disposed inside the hollow body that connect the rotating element provided with vanes to said means for drawing and pumping in such manner that a rotation of the rotating element provided with vanes generates a translation of the means for drawing and pumping,
- a dosage chamber comprising an inlet for the liquid to be dosed, intended to be crossed by an end of the injection stem in such manner that the injection stem injects the liquid to be dosed inside the dosage chamber, and an outlet for the dosed liquid; said dosage chamber being in communication with a riser tube of the dosed liquid through a connecting channel;
- a flow control element intended to close the outlet of the dosage chamber;
- a closure plug provided with a connecting channel through which the dosed liquid is conveyed into a

riser tube connected to the hydraulic circuit.

[0017] The peculiarity of the pumping device of the invention consists in that:

- the dosage chamber is integral with the tubular guiding element and is disposed inside a lower end of the tubular guiding element, and
- the flow control element is disposed inside said lower end of the tubular guiding element under the dosage chamber;
- ditto closure plug is intended to exactly house said lower end of the tubular guiding element in such manner to guarantee the transfer of a liquid dose towards the riser tube.

[0018] Additional characteristics of the invention will appear evident from the detailed description below, which refers to a merely illustrative, not limiting, embodiment, illustrated in the attached drawings, wherein:

Fig. 1 is a side view in longitudinal section of a pumping device according to the prior art;

Fig. 1A is an enlarged view of the detail of Fig. 1 enclosed in circle A-A;

Fig. 2 is a side view in a partial section of the pumping device according to the present invention;

Fig. 3A is a view in longitudinal section of the lower end of the tubular guiding element and of the flow control element of the pumping device according to the present invention, in non-assembled condition, Fig. 3B is the same as Fig. 3A, except for it shows the lower end of the tubular guiding element and the flow control element of the pumping device according to the present invention, in assembled condition; Fig. 4A is the same as Fig. 3B, except for it also shows the closure plug engaged at the base of the lower end of the tubular guiding element.

[0019] Referring to Fig. 2, a pumping device according to the invention is disclosed, being comprehensively indicated with reference number (10).

[0020] The pumping device (10) comprises a hollow body (11) adapted to be interposed between two pipe portions of a hydraulic circuit (not shown in the attached figures).

[0021] The pumping device (10) comprises a rotating element (12) provided with vanes that is disposed inside the hollow body (11) and is intended to be driven into rotation by the fluid flowing between the two pipe portions of the hydraulic circuit.

[0022] The pumping device (10) also comprises means (15) for drawing and pumping the liquid to be dosed, as well as motion conversion means (14) that connect the rotating element (12) provided with vanes with said means (15) for drawing and pumping the liquid, in such manner that a rotation of the rotating element (12) provided with vanes generates a translation of the

means (15) for drawing and pumping the liquid.

[0023] Kinematic reduction means (13) are connected to the rotating element (12) provided with vanes to reduce the rotational speed of said motion conversion means (14).

[0024] The means for drawing and pumping (15) are disposed inside a container (16) fixed to the hollow body (11) and comprise an injection stem (17) intended to translate inside a tubular guiding element (25) internally comprising four protrusions (34) intended to act as guide for an end (18) of the injection stem (17).

[0025] With reference to Fig. 3A, the tubular guiding element (25) comprises a lower end (28) intended to house a dosage chamber (19).

[0026] The dosage chamber (19) comprises:

- an inlet (19a) for the liquid to be dosed, intended to be crossed by the end (18) of the injection stem (17) in such manner that the injection stem (17) injects the liquid to be dosed inside the dosage chamber (19); and
- an outlet (19b) for the dosed liquid, in axially opposite position with respect to the inlet (19a).

[0027] In particular, it must be noted that the liquid contained in the container (16) is conveyed into the inlet (19a) passing through a series of slots (19c) obtained in the tubular guiding element (25).

[0028] As shown in Figs. 3A and 3B, the dosage chamber (19) comprises a spacer ring (33).

[0029] Moreover, said dosage chamber (19) comprises a first annular sealing gasket (29) arranged at the inlet (19a) of the dosage chamber (19), and a second annular sealing gasket (31) arranged at the outlet (19b) of the dosage chamber (19).

[0030] With reference to Figs. 3A and 3B, the pumping device (10) comprises a flow control element (20) disposed inside the lower end (28) of the tubular guiding element (25), under the dosage chamber (19) to close the outlet (19b) of the dosage chamber (19).

[0031] More precisely, said flow control element (20) can be in a closing position, wherein the flow control element (20) closes the outlet (19b) of the dosage chamber (19), and in an opening position, wherein the flow control element (20) does not close the outlet (19b) of the dosage chamber (19), thus transferring a dose of liquid from the dosage chamber (19) to the connecting channel (22).

[0032] The flow control element (20) is composed of a cylindrical hollow body (50) comprising a bottom (50a) and an upper opening in opposite position to said bottom (50a). The hollow body (50) of the flow control element (20) housing a ball (S) and elastic means (21) intended to push said ball (S) in closing position. The elastic means (21) comprise a helical spring that rests against the bottom (50a) of the hollow body (50) of the flow control element (20) and is intended to push the ball (S) against the second annular sealing gasket (31) arranged at the outlet (19b) of the dosage chamber (19). The hollow body

(50) of the flow control element (20) comprises a lateral opening (51) arranged in correspondence of a lateral opening (F) of the lower end (28) of the tubular guiding element (25).

[0033] The pumping device (10) also comprises a closure plug (5) intended to be hermetically engaged at the base of the tubular guiding element (25) where a sealing gasket (25a) is specifically provided. The closure plug (5) comprises a connecting channel (22) through which the dosed liquid is conveyed into the riser tube (23) connected to the hydraulic circuit.

[0034] In view of the above, once it is engaged on the tubular guiding element (25), the closure plug (5) guarantees the transfer of the pumped dose from the dosage chamber (19) towards the riser tube (23) of the dosed liquid (Fig. 4A).

[0035] In particular, when the closure plug (5) is engaged on the tubular guiding element (25), the lateral opening (F) of the lower end (28) of the tubular guiding element (25) is interposed between the lateral opening (51) of the hollow body (50) of the flow control element (20) and an inlet (22a) of the connecting channel (22) of the closure plug (5) in such manner to transfer the liquid dose from the dosage chamber (19) to the connecting channel (22).

[0036] Because of such a position of the dosage chamber (19) and of the flow control element (20), the flow control element (20) can be disassembled, replaced or cleaned without having to disassemble the dosage chamber (19) previously, unlike the device disclosed in patent EP1832746.

[0037] In view of the above, the assembly/disassembly of the flow control element (20) and the assembly/disassembly of the dosage chamber (19) can be carried out separately in different moments.

[0038] Moreover, the assembly/disassembly procedures of the flow control element (20) and of the dosage chamber (19) can be automated because the flow control element (20) and the dosage chamber (19) can be assembled/disassembled in different moments without having to follow a mandatory operating sequence.

[0039] Variations and modifications can be made to the present embodiments of the invention, within the reach of an expert of the field, while still falling within the scope of the invention.

Claims

1. Pumping device (10) comprising:

- a hollow body (11) adapted to be interposed between pipe portions of a hydraulic circuit;
- a rotating element (12) provided with vanes disposed inside the hollow body (11) and intended to be driven into rotation by the fluid flowing between the pipe portions of the hydraulic circuit,

- kinematic reduction means (13) disposed inside the hollow body (11) and connected to the rotating element (12) provided with vanes,
- means (15) for drawing and pumping disposed inside a container (16) fixed to the hollow body (11) for drawing and pumping the liquid to be dosed; said means (15) for drawing and pumping comprising an injection stem (17), adapted to translate inside a tubular guiding element (25);
- motion conversion means disposed inside the hollow body (11) that connect the rotating element (12) provided with vanes with said means (15) for drawing and pumping in such manner that a rotation of the rotating element (12) provided with vanes generates a translation of the means (15) for drawing and pumping,
- a dosage chamber (19) comprising an inlet (19a) for the liquid to be dosed, intended to be crossed by an end (18) of the injection stem (17) in such manner that the injection stem (17) injects the liquid to be dosed inside the dosage chamber (19), and an outlet (19b) for the dosed liquid; said dosage chamber (19) being in communication with a riser tube (23) of the dosed liquid through a connecting channel (22);
- a flow control element (20) intended to close the outlet (19b) of the dosage chamber (19);
- a closure plug (5) provided with a connecting channel (22) through which the dosed liquid is conveyed into a riser tube (23) connected to the hydraulic circuit.

characterized in that

- the dosage chamber (19) is integral with the tubular guiding element (25) and is disposed inside a lower end (18) of the tubular guiding element (25), and
- said flow control element (20) is disposed inside the lower end (28) of the tubular guiding element (25), under the dosage chamber (19), to close the outlet (19b) of the dosage chamber (19);
- said closure plug (5) is intended to exactly house said lower end (28) of the tubular guiding element (25) in such manner to guarantee the transfer of a liquid dose towards the riser tube (23).

2. The pumping device (10) of claim 1, wherein said tubular guiding element (25) comprises slots (19c) intended to be crossed by the liquid contained in the container (16) in such manner that said liquid flows into the inlet (19a) of the dosage chamber (19).
3. The pumping device (10) of claim 1 or 2, wherein the dosage chamber (19) comprises a spacer ring (33),

a first annular sealing gasket (29) arranged at the inlet (19a) of the dosage chamber (19), and a second annular sealing gasket (31) arranged at the outlet (19b) of the dosage chamber (19).

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4. The pumping device (10) of any one of the preceding claims, wherein the flow control element (20) comprises:

- a hollow body (50) comprising a bottom (50a) and an upper opening in opposite position to said bottom (50a);
- a ball (S) housed inside said hollow body (50);
- elastic means (21) housed inside said hollow body (50) to push the ball (S) in closing position.

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5. The pumping device (10) of claim 4, wherein said elastic means (21) comprise a helical spring that rests against the bottom (50a) of the hollow body (50) of the flow control element (20) and intended to push the ball (S) against said outlet (19b) of the dosage chamber (19).

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6. The pumping device (10) of any one of the preceding claims, wherein, when the closure plug (5) is engaged on the tubular guiding element (25), said lower end (28) of the tubular guiding element (25) comprises a lateral opening (F) interposed between a lateral opening (51) of the hollow body (50) of the flow control element (20) and an inlet (22a) of the connecting channel (22) in such manner to transfer a liquid dose from the dosage chamber (19) to the connecting channel (22).

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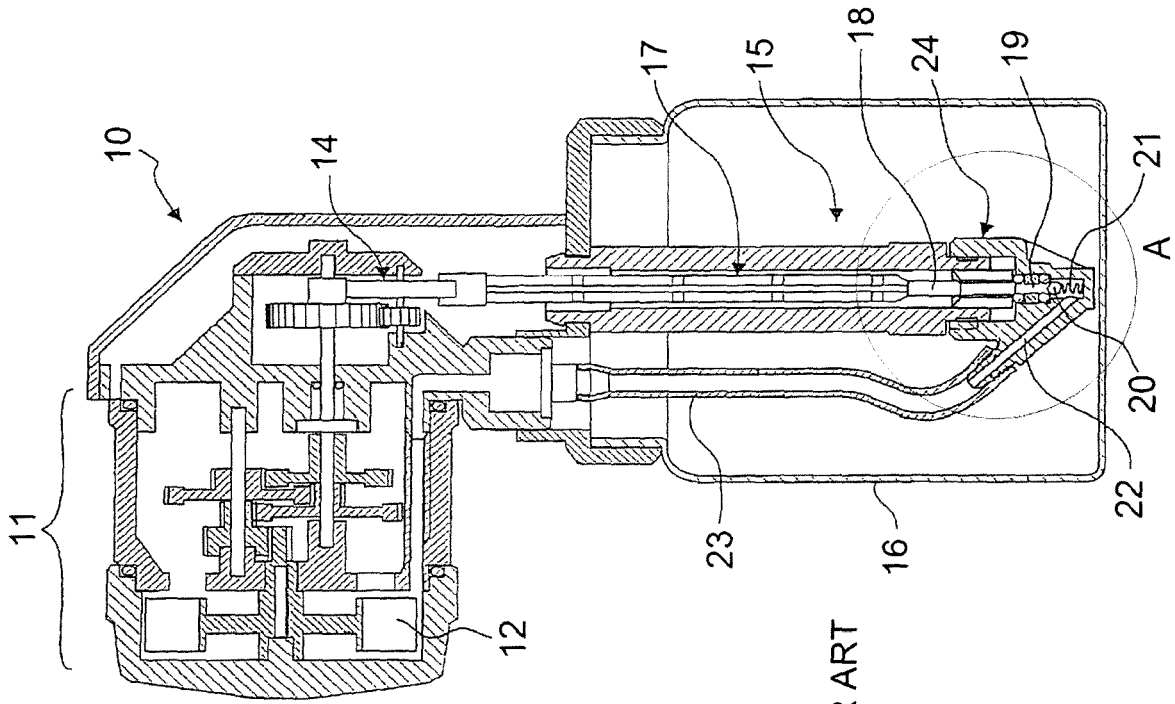


FIG. 1
PRIOR ART

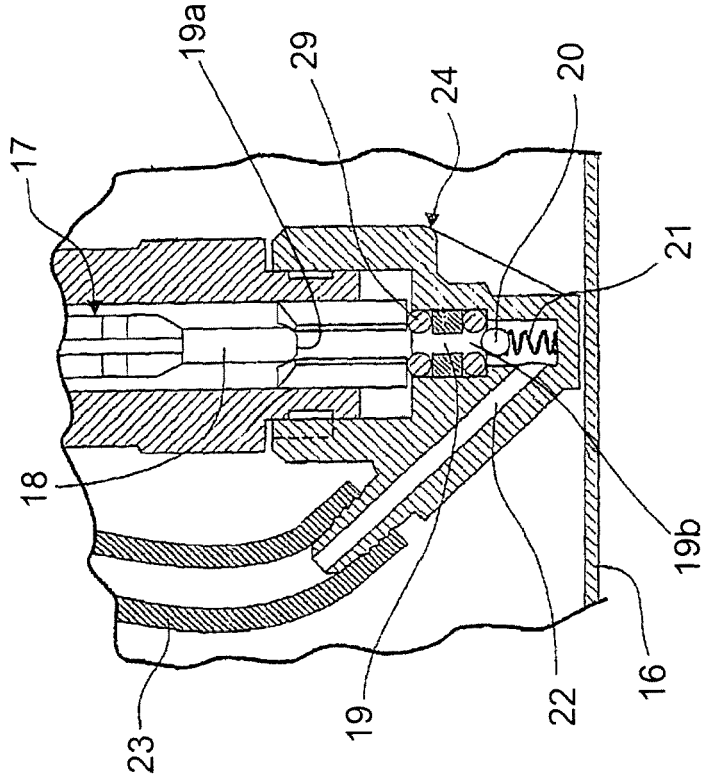
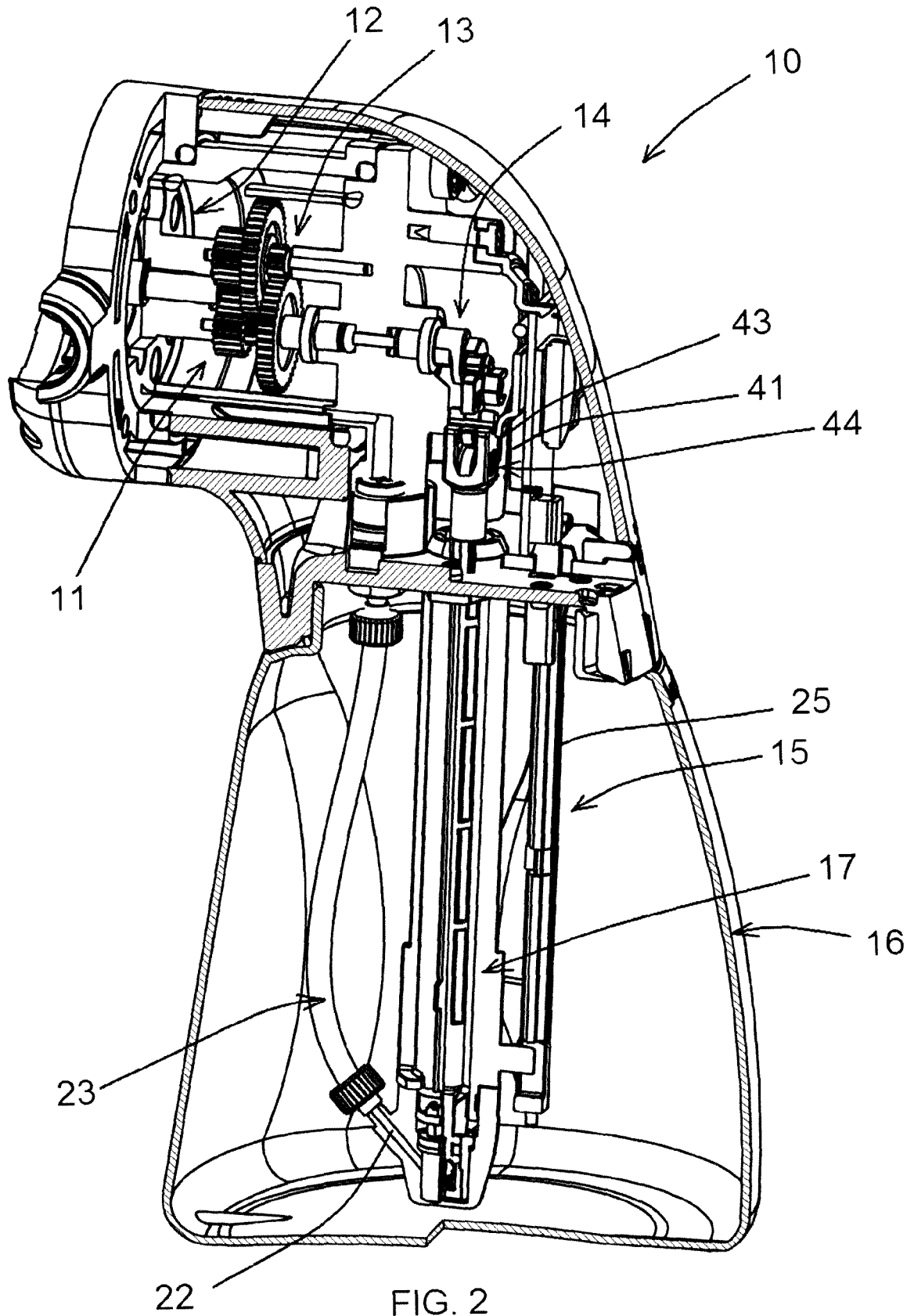


FIG. 1A
PRIOR ART



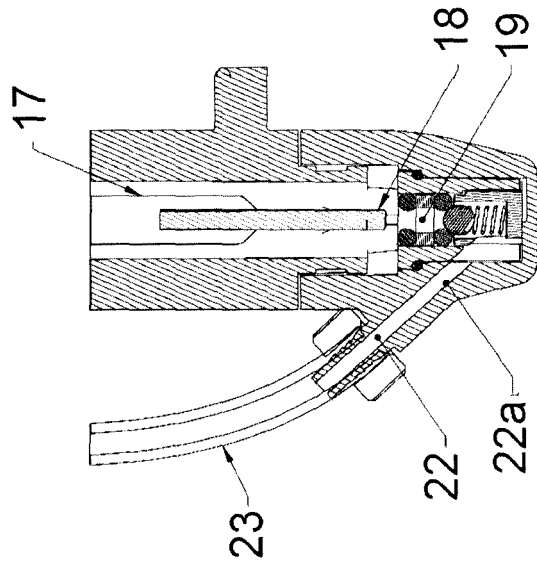


FIG. 4A

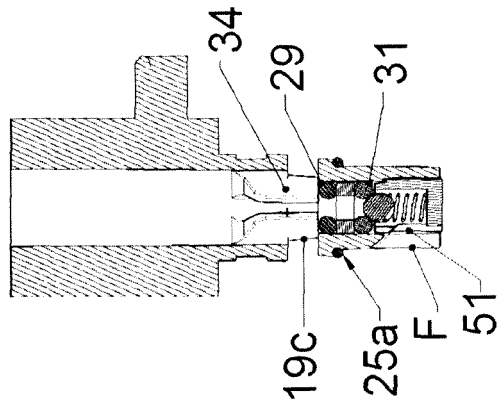


FIG. 3B

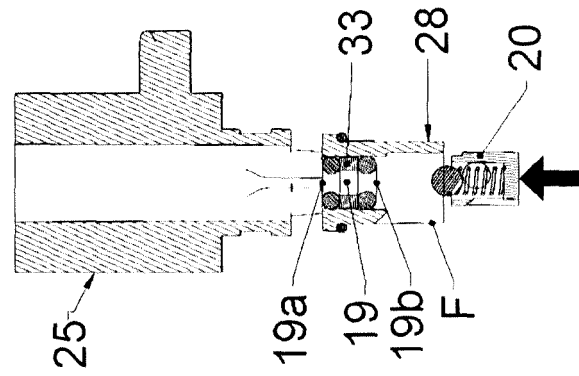


FIG. 3A



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Application Number
EP 15 42 5106

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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			F04B B01F
Place of search		Date of completion of the search	Examiner
Munich		6 June 2016	Jurado Orenes, A
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ANNEX TO THE EUROPEAN SEARCH REPORT
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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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