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

(11) **EP 3 000 533 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
30.03.2016 Bulletin 2016/13

(51) Int Cl.:
B05B 11/00 *(2006.01)*

(21) Application number: **14186468.6**

(22) Date of filing: **25.09.2014**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(71) Applicant: **Albea Thomaston Inc.**
Thomaston, CT 06787 (US)

(72) Inventor: **Scherer, Christopher**
Orange, CT 06477 (US)

(74) Representative: **Gevers & Orès**
41 avenue de Friedland
75008 Paris (FR)

(54) **Pump for dispensing a product contained in a bottle**

(57) The invention concerns a pump for dispensing a product contained in a bottle, including: a pump body (2); a tube (8) secured to a push button (9) to be actuated in translatory motion in said body between an upper rest position and a lower stressed position, said tube including a dispensing path including at least one upstream orifice (12) and a channel (13) in communication with a dispensing nozzle (14); a plunger (16) mounted in frictional contact against the internal surface of said body so as to define a dosing chamber (17) which is in communication with the product by means of a check valve (18), said plunger being arranged to offer a state where the orifices (12) are closed and a state where said orifices are brought into communication with the chamber (17); said pump further comprising magnetic means for the return of the tube (8) in its rest position after actuation, said magnetic means comprising a first magnet (10) fixed in relation to the body (2) and a second magnet (11) adapted to move in translation together with the tube (8), said magnets being arranged to repulse the tube (8) towards its rest position.

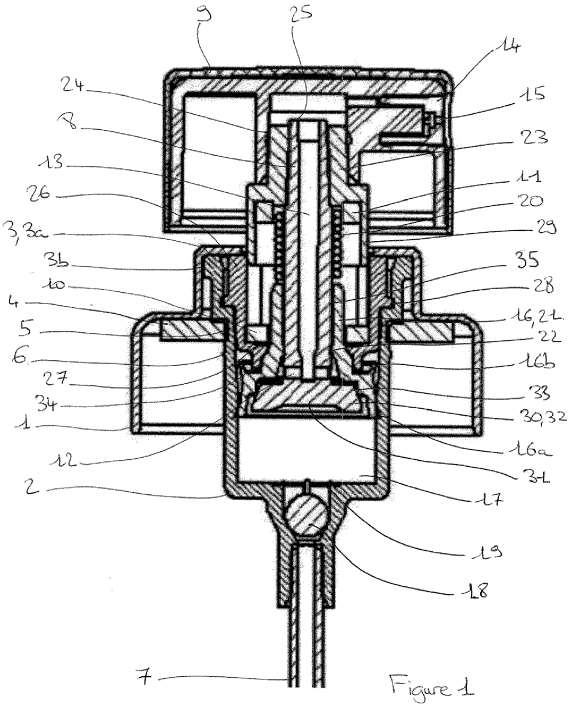

Figure 1

EP 3 000 533 A1

Description

[0001] The invention relates to a pump intended to be mounted on a bottle so as to enable a product contained in said bottle to be dispensed, said product possibly being a perfume, a cosmetic product or a pharmaceutical product.

[0002] Such pumps are known that typically include a tube which is actuated to be displaced in translatory motion in a body via a push button between an upper rest position and a lower stressed position. Furthermore, to enable the product to be pressurised, a plunger is mounted on the tube so as to offer, depending on said pressure, a state where a dispensing path is closed and a state where it is open.

[0003] To enable the tube to be switched reversibly into these two positions, it is known from the prior art to provide the system with means for the elastic return of the tube in its rest position after actuation.

[0004] In particular, such elastic return means may be formed by a spring that is compressed when the tube is actuated, so as to store energy and thus, after said actuation, to liberate said energy for the return of said spring to its rest deployed state, and then for the return of the tube to its rest position.

[0005] However, this solution is not entirely satisfactory, as such elastic return means may generate unsightly noise during their compression and/or their deployment, and thus during the actuation and the elastic return of the tube. Moreover, such elastic return means presents a force that opposes to their compression, which constraints the user to apply a strong digital pressure on the push button to actuate the pump.

[0006] The invention aims in particular to overcome the limitations mentioned above, so as to enable a pump that can be actuated with silent and soft gestures.

[0007] To this end, the invention proposes a pump intended to be mounted on a bottle so as to enable a product contained in said bottle to be dispensed, said pump including:

- a pump body intended to be rigidly connected to the bottle while able to be brought into communication with the product;
- a tube secured to a push button so as to be actuated by being displaced in translatory motion in said body between an upper rest position and a lower stressed position, said tube including a dispensing path including at least one upstream orifice and a channel whereof the downstream end is in communication with a dispensing nozzle;
- a plunger mounted in frictional contact against the internal surface of said body so as to define a dosing chamber which is in communication with the product by means of a check valve, said plunger being arranged so as to offer a state where the upstream orifices are closed and a state where said upstream orifices are brought into communication with the dosing chamber;

said pump further comprising magnetic means for the return of the tube in its rest position after actuation, said magnetic means comprising a first magnet fixed in relation to the pump body and a second magnet adapted to move in translation together with the tube, said magnets being arranged to repulse the tube towards its upper rest position.

[0008] Other objects and advantages of the invention will emerge from the following description, given in reference to the appended figures 1 and 2, which are views in longitudinal cross-section of a pump according to one embodiment of the invention, said pump being shown respectively in the rest position (figure 1) and in the end of its distribution stroke (figure 2).

[0009] In the description, the spatial positioning terms are taken with reference to the position of the pump shown in the figures.

[0010] With reference to the figures, a pump is described below that is intended to be mounted on a bottle so as to enable a product contained in said bottle to be dispensed. As an application example, the product is a perfume, a cosmetic product or a pharmaceutical product.

[0011] In the figures, the pump is mounted on the collar of a bottle (not shown) by means of a cap 1, made particularly of aluminium, which is intended to be deformed so as to conform in shape to the forms of the association zone in order to lock the pump axially and radially relative to the bottle. In other embodiments, the cap 1 may include a geometry and/or configurations of association means on the collar of the bottle which are different.

[0012] The pump also includes a pump body 2 on which the cap 1 is mounted, said body having a cylindrical geometry defined by an inner surface. To be more precise, the body 2 includes an upper zone 3 which is intended to enable the pump to be mounted onto the bottle, said zone including an upper sealing bead 3a and a lateral sealing bead 3b. The cap 1 is intended to be folded back over the zone 3 to enable a radial bearing surface and a lateral bearing surface of the cap 1 to be supported in a sealed way on one sealing bead 3a, 3b respectively. As a variant is not shown, a single type of beads 3a, 3b may be provided to provide the seal between the cap 1 and the pump body 1.

[0013] Furthermore, an internal gasket 4 is provided between the body 2 and the cap 1. The gasket 4 is held supported on the upper surface of the collar by the cap 1 and a sealing groove 5 is provided on the periphery of the body 2 to accommodate in a sealed way the internal end of said gasket. In particular, the periphery of the body 2 also has, under the groove 5, a bead 6 which on one hand enables the gasket 4 to be retained axially before the pump is mounted onto the collar, and on the other hand enables a seal to be formed between the inside of the collar and the body 2.

[0014] The pump includes a dip tube 7 whereof the

upper part is fitted into the lower part of the body 2 and whereof the lower part is intended to be immersed in the product contained in the bottle.

[0015] Furthermore, the pump includes a tube 8 which is placed in the body 2. The tube 8 is secured to a push button 9 which can be actuated in translatory motion by the user so as to displace said tube in said body between an upper rest position

[0016] (figure 1) and a lower stressed position (figure 2). In particular, the tube 8 is displaced on a product dispensing stroke - respectively a product suction stroke - when said tube is displaced from the rest position to the stressed position - respectively from the stressed position to the rest position.

[0017] To enable the tube 8 to be switched reversibly into these two positions, the pump comprises magnetic means for the return of said tube in its rest position after actuation, said magnetic means comprising a first magnet 10 fixed in relation to the pump body 2 and a second magnet 11 adapted to move in translation together with the tube 8.

[0018] The magnets 10, 11 are arranged to repulse the tube 8 towards its upper rest position, notably by generating a repulsive force that opposes to the translatory motion of the tube 7 towards its lower stressed position.

[0019] In particular, the magnets 10, 11 are arranged to generate such a repulsive force with a reduced intensity, so as to reduce the intensity of the digital pressure the user may apply on the push button 9 to overcome said repulsive force, and thus to actuate the displacement of the tube 8 on its dispensing stroke.

[0020] Thus, the magnetic means 10, 11 enables the pump to be actuated with soft gestures, which is particularly advantageous for the ergonomics of said pump. These magnetic means 10, 11 are also particularly silent, notably in comparison to elastic means that are classically employed for the return of the tube 8 in its rest position after actuation, and thus enables to obtain a pump which is particularly pleasant to use.

[0021] In the embodiment shown, the first 10 and second 11 magnets both presents an annular structure. Moreover, the magnets 10, 11 both presents an axial magnetisation and are arranged axially opposite so their same polarity (North or South) are facing each other, which allows to generate the repulsive force necessary to move the tube 8 back to its upper rest position.

[0022] For dispensing the product, the tube 8 includes a substantially vertical dispensing path which is formed of two radial upstream orifices 12 and a channel 13 in communication with said orifices. Furthermore, the downstream end of the channel 13 is inserted into the push button 9 to be in communication with a dispensing nozzle 14 by means of a path provided in said button so as to dispense the product through a dispensing orifice 15. For dispensing a liquid product, the dispensing nozzle 14 can be adapted to produce a spray, notably by comprising a swirling chamber emerging in the dispensing orifice 15.

[0023] The pump also includes a plunger 16 which is mounted in frictional contact against the internal surface of the body 2. The plunger 16 defines a dosing chamber 17 which is in communication with the dip tube 7 by means of a check valve formed by a ball 18 placed on a seat provided in the bottom of the body 2. The seat is provided with means 19 to hold down the ball 18 thereby forming a retaining cage thereof at the bottom of the dosing chamber 17.

[0024] The plunger 16 is mounted coaxially around the tube 8 in an association zone so as to be able to offer a state where the upstream orifices 12 are blocked and a state where said upstream orifices are brought into communication with the dosing chamber 17.

[0025] In the embodiment shown, the association zone is arranged so as to enable a relative sliding of the plunger 16 around the tube 8 between the state where it is blocked and the state where it is brought into communication. Furthermore, the sliding is constrained by elastic pre-tensioning means 20 mounted in support between the plunger 16 and the tube 8, said plunger comprising notably an upper shaft 21 on an upper surface of which said pre-tensioning means are supported. Alternatively and not shown, the plunger 16 may be switched between its two states by deforming it as a function of the pressure applied.

[0026] In this way, in its state of rest (figure 1), the plunger 16 is in its blocked state and pressing on the push button 9 pressurises the product contained in the dosing chamber 17 such that, in compensation for the stress exerted by the pre-tensioning means 20, the plunger 16 is switched into its dispensing state, until the end of the dispensing stroke (figure 2). Then, by releasing the pressure on the push button 9, the magnetic means 10, 11 moves the tube 8 on its suction stroke wherein the plunger 16 is in its blocked state and the ball 18 is raised to enable the dosing chamber 17 to be supplied with product.

[0027] To seal the dosing chamber 17, the plunger 16 includes a lower sealing lip 16a which is in frictional contact on the internal surface of the body 2. The lip 16a is annular and extends in the direction of the dosing chamber 17 moving away from the axis of the plunger 16. The plunger 16 additionally includes an upper sealing lip 16b which is in frictional contact on the internal surface of the body 2, said upper lip extending on the opposite side from the lower lip 16a relative to the direction of the translatory motion of the plunger 16.

[0028] To compensate for any misalignments between the axis of the thrust exerted on the push button 9 and the axis of the body 2, the association zone may arranged so as to enable sealed swivelling between the plunger 16 and the tube 8. In this way, in the event of off-centre pressure being applied to the push button 9, misalignment of the tube 8 relative to the body 2 is compensated by swivelling in order to keep the plunger 16 in the axis, so as in particular to maintain the seal of the dosing chamber 17. In particular, swivelling enables the sealing lips

16a, 16b to be held in contact on the internal surface of the body 2.

[0029] Swivelling may be obtained by providing an association zone that includes a projection 22 for centring and sealing the plunger 16 around the tube 8 and an annular space 35 enabling angular deflection of the tube 8 relative to the plunger 16. For example, in the embodiment shown, the upper shaft 21 of the plunger 16 includes a bore which has an upper diameter defining the annular space 35 around the periphery of the tube 8, and a lower diameter forming a radial centring projection 22 which is in sealed contact around the periphery of the tube 8. Alternatively, the geometry of the periphery of the tube 8 may be adapted to form the association zone that enables swivelling.

[0030] The pump additionally includes an upper shroud 23 which is interposed between the tube 8 and the push button 9, said shroud providing local reinforcement for the tube 8, so that a tube 8 of reduced diameter can be implemented in the zones that are less acted upon mechanically. Furthermore, the periphery of the shroud 23 includes a surface 24 for fitting a bore of the push button 9 by leaving an upper surface 25 of the tube 8 free.

[0031] The pump shown also includes an expander 26 rigidly connected to the body 2 by sealed fitting inside said body, the plunger 16 being slidably mounted in the expander 26. The expander 26 is of cylindro-conical geometry including a lower bearing surface 27 in contact with the periphery of the plunger 16, and particularly in sealed contact with the periphery of the shaft 21, so as to guide said plunger while restricting the swivelling thereof relative to said body.

[0032] The first fixed magnet 10 is mounted on the outside of the lower bearing surface 27. Furthermore, the periphery of the expander 26 includes a radial projection 28 which forms an axial stop of the expander 26 on a step formed in the body 2.

[0033] To improve the guiding in translatory motion of the tube 8, the shroud 23 includes a lower skirt 29 which extends under the fitting surface 24 of the push button 9, said skirt having an external diameter that enables said skirt to slide without play in the expander 26 when the tube 8 is moved in translatory motion. Furthermore, this embodiment enables the angle of swivel of the tube 8 to be restricted. Furthermore, the presence of the skirt 29 masks laterally the pre-tensioning spring 20 when the pump is in the rest position.

[0034] In particular, the skirt 29 may have at least one hollow zone emerging axially so as to enable air to pass between said skirt and the expander 26. Thus, the difference in pressure between the inside and outside of the expander 26 may be limited so as not to interfere over the suction stroke of the tube 8.

[0035] The pre-tensioning spring 20 is placed concentrically with the annular structure of the magnets 10, 11, said magnetic structure having the largest diameter. The magnets 10, 11 and the spring 20 are on one hand supported on the shroud 23 and on the other hand supported on the expander 26 and the plunger 16 respectively. This embodiment prevents the magnets 10, 11 and the spring 20 from being brought into contact with the fluid, and contributes to the axial compactness of the pump.

[0036] Furthermore, since the magnets 10, 11 and the spring 20 are not visible in the pump, provision may be made for the body 2, the ball 18 and/or the dip tube 7 to be made out of a transparent or at least a translucent material so as to provide a particularly unobtrusive and aesthetically satisfying pump. Furthermore, the compactness of the pump enables it to be accommodated in the collar, only the dip tube 7 extending inside the bottle.

[0037] In particular, the second moving magnet 11 is supported under the skirt 29, so as to be arranged axially opposite to the first magnet 10 supported on the expander 26. Thus, magnets 10, 11 of significant diameter can be used so that the stresses exerted by said magnets are able to contribute to the angular stability of the tube 8 relative to the body 2.

[0038] According to an embodiment, the lower part 30 of the tube 8 which is placed in the dosing chamber 17 may be arranged so as to form a dead space volume 31 under a ring 32. The plunger 16 may include a sealing zone 33 which, in the blocked state, is in contact on the outer surface of the ring 32.

[0039] Furthermore, the lower bearing surface 27 is arranged to engage with a complementary bearing surface 34 of the plunger 16 so that, in the blocked state, the stress exerted by the second magnet 11 on the first magnet 10 improves the seal of the dosing chamber 17 in said sealing zone in contact with the ring 32.

[0040] To be more precise, the outer surface of the complementary bearing surface 34 has an annular surface which is inclined externally, and a radial annular surface. Thus, when pressure is applied to this surface, the sealing zone 33, which is provided on the opposite side, is pinned against the outer surface of the ring 32. This embodiment ensures that a seal is provided between the expander 26 and the plunger 16 and also improves the suction power of the pump.

Claims

1. Pump intended to be mounted on a bottle so as to enable a product contained in said bottle to be dispensed, said pump including:

   - a pump body (2) intended to be rigidly connected to the bottle while able to be brought into communication with the product;
   - a tube (8) secured to a push button (9) so as to be actuated by being displaced in translatory motion in said body between an upper rest position and a lower stressed position, said tube including a dispensing path including at least one upstream orifice (12) and a channel (13) whereof the downstream end is in communica-

tion with a dispensing nozzle (14);
- a plunger (16) mounted in frictional contact against the internal surface of said body so as to define a dosing chamber (17) which is in communication with the product by means of a check valve (18), said plunger being arranged so as to offer a state where the upstream orifices (12) are closed and a state where said upstream orifices are brought into communication with the dosing chamber (17);

said pump being **characterised in that** it comprises magnetic means for the return of the tube (8) in its rest position after actuation, said magnetic means comprising a first magnet (10) fixed in relation to the pump body (2) and a second magnet (11) adapted to move in translation together with the tube (8), said magnets being arranged to repulse the tube (8) towards its upper rest position.

2. Pump according to claim 1, **characterised in that** the first (10) and second (11) magnets both presents an annular structure.

3. Pump according to claim 1 or 2, **characterised in that** the first (10) and second (11) magnets both present an axial magnetisation, said magnets being arranged axially opposite so their same polarity are facing each other.

4. Pump according to any one of claims 1 to 3, **characterised in that** it additionally includes an expander (26) secured to the body (2), said expander having a lower bearing surface (27) whereon the first magnet (10) is fixed.

5. Pump according to claim 4, **characterised in that** the lower bearing surface (27) is arranged to engage with a complementary bearing surface (34) of the plunger (16) so that, in the closed state of the plunger (16), the stress exerted by the second magnet (11) on the first magnet (11) improves the seal of the dosing chamber (17).

6. Pump according to any one of claims 1 to 5, **characterised in that** it additionally includes an upper shroud (23) which is interposed between the tube (8) and the push button (9).

7. Pump according to claim 6 when dependents of claim 4, **characterised in that** the shroud (23) includes a lower skirt (29) which has an external diameter that enables said skirt to slide without play in the expander (26) when the tube (8) is moved in translatory motion.

8. Pump according to claim 6 or 7, **characterised in that** the second magnet (11) is supported on the shroud (23).

9. Pump according to any of claims 1 to 8, **characterised in that** the plunger (16) is mounted coaxially around the tube (8) in an association zone, said association zone being arranged so as to enable sealed swivelling between the plunger (16) and the tube (8).

10. Pump according to claim 9, **characterised in that** the association zone is arranged so as to enable a relative sliding of the plunger (16) around the tube (8) between the state where it is closed and the state where it is brought into communication, said sliding being constrained by elastic pre-tensioning means (20) mounted in support between the plunger (16) and the tube (8).

11. Pump according to claim 10 when depends of claim 2, **characterised in that** the pre-tensioning means (20) are formed of a cylindrical structure which is placed concentrically with the annular structure of the magnets (10, 11), said magnetic structure having the largest diameter.

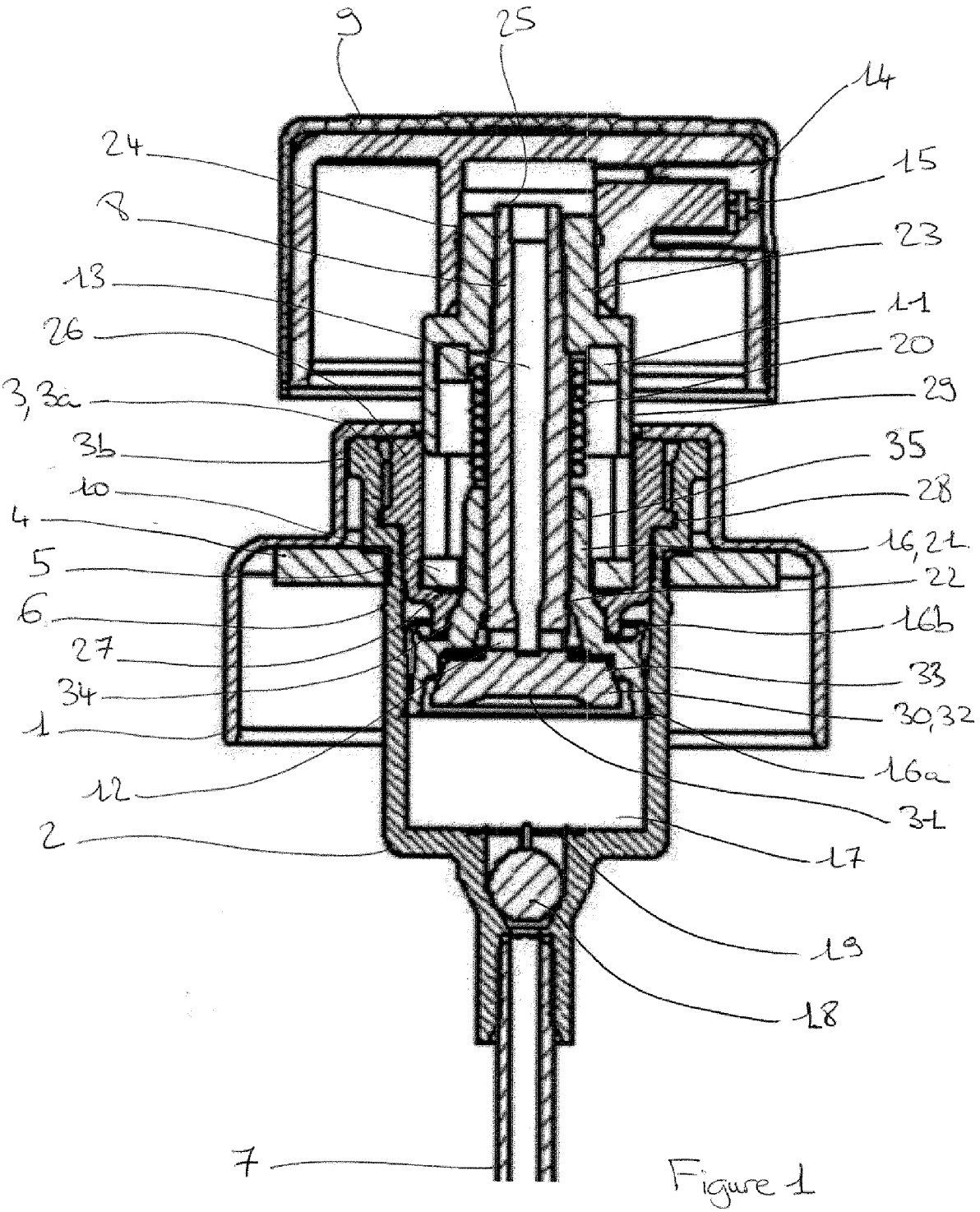
9
25
14
24
15
8
23
13
11
26
20
3, 3a
29
3b
35
10
28
4
16, 21
5
22
6
16b
27
33
34
30, 32
1
16a
12
31
2
17
19
18
7

Figure 1

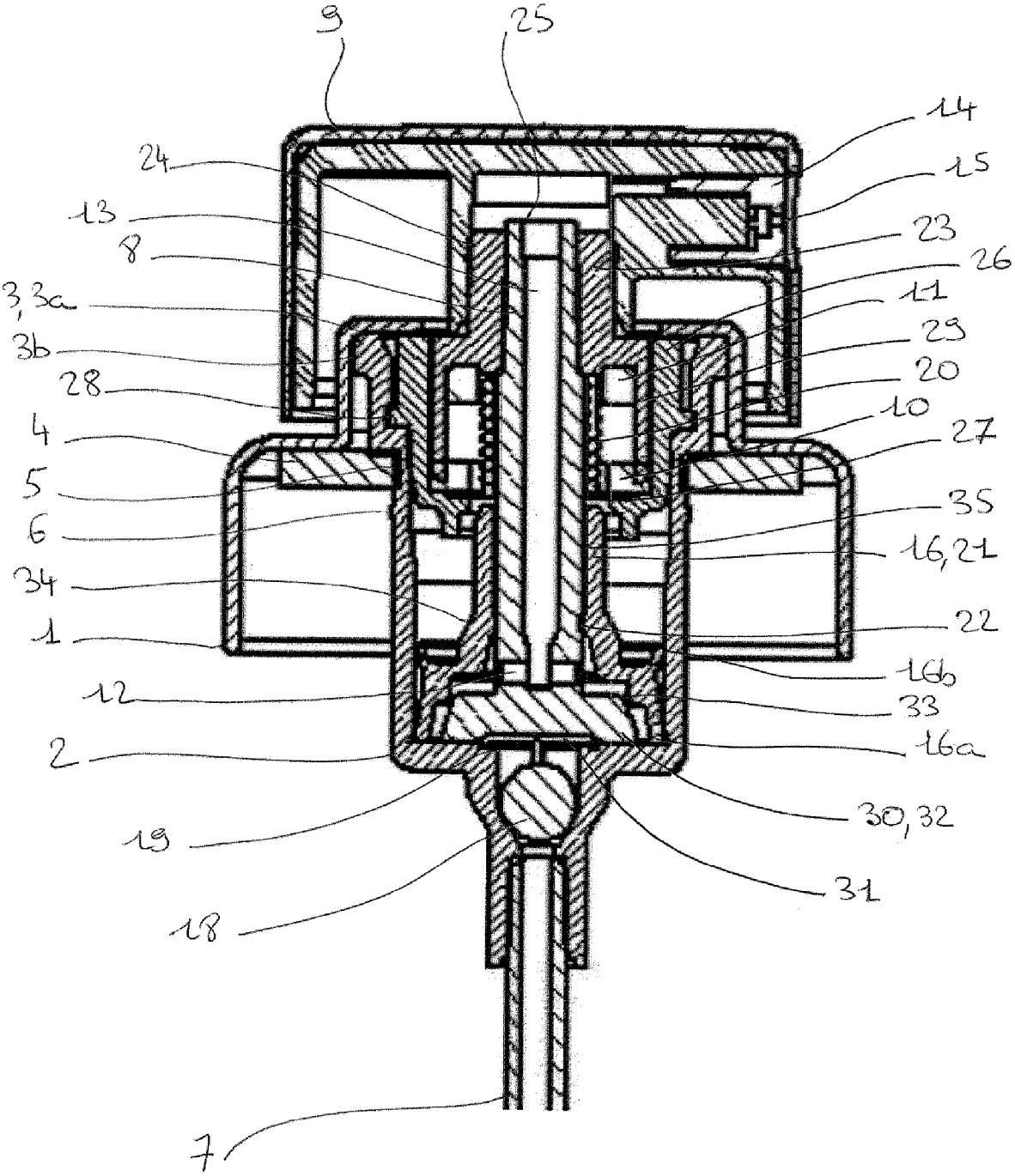
9
25
14
24
15
13
23
8
26
3, 3a
11
3b
29
28
20
10
4
27
5
35
6
16, 21
34
22
1
16b
12
33
2
16a
19
30, 32
31
18
7

Figure 2

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 14 18 6468

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 5 875 938 A (GRAF LOTHAR [DE] ET AL) 2 March 1999 (1999-03-02) * column 1, line 58 - column 2, line 25 * * column 3, line 25 - column 4, line 46 * * figures * & EP 0 794 010 A1 (PFEIFFER GMBH ERICH) 10 September 1997 (1997-09-10) * column 5, line 18 - line 36; figures *	1-3 4-11	INV. B05B11/00
Y	EP 1 935 501 A1 (REXAM DISPENSING SYS [FR]) 25 June 2008 (2008-06-25) * paragraph [0010] - paragraph [0037]; figures *	4-11	
X	JP H09 70371 A (KAO CORP) 18 March 1997 (1997-03-18) * abstract; figures *	1-3,6	
X	EP 1 243 216 A1 (ADVANEX INC [JP]) 25 September 2002 (2002-09-25) * paragraph [0091] - paragraph [0103]; figures 23-24 *	1-3	TECHNICAL FIELDS SEARCHED (IPC)
X	JP 2001 349273 A (ADVANEX INC) 21 December 2001 (2001-12-21) * figures 23-24 *	1-3	B05B B65D A47K

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	25 February 2015	Endrizzi, Silvio

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

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 14 18 6468

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

25-02-2015

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5875938 A	02-03-1999	AT 240788 T	15-06-2003
		DE 19609181 A1	11-09-1997
		EP 0794010 A1	10-09-1997
		US 5875938 A	02-03-1999
EP 1935501 A1	25-06-2008	AT 474670 T	15-08-2010
		AT 555856 T	15-05-2012
		BR PI0705974 A	23-09-2008
		CN 101245771 A	20-08-2008
		EP 1935501 A1	25-06-2008
		EP 1935502 A1	25-06-2008
		EP 1935503 A1	25-06-2008
		ES 2348271 T3	02-12-2010
		ES 2385500 T3	25-07-2012
		FR 2910449 A1	27-06-2008
		US 2008164344 A1	10-07-2008
JP H0970371 A	18-03-1997	NONE	
EP 1243216 A1	25-09-2002	AU 5572700 A	18-06-2001
		EP 1243216 A1	25-09-2002
		WO 0141611 A1	14-06-2001
JP 2001349273 A	21-12-2001	NONE	

EPO FORM P0459

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