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

(11) **EP 3 214 307 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
06.09.2017 Bulletin 2017/36

(21) Application number: **17158879.1**

(22) Date of filing: **02.03.2017**

(51) Int Cl.:
F04B 9/103 *(2006.01)* ***F04B 13/00*** *(2006.01)*
F04B 23/02 *(2006.01)* ***F04B 17/00*** *(2006.01)*
F04B 53/22 *(2006.01)*

(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
Designated Validation States:
MA MD

(30) Priority: **03.03.2016 IT UA20166537 U**

(71) Applicant: **ACQUA BREVETTI S.R.L.**
35035 Mestrino (PD) (IT)

(72) Inventor: **BARBIERI, Graziano**
35035 MESTRINO PD (IT)

(74) Representative: **Modiano, Micaela Nadia et al**
Modiano & Partners
Via Meravigli, 16
20123 Milano (IT)

(54) **METERING PUMP**

(57) A metering pump (10), comprising, inside a head (11):
- an impeller provided with vanes (12),
- means (13) for the transmission and kinematic reduction of the rotary motion of the impeller (12),
- means (14) for converting the rotary motion into reciprocating rectilinear motion,
- means (15) for pumping a liquid to be metered, which are moved mechanically by the motion conversion means (14).

A rigid container (16) for a liquid to be metered is fixed to the head (11), with reversible bayonet coupling means; the pumping means (15) are provided with an intake duct (17) that draws from the rigid container (16).

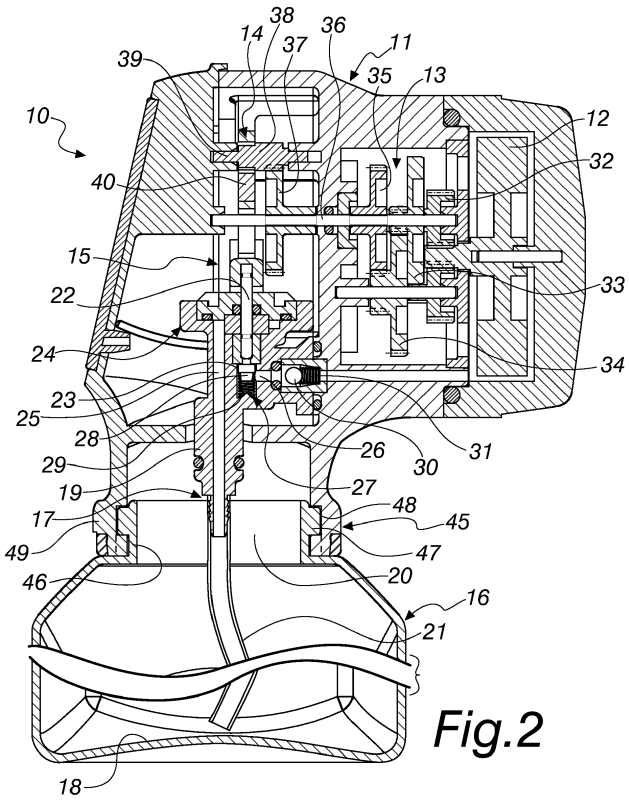


Fig.2

EP 3 214 307 A1

Description

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

[0002] Volumetric metering pumps are currently known which comprise, within a head to be interposed between segments of piping of a hydraulic circuit, an impeller provided with vanes, which rotates due to the flowing fluid and which, by virtue of means for the transmission and kinematic reduction of the rotary motion and means for converting the rotary motion into reciprocating rectilinear motion, mechanically moves associated means for drawing and pumping the liquid to be metered.

[0003] These means for drawing and pumping the liquid to be metered are arranged inside a substantially rigid container vessel for said liquid, which is fixed to the head, and comprise an injection piston which is moved by the motion conversion means so as to enter and exit, with its lower end, a metering chamber.

[0004] Said metering chamber, on the opposite side with respect to the entry side for the injection piston, is closed by a flow control element, which is pushed closed by elastic means; the chamber is connected to the inside of the container on the side of the injection piston and to a rigid duct for the rise of the metered liquid toward the head on the side of the flow control element.

[0005] The metering chamber is generally located proximate to the bottom of the container vessel of the liquid to be metered, so as to utilize as much as possible the liquid contained in said vessel and accordingly the rigid riser duct extends from the bottom of the container vessel up to the head.

[0006] Although this metering pump is widespread and widely appreciated, it has limitations.

[0007] A first limitation is inconvenience during replacement of the empty container with another new one; the container is in fact replaced without removing the head, which is installed on a line of a hydraulic system, often in a confined space and in a position that is awkward to access on the part of a user.

[0008] Removal of the empty container requires it to be lowered with respect to the head to which it is fixed initially until the riser duct, which as mentioned is rigid, that protrudes from the head is extracted completely.

[0009] This operation can be awkward and in any case causes dripping of the liquid to be metered, which remains to wet the surfaces of the riser duct.

[0010] Furthermore, the liquid to be metered that remains on the surfaces of the duct constitutes a loss of useful material.

[0011] The aim of the present invention is to provide a metering pump that is capable of obviating the cited limitations of metering pumps of the known type.

[0012] Within this aim, an object of the invention is to provide a metering pump the container of which is simpler to disengage and reengage.

[0013] Another object of the invention is to provide a metering pump that is capable of better utilizing the liquid to be metered that is present in the container, minimizing losses and waste.

[0014] A further object of the invention is to provide a metering pump that is simple to handle, like known metering pumps, even without particular prior teachings.

[0015] This aim, as well as these and other objects that will become better apparent hereinafter, are achieved by a metering pump according to claim 1.

[0016] Further characteristics and advantages of the invention will become better apparent from the description a preferred but not exclusive embodiment of the metering pump according to the invention, illustrated by way of nonlimiting example in the accompanying drawings, wherein:

Figure 1 is a perspective view of a metering pump according to the invention;

Figure 2 is a sectional side view of the pump of Figure 1;

Figure 3 is a perspective cutout view of a portion of the pump according to the invention.

[0017] With reference to the figures, a metering pump according to the invention is designated generally by the reference numeral 10.

[0018] The metering pump 10 comprises, inside a head 11:

- an impeller provided with vanes 12,
- means 13 for the transmission and kinematic reduction of the rotary motion of the impeller 12,
- means 14 for converting the rotary motion into reciprocating rectilinear motion,
- pumping means 15 for a liquid to be metered, which are moved mechanically by the means 14 for converting the rotary motion into reciprocating rectilinear motion.

[0019] A rigid container 16 for a liquid to be metered is fixed to the head 11 by means of reversible bayonet coupling means 45 described hereinafter, the pumping means 15 being provided with an intake duct 17 that is extended so as to draw from the rigid container 16, as clearly visible in Figure 2, and in particular from the bottom 18 of the rigid container 16.

[0020] The reversible bayonet coupling means 45 comprise a collar 46 of the rigid container 16, which is provided with external radial protrusions 47 which are contoured for bayonet coupling in corresponding recesses 48 formed within a corresponding coupling portion 49 of the head 11.

[0021] The intake duct 17 comprises a first segment 19, which is integral with the pumping means 15 and is extended, within the head 11, between the pumping means 15 and the inlet 20 of the rigid container 16, and a second segment 21, which is extended from the end of the first portion 19 to the bottom 18 of the rigid container 16.

[0022] The second segment 21 is constituted by a flexible tube.

[0023] By virtue of the first segment 19, which remains in the head 11, and of said flexible tube, which has such a length as to draw from the bottom 18 of the rigid container 16, the operations for removing an empty container and fitting the newly filled container are simpler and more rapid, since the flexible tube can be extracted more easily than a rigid duct as in metering pumps of the known type.

[0024] Furthermore, these operations for removal and fitting, by virtue of the flexible tube, can be performed in more confined spaces than those necessary with known metering pumps, since it is sufficient to lower the container 16 from the head 11 enough to allow to extract the flexible tube, i.e., the second segment 21 of the intake duct 17, from the container 16.

[0025] Furthermore, the flexible tube retains on its surfaces less liquid to be metered, causing a lower loss of said liquid upon its extraction from a container to be replaced.

[0026] Moreover, the rigid container 16 is more comfortable to hold with a grip that is safe and useful to induce thereon a rotation for coupling or uncoupling with respect to the head 11, differently from known metering pumps with non-rigid bag-like containers, which are more difficult to hold and therefore turn in order to induce their bayonet coupling or uncoupling with respect to the head; a safe grip of the container is in fact fundamental in all situations in which the metering pump 10 is mounted in a space that is so tight as to prevent the hand of the user from gripping directly the bayonet coupling means and it is therefore fundamental for the container to be completely and easily rotatable by holding it by its bottom, which is not feasible with a container of the bag-like type or lacking rigidity in general.

[0027] In the embodiment of the invention described herein, by way of nonlimiting example thereof, the pumping means 15 comprise an injection piston 22 which is moved by the motion conversion means 14 so as to enter and exit alternately, with its lower end, a metering chamber 23.

[0028] The metering chamber 23 is provided inside a contoured body 24, which is fixed inside the head 11 and on which contoured body 24 there is also an intake channel 25 and a discharge channel 26 for the liquid to be metered.

[0029] Inside the contoured body 24, below the metering chamber 23, there are one-way valve means 27, which are adapted to prevent the return of liquid to be metered toward the chamber 23.

[0030] The valve means 27 comprise a first flow control element 28, with a complementary contrast pusher spring 29, for direct closure of the chamber 23, and a second lateral flow control element 30, with a corresponding contrast pusher spring 31, arranged in the discharge channel 26.

[0031] The first segment 19 of the intake duct 17, inside which the intake channel 25 is formed, extends from the contoured body 24.

[0032] The means 13 for transmission and kinematic reduction of rotary motion comprise a series of reduction gears 32, 33, 34, 35, which are to be understood as being of a per se known type.

[0033] A shaft 36 extends from the last gear 35 and is designed to transfer the torque from the means 13 for transmission and kinematic reduction of the rotary motion to the means 14 for converting the rotary motion into reciprocating rectilinear motion.

[0034] The means 14 for converting rotary motion into reciprocating rectilinear motion comprise a gear 37 which is keyed onto the shaft 36 and a pinion 38 which is matched with the first gear 37 and is integral with a second shaft 39 which supports an eccentric disk 40; the eccentric disk 40 is arranged so as to rotate within a slot 41, the height of which corresponds to the diameter of the eccentric disk 40 and which is formed on the head 42 of the injection piston 22 of the pumping means 15.

[0035] In practice it has been found that the invention achieves the intended aim and objects.

[0036] In particular, the invention provides a metering pump the container of which is simpler to uncouple and recouple in order to manage refilling.

[0037] Moreover, the invention provides a metering pump that is capable of better utilizing the liquid to be metered that is present in the container, minimizing losses and waste.

[0038] Moreover, the invention provides a metering pump that is simple to handle, like known metering pumps, even without particular prior teachings.

[0039] The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims; all the details may further be replaced with other technically equivalent elements.

[0040] In practice, the components and the materials used, so long as they are compatible with the specific use, as well as the contingent shapes and dimensions, may be any according to the requirements and the state of the art.

[0041] The disclosures in Italian Utility Model Patent Application no. 202016000022180 (UA2016U056537), from which this application claims priority, are incorporated herein by reference.

[0042] 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 metering pump (10), **characterized in that** it comprises, inside a head (11):

- an impeller provided with vanes (12),
- means (13) for the transmission and kinematic reduction of the rotary motion of the impeller (12),
- means (14) for converting the rotary motion into reciprocating rectilinear motion,
- means (15) for pumping a liquid to be metered, which are moved mechanically by said means (14) for converting rotary motion into reciprocating rectilinear motion,

a rigid container (16) for a liquid to be metered being fixed to said head (11), with reversible bayonet coupling means (45), said pumping means (15) being provided with an intake duct (17) that is extended so as to draw from said rigid container (16).

2. The metering pump according to claim 1, **characterized in that** said reversible bayonet coupling means (45) comprise a collar (46) of the rigid container (16) with external radial protrusions (47) which are contoured for bayonet coupling in corresponding recesses (48) formed within a corresponding coupling portion (49) of said head (11).

3. The metering pump according to one or more of the preceding claims, **characterized in that** said intake duct (17) comprises a first segment (19) that is integral with the pumping means (15) and is extended between said pumping means (15) and the inlet (20) of said rigid container (16), and a second segment (21) that extends from the end of said first segment (19) to the bottom of said rigid container (18).

4. The metering pump according to claim 3, **characterized in that** said second segment (21) is constituted by a flexible tube.

5. The metering pump according to one or more of the preceding claims, **characterized in that** said pumping means (15) comprise an injection piston (22) that is moved by the means (14) for converting motion so as enter and exit alternately, with its lower end, a metering chamber (23).

6. The metering pump according to one or more of the preceding claims, **characterized in that** said metering chamber (23) is provided inside a contoured body (24), which is fixed inside the head (11), an intake channel (25) and a discharge channel (26) for the liquid to be metered being also formed on said contoured body (24).

7. The metering pump according to one or more of the preceding claims, **characterized in that** inside the contoured body (24), below the metering chamber (23), there are one-way valve means (27), which are adapted to prevent the return of liquid to be metered toward the chamber (23).

8. The metering pump according to one or more of the preceding claims, **characterized in that** said first segment (19) of the intake duct (17) extends from said contoured body (24).

9. The metering pump according to one or more of the preceding claims, **characterized in that** said means for transmission and kinematic reduction of rotary motion (13) comprise a series of reduction gears (32, 33, 34, 35), a shaft (36) extending from the last gear (35) and being designed to transfer the torque from the means (13) for transmission and kinematic reduction of rotary motion to the means (14) for converting rotary motion into reciprocating rectilinear motion.

10. The metering pump according to one or more of the preceding claims, **characterized in that** said means (14) for converting rotary motion into reciprocating rectilinear motion comprise a gear (37) that is keyed on the shaft (36) and a pinion (38) that meshes with the first gear (37) and is integral with a second shaft (39) which supports an eccentric disk (40), said eccentric disk (40) being arranged so as to rotate within a slot (41), the height of which corresponds to the diameter of the eccentric disk (40), formed on the head (42) of the injection piston (22) of the pumping means (15).

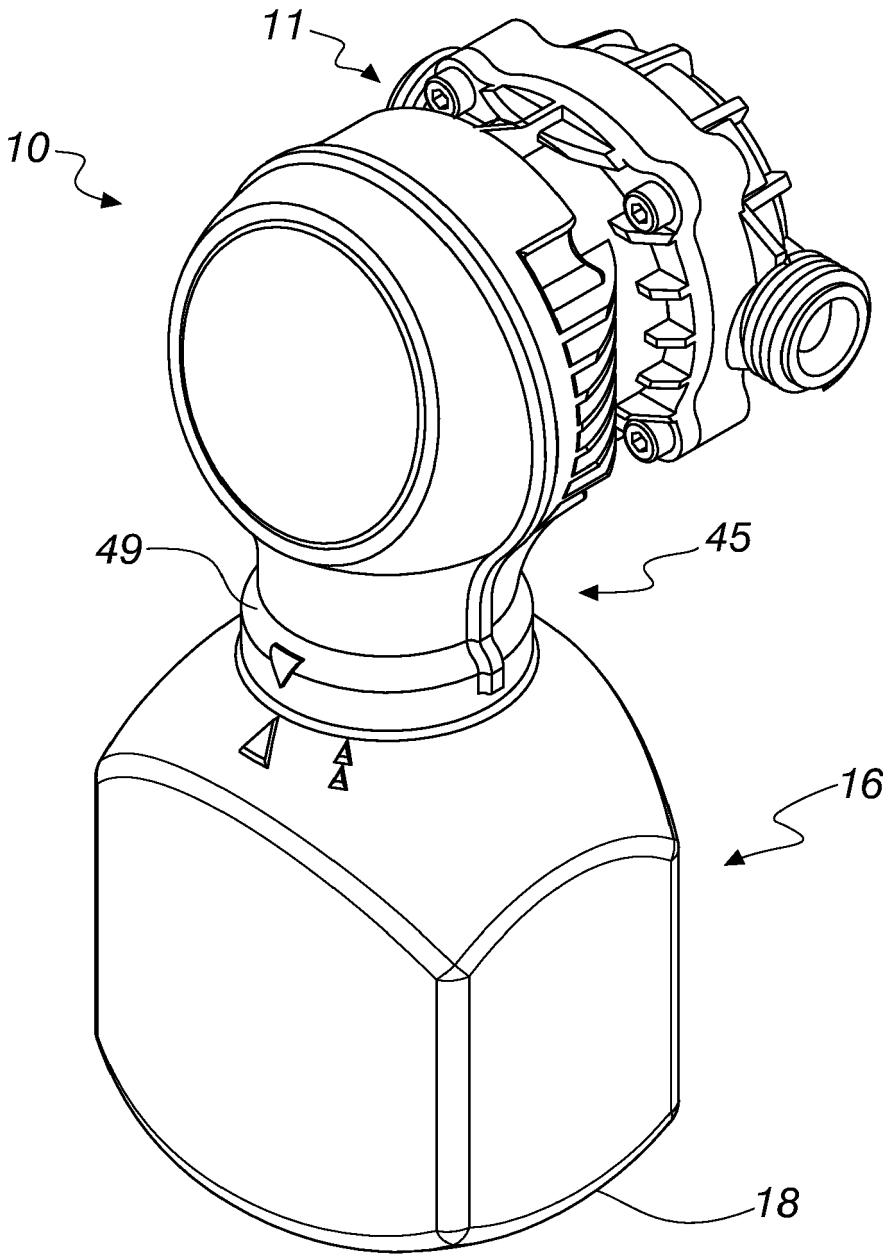


Fig.1

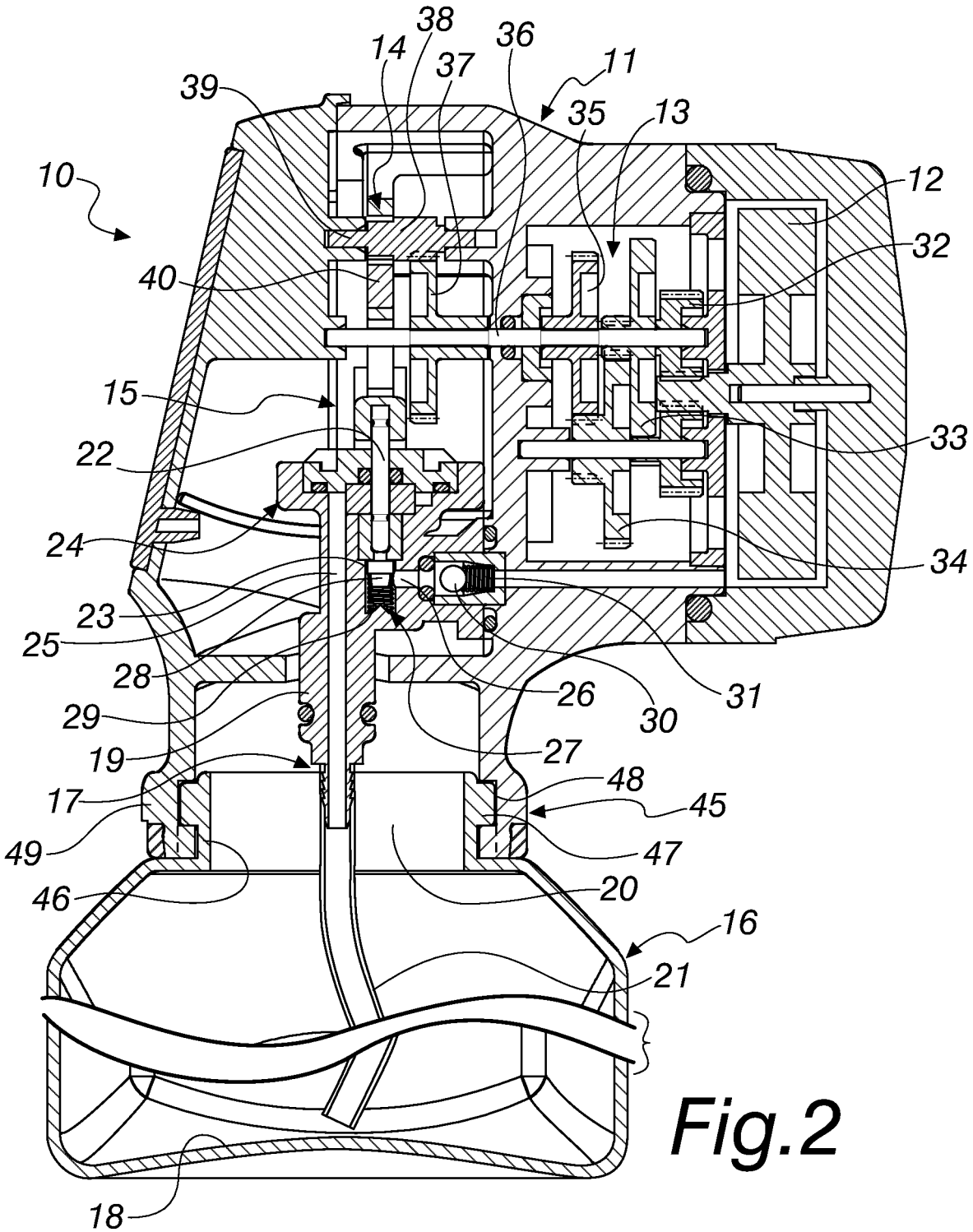

38
14
36
37
11
39
35
13
10
12
32
40
15
33
22
24
34
23
25
28
26
30
31
29
27
19
48
17
45
49
47
46
20
16
21
18

Fig.2

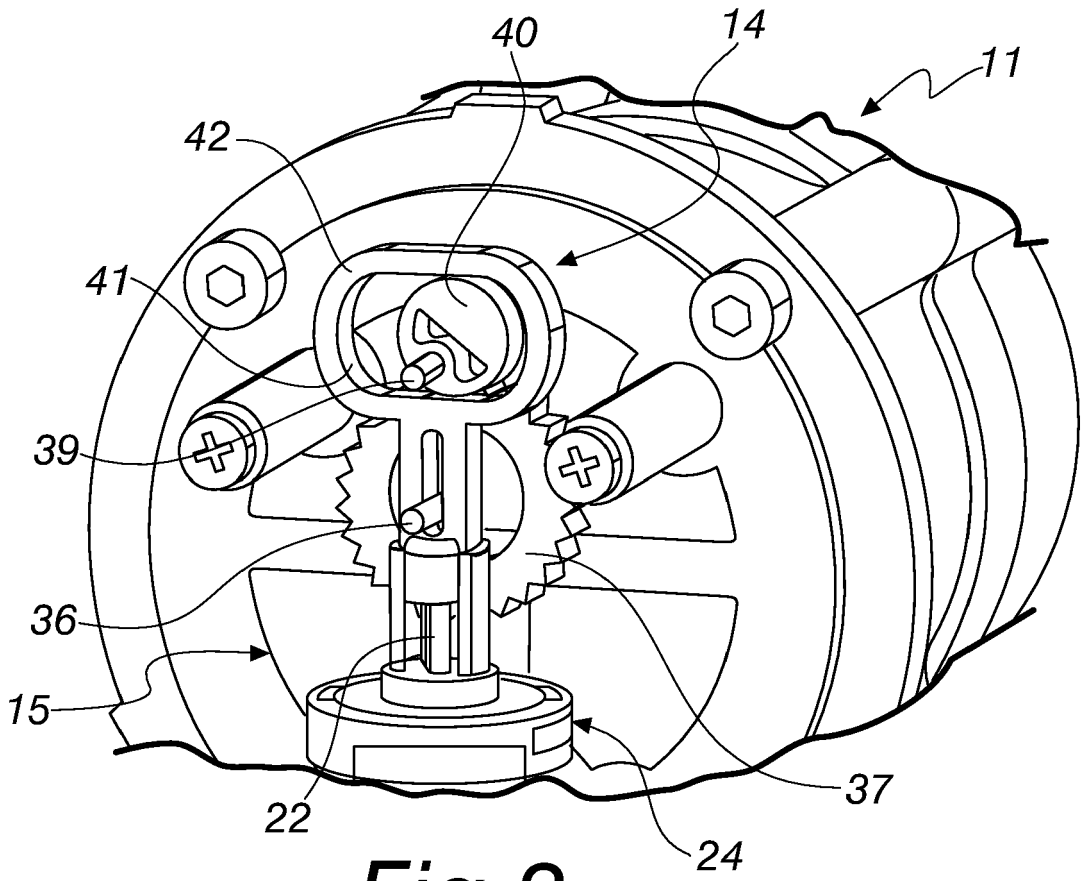


Fig.3

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 17 15 8879

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	EP 1 832 746 A2 (RAMPAZZO GIOVANNI [IT]) 12 September 2007 (2007-09-12) * paragraphs [0019] - [0047]; figures 1-8 *	1-10	INV. F04B9/103 F04B13/00 F04B23/02 F04B17/00
Y	US 2006/073036 A1 (PASCUAL JOSEPH A [US] ET AL) 6 April 2006 (2006-04-06) * paragraphs [0040] - [0043]; figure 8 *	1-10	F04B53/22
A	US 2004/118877 A1 (VON SCHUCKMANN ALFRED [DE] ET AL) 24 June 2004 (2004-06-24) * paragraph [0033]; figure 1 *	1-10	

TECHNICAL FIELDS SEARCHED (IPC)

F04B
B05B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	24 July 2017	Jurado Orenes, A

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 17 15 8879

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.

24-07-2017

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1832746 A2	12-09-2007	EP 1832746 A2	12-09-2007
		IT PD20060025 U1	17-08-2007
US 2006073036 A1	06-04-2006	NONE	
US 2004118877 A1	24-06-2004	DE 10139573 A1	19-09-2002
		US 2004118877 A1	24-06-2004

EPO FORM P0459

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

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- IT 202016000022180 **[0041]**
- IT UA2016056537 U **[0041]**