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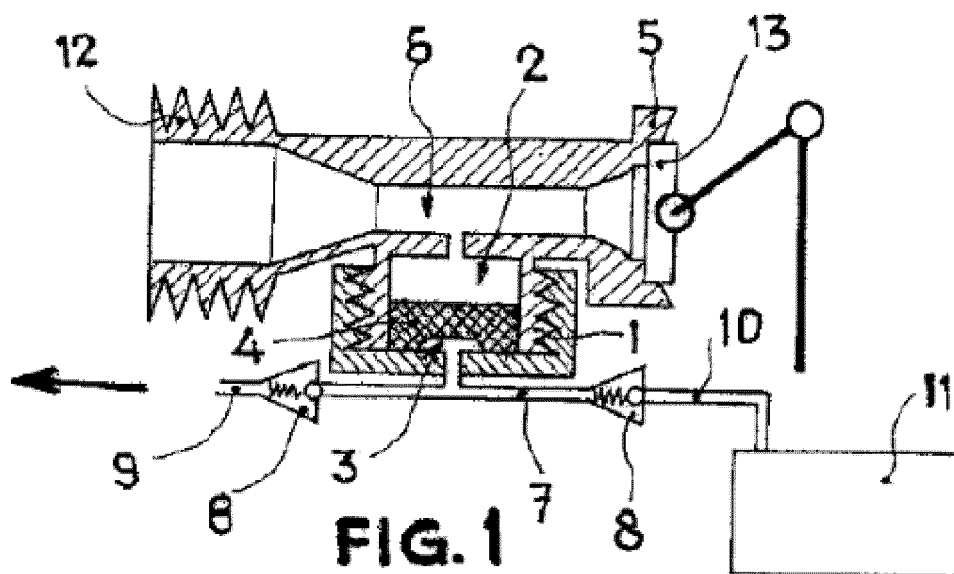
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(54) **FLUID DISPENSING DEVICE ACTUATED BY PRESSURE VARIATIONS IN A MAIN CIRCUIT**

(57) The dispensing device is comprised of a hollow body, divided into a pressurisation chamber and a dispensing chamber using conversion media of the pressure variations into volume variations of the dispensing chamber designed as an elastomer, which has a cavity constituting the actual dispensing chamber, whilst the pressurisation chamber is connected to an inlet tap which has a restriction and ends with an inlet valve and the dispens-

ing chamber to an intermediate section of a secondary circuit which ends at each end in check valves which extend the secondary circuit with a downstream section and an upstream section, the latter being connected to a tank with the product to be dispensed. The closing of the inlet valve leads to a reduction in the volume of the dispensing chamber due to the compression of the elastomer, ejecting the fluid to be dispensed.



Description

TECHNICAL FIELD OF THE INVENTION

[0001] This invention refers to an intermittent fluid dispenser which is controlled and operated by the pressure variations in a main circuit of another fluid. The device operates automatically and autonomously, without having to have any type of external power supply or specific control system.

[0002] Its field of application is for dispensing and dosing pumps, being suitable in particular for automatically supplying hygiene products such as detergents and deodorants in sanitary equipment, adding chlorine to swimming pools, washing machine detergents, anti-fouling agents in dishwashers, lubricants in hydraulic circuits and in all cases in which there is a fluid, liquid or gas subjected to pressure variations in a main circuit, and there is a need to add any other fluid, automatically, in a secondary circuit.

BACKGROUND TO THE INVENTION

[0003] Numerous dispensing devices of this kind are known. As such, document ES 2159392T3 describes a dosing device for adding a steriliser to a water supply network in order to provide sterilised water for consumers. The device is comprised of a steriliser tank and a control system which, based on a flow measurement, transmits the opportune commands in order to maintain a preset concentration of steriliser operated using compressed air.

[0004] Document ES 1049300U describes a dispenser for disinfectants for toilet equipment which uses a pump operated by a battery-run motor. As in the previous case, an external power supply is required.

[0005] Other devices which do not require an external power supply are also known. As such, document US 5,692,250 refers to the automatic dispensing of a disinfectant liquid in vacuum toilet equipment without cistern, like the type used in aeroplanes. The power for moving the dispensing pump originates from the pressure variations in the on-board drinking water circuit used for cleaning the toilet bowl. This dispensing pump is connected after the circuit gate valve and pours into the toilet bowl which varies the pressure between the zero value and the full static pressure of the main water circuit which results in an excessive and sudden change in pressure. This, in conjunction with the mechanical design of the pump, a spring-loaded floating piston, gives rise to noisy operation and the occurrence of constant breakdowns.

[0006] Document ES 2377092B1 describes a device very similar to the previous one, however adapted to usual toilet equipment with cistern. In this case, the pump driving chambers both have an inlet and an outlet which further complicates mechanical and tightness problems in the floating pistons of which the main part of the system is comprised. As in the previous case, the device is lo-

cated behind the inlet and discharge valve which gives rise to various problems:

- The pressure jump between the static pressure in the main circuit and zero is too high and, above all, sudden.
- The dispensing of the product occurs when the discharge valve opens, which means that the effect of the disinfectant is very short and transitory, being swept by the subsequent flushing of cleaning water from the main circuit. This worsens in the case of toilets without cistern.

[0007] Devices are also known which use direct suction to dispense the fluid from a tank as described in document US 2009/0100579 A1, which uses a Venturi. This device operates continuously whilst there is flow in the main circuit, which means the consumption of the fluid to be dispensed is very high, with regulation difficulties.

[0008] As a result, one of the objectives of this invention is to have a dispensing device which acts at the end of flushing when cutting the flow in the main circuit.

[0009] Another objective of this invention is to have a soft running dispensing device.

[0010] A final objective of this invention is to have a simpler and cheaper dispensing device with no tightness problems.

DESCRIPTION OF THE INVENTION

[0011] To meet the proposed objectives, a dispensing device has been designed located before the main circuit inlet valve. As such, the dispensing device in the invention is always pressurised, generating the required pressure variations for its operation using a restriction arranged in the inlet tap which connects the main circuit to the inlet valve. Within the context of this document, "restriction" refers to a section of circuit with a diameter size which accelerates the main fluid when the inlet valve is open. This diameter will usually be less than the main circuit and its sizing will be defined, in addition to the conditions of the actual device, by the load loss of the inlet valve. The basis of the invention is to replace all-or-nothing pressure jump seen in the previous technique with a minor pressure jump in absolute value and with smooth transition, thus dispensing at the end of flushing when the main circuit, without flow, is at its maximum pressure.

[0012] Bernoulli's theorem defining the behaviour of fluids in a pipe sets forth that; $(p/dg) + (v^2/2g) = k$.

[0013] Where p is the pressure, v the fluid speed, d the fluid density, g the gravity acceleration, and k a constant.

[0014] In this way, if we introduce a restriction in the inlet tap in the main circuit, before the inlet valve, the device will always be pressurised, either with the static pressure when there is no flow, or with the pressure dependent on the flow rate speed when the inlet valve in

the main circuit is open. The presence of a restriction allows having a sufficient jump in pressure to operate the device, however not excessive, thereby optimising its operation.

[0015] The dispensing part of the device is similar to the one described in the first variant (Figure 1) of document US 5,692,250. It is comprised of a hollow body, advantageously cylindrical and a dispensing chamber which converts the pressure variations in the pressurisation chamber into volume variations in the dispensing chamber, connecting the pressurisation chamber to the inlet tap in the restriction zone and the dispensing chamber to a secondary circuit which includes the tank holding the fluid to be dispensed and a pair of check valves which ensure circulation according to the conventional layout in hydraulics.

[0016] Fortunately, the means used to convert the pressure variations in the pressurisation chamber into volume variations in the dispensing chamber will be comprised of a cylindrical elastomer part featuring a cavity which constitutes the dispensing chamber in itself. Such a solution is unable to withstand the all-or-nothing pressure jump in the main circuit, however, it operates surprisingly efficiently and smoothly when remaining constantly pressurised with controlled pressure variations. An explanation for this is found not only in the absolute values of the jump in pressure, but rather when these values occur due to variations in the flow, the actual inertia of the fluid establishes progressive pressure changes.

[0017] Although the previous elastomer variant for converting pressure variations to volume variations presents obvious synergy with the use of a restriction, conventional means can be used such as floating pistons, bellows or similar in those cases where the high pressure or chemical aggressiveness of the fluid to be dispensed advise against the use of elastomer. The advantages of the dispensing device in the invention are definitive, i.e.:

- The product dispensing takes place upon closing the inlet valve, instead of when opening as occurs with the previous technique. This means that in toilets without cistern, the product remains in the toilet bowl.
- Operation is soft and silent.
- The elastomer version is extremely straightforward mechanically, cheap and long lasting.

BRIEF DESCRIPTION OF THE FIGURES

[0018] To supplement the description given above, and in order to help a better understanding of the invention features, a detailed description will be given of the preferred design based on a set of drawings accompanying this descriptive report and where, by way as a guideline and by no means exhaustive, the following has been depicted.

Figure 1 shows a diagram section of the invention device with the inlet valve closed.

Figure 2 shows a diagram section of the invention device with the inlet valve open.

Figure 3 shows the application to a toilet with cistern from an external tank of the product to be dispensed.

Figure 4 shows the application to a toilet including the tank of the product to be dispensed inside the cistern.

Figure 5 shows a diagram of a variant using a spring-loaded floating piston.

Figure 6 shows a diagram of a variant using bellows.

Figure 7 shows a diagram of a variant using a spring-loaded membrane.

Figure 8 shows a diagram of a variant using an elastomer fitted with a cavity.

[0019] In the above figures, the numerical references correspond to the following parts and components:

- | | |
|----|---|
| 1 | Hollow body |
| 2 | Pressurisation chamber |
| 3 | Dispensing chamber |
| 4 | Elastomer |
| 5 | Inlet tap |
| 6 | Restriction |
| 7 | Intermediate section of the secondary circuit |
| 8 | Check valves |
| 9 | Downstream section of the secondary circuit |
| 10 | Upstream section of the secondary circuit |
| 11 | Tank |
| 12 | Connection to the main circuit |
| 13 | Inlet valve |
| 14 | Float |
| 15 | Cistern |
| 16 | Flush |
| 17 | Bottom valve |
| 18 | Floating piston |
| 19 | Bellows |
| 20 | Membrane |

DETAILED EXPLANATION OF THE PREFERRED EXECUTION OF THE INVENTION

[0020] As can be seen in figures 1 and 2, the dispensing device in the invention is comprised of a hollow body (1), advantageously cylindrical, divided into a pressurisation chamber (2) and a dispensing chamber (3) using an elastomer (4) which has a cavity constituting the actual dispensing chamber (3), whilst the pressurisation chamber (2) is connected to an inlet tap (5) which has a re-

striction (6), and the dispensing chamber (3) to an intermediate section (7) of a secondary circuit which terminates at each end in the check valves (8) which extend the secondary circuit with a downstream section (9) and an upstream section (10), which itself is connected to a tank (11) of the product to be dispensed. The inlet tap (5) starts at a connection to the main circuit (12) and ends at an inlet valve (13).

[0021] With regard to figures 3 and 4, a description will be given of the application of the dispensing device in the invention to a toilet with cistern (15) in which, to expound on the general case, the inlet valve (13) is operated using a float (14), and a flush (16) operates a bottom valve (17) to produce the conventional flushing of the cistern (15). The tank (11) can be fitted inside the cistern (15) or outside it. If selecting the last option, the one tank (11) only can supply various toilets, with or without cistern.

[0022] The operation of the device is as follows. When the inlet valve (13) opens, a flow is established in the restriction (6) which causes a pressure drop. As a result, the elastomer (4) expands, increasing the volume of the dispensing chamber (3), which causes it to fill from the tank (11) using an upstream section (10) of the secondary circuit. See figure 2.

[0023] When the inlet valve (13) closes, the pressure increases in the restriction (6) and in the pressurisation chamber (2), compressing the elastomer (4), which reduces the volume of the dispensing chamber (3) and causes the injection of the product to be dispensed in the downstream (9) secondary circuit. See figure 1.

[0024] As far as industrial implementation is concerned, for experts in the field a series of variants will be obvious which, whilst respecting the essence of the invention, adapt the execution of the device to the properties of the fluids to be handled, the available pressures and the fluid volume to be dispensed. As such, the conversion of the pressure variations in the pressurisation chamber to variations in volume in the dispensing chamber will be advantageously carried out using an elastomer (4) however, depending on requirements, a spring-loaded floating piston (18) (Figure 5), bellows (19) or elastic buffer accumulator (Figure 6), a membrane (20), (Figure 7) or any functionally similar mechanism could be used. Advantageously, the device in the invention will be incorporated in the inlet tap (5), connected to the inlet valve (13) and to the float (14) to form a monoblock set which replaces the conventional devices in existing installations (Figures 1, 3 and 4).

[0025] The sizing of the restriction (6), could be easily optimised using the trial and error method applied to the specific system conditions.

Claims

1. Fluid dispensing device operated by pressure variations in a main circuit, **characterised by** compris-

ing;

- an inlet tap (5), fitted with a restriction (6), and ending at one end at a connection to the main circuit (12) and at the opposite end with an inlet valve (13);

- a hollow body (1), divided into a pressurisation chamber (2) and a dispensing chamber (3) using conversion of the pressure variations in the pressurisation chamber (2) to volume variations in the dispensing chamber (3), whilst the pressurisation chamber (2) is connected to the inlet tap (5) in the restriction zone (6), and the dispensing chamber (3) to the intermediate section (7) of a secondary circuit, with each intermediate section (7) ending at each end in check valves (8) which extend with a downstream section (9) and an upstream section (10), whilst the latter is connected to a tank (11) which contains the fluid to be dispensed,

in such a way that the fluid dispensing occurs when the inlet valve (13) closes.

2. Fluid dispensing device operated by pressure variations in a main circuit, in accordance with Claim 1, **characterised by** the fact that the conversion media for the pressure variations in the pressurisation chamber (2) into volume variations in the dispensing chamber (3) are executed as an elastomer (4) featuring a cavity which comprises the actual dispensing chamber (3).
3. Fluid dispensing device operated by pressure variations in a main circuit, in accordance with Claim 1, **characterised by** the fact that the conversion means for the pressure variations in the pressurisation chamber (2) into volume variations in the dispensing chamber (3) are executed using a spring-loaded floating piston (18).
4. Fluid dispensing device operated by pressure variations in a main circuit, in accordance with claim 1, **characterised by** the fact that the conversion means for the pressure variations in the pressurisation chamber (2) into volume variations in the dispensing chamber (3) are achieved using bellows (19) or an elastic buffer accumulator.
5. Fluid dispensing device operated by pressure variations in a main circuit, in accordance with Claim 1, **characterised by** the fact that the conversion means for the pressure variations in the pressurisation chamber (2) into volume variations in the dispensing chamber (3) are executed using spring-loaded membrane (20).

Amended claims under Art. 19.1 PCT

1. Fluid dispensing device operated by pressure variations in a main circuit, **characterised by** comprising; 5
- an inlet tap (5), fitted with a restriction (6), and ending at one end at a connection to the main circuit (12) and at the opposite end with an inlet valve (13); 10
 - a hollow body (1), divided into a pressurisation chamber (2) and a dispensing chamber (3) using conversion of the pressure variations in the pressurisation chamber(2) to volume variations in the dispensing chamber (3), whilst the pressurisation chamber (2) is connected to the inlet tap (5) in the restriction zone (6), and the dispensing chamber(3) to the intermediate section (7) of a secondary circuit, with each intermediate section (7) ending at each end in check valves (8) 15 20
 - which extend with a downstream section (9) and an upstream section (10), whilst the latter is connected to a tank (11) which contains the fluid to be dispensed, 25
- in such a way that the fluid dispensing occurs when the inlet valve (13) closes, the conversion media for the pressure variations in the pressurisation chamber (2) are an elastomer (4) featuring a cavity which comprises the actual dispensing chamber (3). 30

Statement under Art. 19.1 PCT

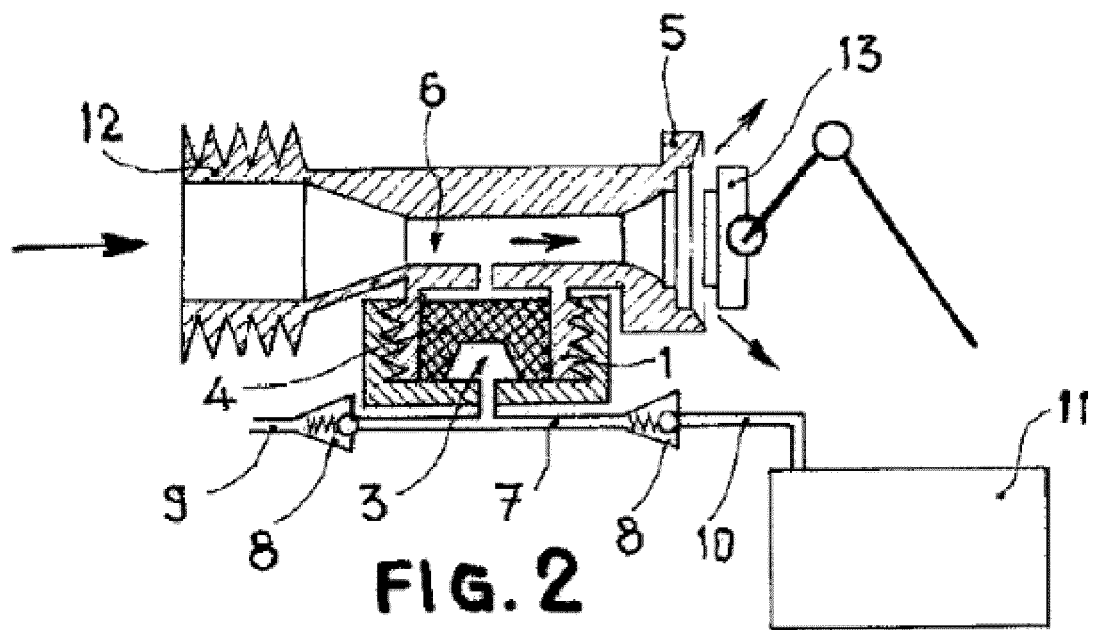
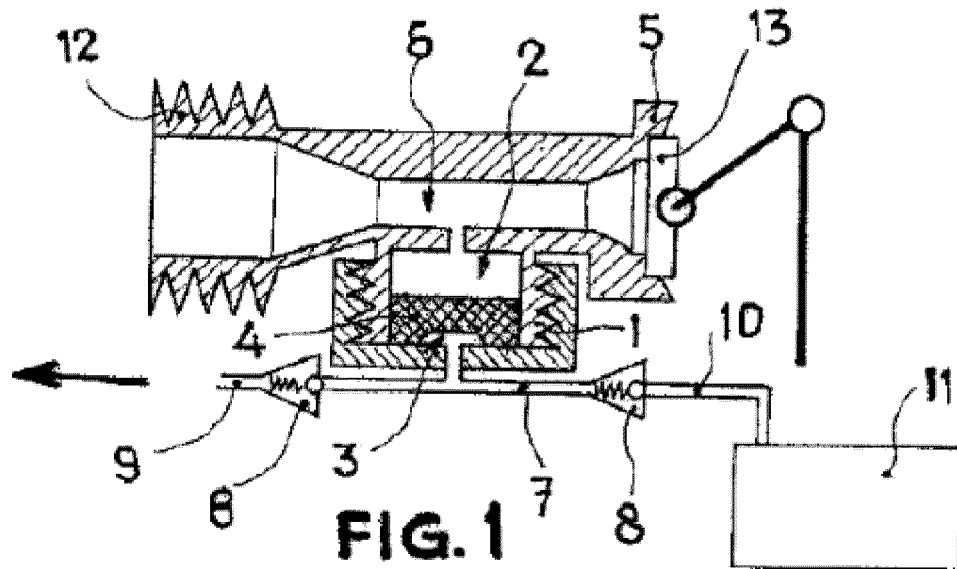
Differences between the claims as filed and the claims as amended: 35

- claims 1 is modified, including in its characterizing portion and at the end of it the claim 2 as filed; basis can be found in page 8, lines 19-21, figures 1, 2 and 8 in the application as filed; 40
- claims 2 to 5 are deleted. 45

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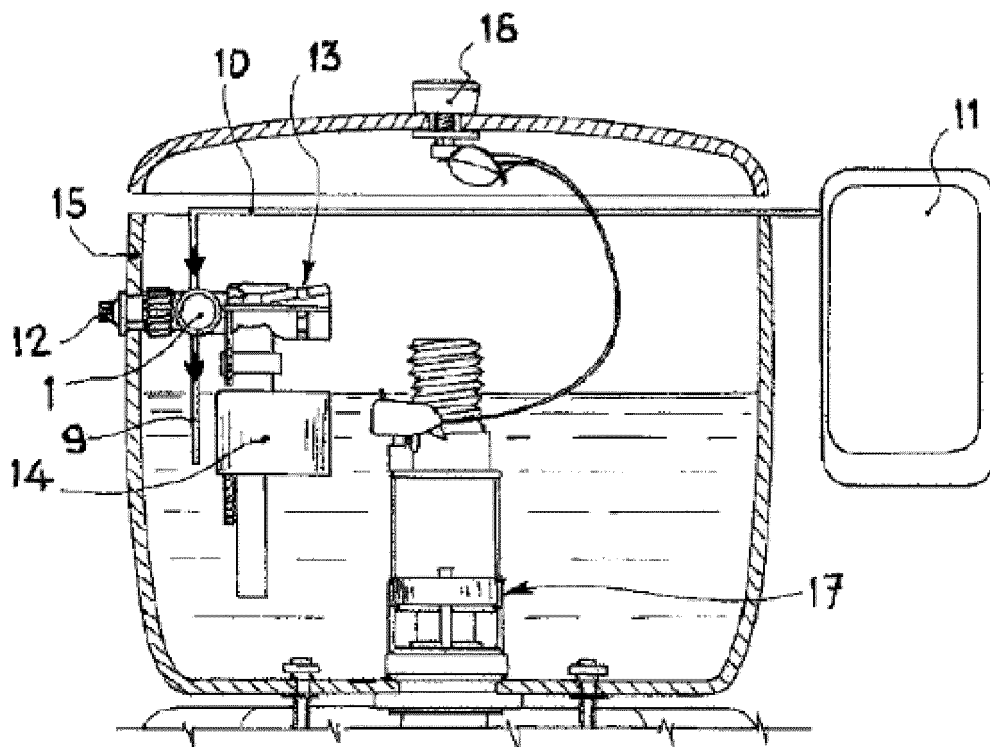


FIG. 3

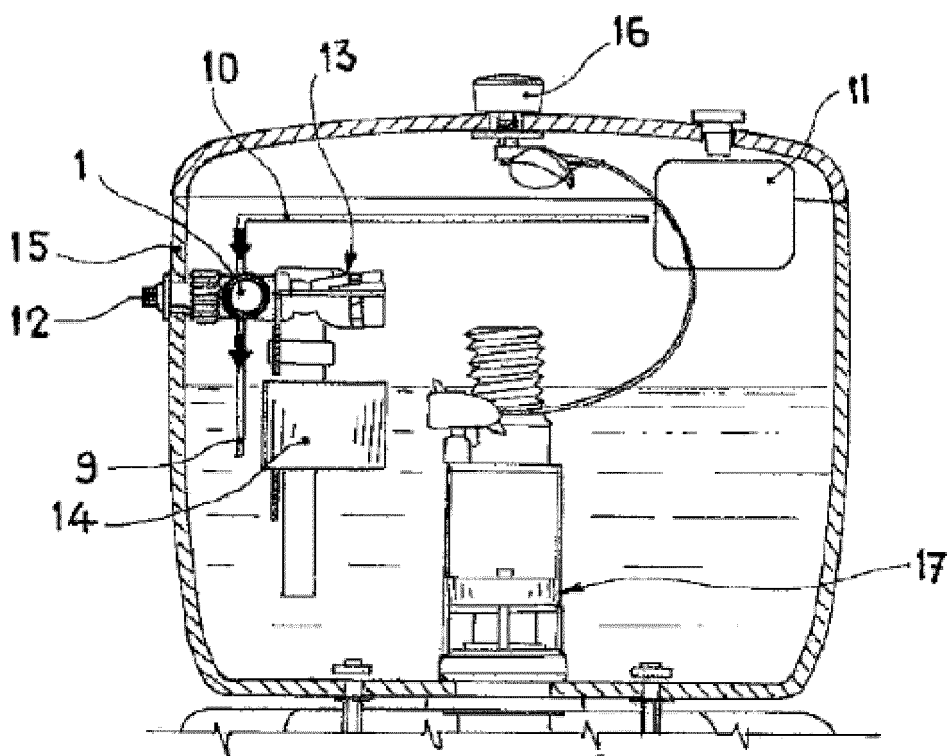


FIG. 4

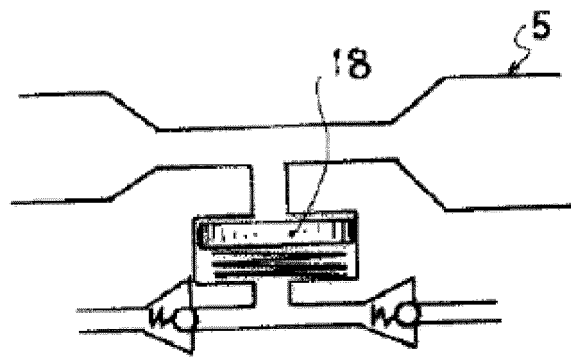


FIG. 5

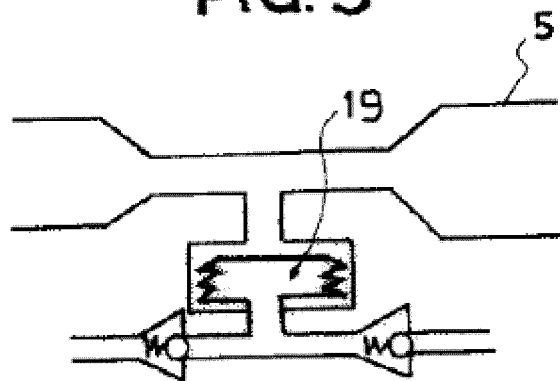


FIG. 6

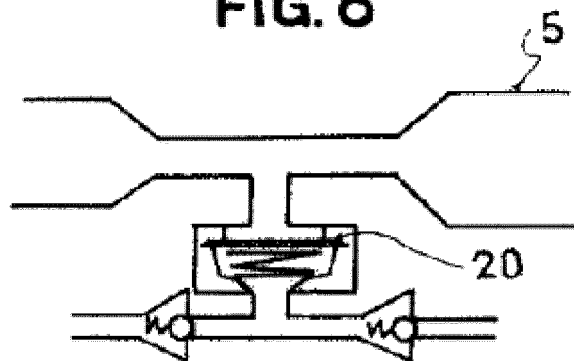


FIG. 7

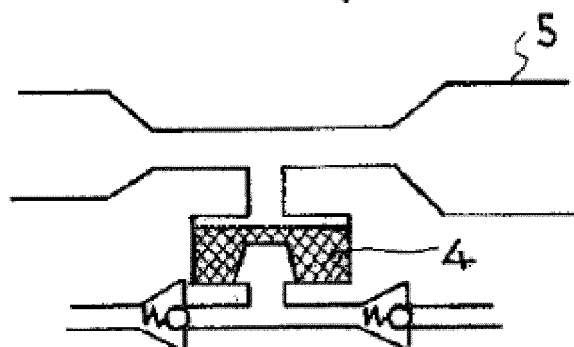


FIG. 8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/ES2015/070783

A. CLASSIFICATION OF SUBJECT MATTER

E03D9/03 (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
E03D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPODOC, INVENES

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR 2498656 A1 (HYCO AULAS) 30/07/1982, Abstract from DataBase WPI. Retrieved from EPOQUE, claim 1, figures 1 - 2.	1-5
A	GB 191418916 A (GILL GEOFFREY MURTON ET AL.) 05/08/1915, (abstract).	1
A	DE 2439821 A1 (ROST & SOEHNE GEORG) 08/04/1976, Abstract from DataBase WPI. Retrieved of EPOQUE; figure 1.	1
A	US 2009100579 A1 (BUHBUT MOSHE ET AL.) 23/04/2009, Abstract from DataBase WPI. Retrieved of EPOQUE; figure 1.	1
A	US 5692250 A (OLDFELT SVEN ET AL.) 02/12/1997, Abstract from DataBase WPI. Retrieved of EPOQUE; figure 1.	1

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance.	
"E" earlier document but published on or after the international filing date	
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"P" document published prior to the international filing date but later than the priority date claimed	"&" document member of the same patent family

Date of the actual completion of the international search
16/02/2016

Date of mailing of the international search report
(19/02/2016)

Name and mailing address of the ISA/

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Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/ES2015/070783

Information on patent family members

Patent document cited in the search report	Publication date	Patent family member(s)	Publication date
FR2498656 A1	30.07.1982	NONE	
GB191418916 A	05.08.1915	NONE	
DE2439821 A1	08.04.1976	NONE	
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Form PCT/ISA/210 (patent family annex) (January 2015)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- ES 2159392 T3 [0003]
- ES 1049300 U [0004]
- US 5692250 A [0005] [0015]
- ES 2377092 B1 [0006]
- US 20090100579 A1 [0007]