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(54) Valve for a pressurized container

(57) The present invention provides a valve for a pressurised container. The valve comprises a hollow body (10) mounted onto the container, the hollow body (10) having an internal volume having a feeding means (14), a first body (11) retained in the hollow body (10), the first body (11) being mobile with respect to the hollow body (10) and co-operating with the feeding means (14) so that the first body (11) obstructs the feeding means (10) in a predetermined orientation of the container and the valve comprises a second body (12), the second body (12) being in magnetic interaction with the first body (11), so as to reinforce the action of the first body (11) particularly when used in combination with viscous product or/and high flow rates.

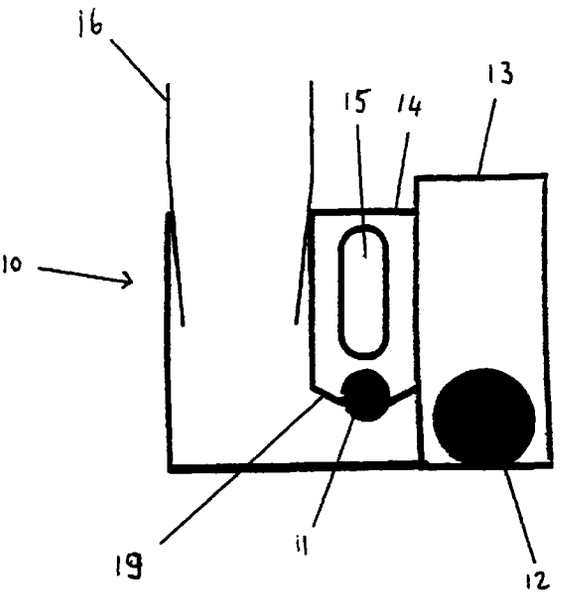

Fig. 1a

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Description

Technical field

The present invention relates to a valve for a pressurised container.

Background of the invention

A pressurised container usually contains a product together with a propellant. The propellant usually creates the necessary pressure inside the container. The propellant may be a liquid or a gaseous propellant. When the propellant is a liquid propellant, the pressure inside the container is created by the vapour pressure of the liquid propellant. The gaseous propellant and the vapour phase of the liquid propellant are usually located in the head space of the container when the container stands in its upright position. The pressure inside the container is higher than the normal outside atmospheric pressure. The inside pressure of the container is maintained by closing the container with a valve. Consequently, the propellant tends to exit from the inside of the container once the valve of the container is opened. Thereby the propellant also drives the product out of the container.

In order that all of the product can be expelled out of the container it has to be ensured that enough propellant is available in the container with respect to the amount of product. Consequently, it has to be ensured that the propellant is not allowed to exit unnecessarily, i.e. the product must be expelled at the same time as the propellant. If product is not expelled at the same time as the propellant, the propellant may be progressively emptied out of the pressurised container until the remaining amount of propellant may become too low, with respect to the rest of product remaining in the container, to ensure the complete dispensing of the rest of product from inside the pressurised container. The rest of the product which cannot be expelled from inside the pressurised container is then wasted.

The discharge of propellant without product may happen whenever the product is not placed between the propellant and the discharging opening of the pressurised container. Indeed, it has to be ensured that the propellant is obliged to pass through the product pushing at least part of the product out of the pressurised container.

This may be done by use of a three-way valve, which is a mechanism comprising two input feeding means, whereby at least one of the feeding means can be obstructed by a mobile body when the container is substantially upright or substantially inverted. The opening of each feeding means is located in such a place that the propellant is obliged to pass through the product pushing at least part of the product out of the pressurised container through one of the feeding means when the container is substantially upright and through the other when the container is substantially inverted. Such types of valves are described in patent EP-0053350, published on the 2nd of May 1985 or US-4277001, published on the 7th of July 1981, and in the application FR-2 688 286, published on the 10th of September 1993.

For example, when on one hand the propellant is above the product when the pressurised container is hold substantially upright, and on the other hand the feeding means are a dip tube connecting the discharging opening at the top of the container with the bottom of the pressurised container and an opening connecting the discharging opening at the top of the container with the top of the pressurised container, the mobile body will obstruct the dip tube when the container is inverted so that the product will be pushed through the other feeding mean by the propel/ant, whereas the same mobile body will obstruct the top feeding mean when the container is inverted so that the product will be pushed through the dip tube by the propellant.

The mechanism can be analysed as follows. The mobile body in the mechanism is submitted to two forces: the force created by the gravity (F_1) and the force created by the product flow (F_2). F_1 is mainly dependent on the mass of the mobile body. F_2 is mainly dependent on the viscosity of the product, on the flow rate and on the main cross section of the mobile body in the product flow and can be approximated by Stoke's law:

$$F_2 = 3\pi D\bar{v}\mu$$

where D is the cross section of the mobile body perpendicular to the flow, $\bar{v}$ is the flow velocity and μ is the product viscosity.

In order to have an appropriate functioning, F_1 must overcome F_2. If we then consider the viscosity of the product and the flow rate of the product as two constraints imposed by the system, two main variables can be modified: the mass of the mobile body and the main cross section of the mobile body in the product flow. In order to overcome the drag force F_2, the mobile body should have a high mass with a small main cross section in the product flow. This is limited as a higher mass normally leads to a higher volume and, consequently, to a higher main cross section. It has been found that this mechanism only works for low discharging rates of about 2 grams of product per second as the maximum limit.

The present invention is aiming at increasing F_1 against F_2 in order to render it possible to spray viscous and/or high flow rate formulae while minimising the propellant losses.

It is an object of the present invention to compensate the viscosity and/or the flow rate of the product to be sprayed while maintaining the functionality of the valve.

It is an other object of the present invention to pro-

vide an ecological spray mechanism for viscous and/or high flow rate formulae.

It is yet an other object of the present invention to provide a spray mechanism for viscous and/or high flow rate formulae allowing to minimise production costs.

Summary of the invention

The present invention relates to a valve for a pressurised container, the valve comprising:

(a) a hollow body (10) mounted onto the container, the hollow body having an internal volume having at least a feeding means (14);

(b) a first body (11) retained in the hollow body (10), the first body (11) being mobile with respect to the hollow body (10) and cooperating with the feeding means (14) so that the first body (10) obstructs the feeding means (14) at least in a predetermined orientation of the container; the valve being characterised in that it comprises:

(c) a second body (12), the second body (12) being in magnetic interaction with the first body (11).

These first (11) and second (12) bodies can then be analysed as a single mechanical system submitted to forces F_1 and F_2. In this system, F_1 depends on the added mass of the first (11) and second (12) bodies whereas F_2 depends only on the main cross section of the first body (11), as the second body (12) can be isolated from the product flow. The user is consequently free to adjust the total mass of the system, consequently F_1, without changing the value of F_2. This is done by acting on the mass of the second body (12).

Detailed description of the invention

Figure 1a is a schematic cross sectional view of an embodiment of a valve according to the present invention in its upright position. Figure 1b is a cross sectional view of the valve of Figure 1a in its inverted position.

Figure 2a is a schematic cross sectional partial view of another embodiment of a valve according to the present invention in its upright position. Figure 2b is a cross sectional view of the valve of Figure 2a in its inverted position.

Figure 3a is a schematic cross sectional partial view of yet another embodiment of a valve according to the present invention in its upright position. Figure 3b is a cross sectional view of the valve of Figure 3a in its inverted position.

The valve for a pressurised container of the present invention comprises a hollow body (10) mounted onto the container, the hollow body (10) having an internal volume having at least a feeding means (14), a first body (11) retained in the hollow body (10), the first body (11) being mobile with respect to the hollow body (10) and co-operating with the feeding means (14) so that the first body (11) obstructs the feeding means (10) at least in a predetermined orientation of the container and is characterised in that it comprises a second body (12), the second body (12) being in magnetic interaction with the first body (11).

The valve is mounted onto a pressurised container. A pressurised container is usually obtained by filling the container with a product and a propellant. The container is a hollow body which may be made from any material, preferably metal, plastics including polyethylene terephthalate (= PET), oriented polypropylene (= OPP), polyethylene (= PE) or polyamide and including mixtures, laminates or other combinations of these. The metal can may be made from tin plated steel or other metals such as aluminium. Preferably, the interior surface of the metal container is laminated with a plastic material or coated with a lacquer or with a varnish. The lacquer or varnish are such to protect the interior surface of the container from corrosion. The corrosion may lead to a weakening of the container and may also lead to a discoloration of the container's content. Preferred plastic materials for lamination and lacquers or varnishes for coating are epoxy phenolic, polyamide imide, organosol, PET, PP, PE or a combination thereof.

Any flowable material, including gaseous, liquid or foaming product, can be contained in the container and discharged through the valve according to the present invention. Preferred are foaming products when discharged with gaseous propellant. The propellant expands to form many bubbles within the composition thereby creating the foam. Specific hard surface cleaners are examples of foaming products. Such a foaming product is disclosed, for example, in EP-A-546 828. A preferred foaming product according to the present invention is a foaming laundry cleaning detergent. A foaming laundry cleaning composition is disclosed in EP-A-677 577 and in the co-pending European Patent Application No. 95870084.1.

The pressure inside the container can be created by a propellant. The pressure inside the pressurised container is such that the flowable material and the propellant is expelled to the outside of the pressurised container once the valve is in an open position. The pressure inside the container is therefore higher than the external atmospheric pressure outside the container. The pressure inside the container is preferably at least 5 bar at 20°C, more preferably the inside pressure is in the range between 8 bar and 10 bar at 20°C. The quantity of propellant contained in the container is such that substantially all the flowable material can be expelled out of the container throughout the life of the pressurised container at the correct pressure. The quantity also depends from the type of propellant used. Suitable propellants known in the art are liquid and gaseous propellants. Preferred propellants are gaseous propellants for environmental friendliness. As herein

referred to, the words "gaseous" and "non-liquifiable" are used interchangeably in regard to the propellant. Indeed, gaseous propellants or non-liquifiable propellants are propellants which are in a gaseous state of matter at room temperature (about 20°C) and at pressures up to 12 bar. Furthermore, it is preferred to use 'ozone-friendly' propellants such as compressed air, carbon dioxide, nitrogen and oxides thereof or mixtures thereof. Carbon dioxide is the more preferred gaseous propellant. Minor amounts of low molecular weight hydrocarbons, such as propane, butane, pentane, hexane, may optionally be included provided that flammability requirements are not exceeded. Various ways to pressurise the propellant gas are known in the art. For example the gas may be pressurised at the time of packing. The product may be physically separated from a compressed gas by a membrane such as rubber under tension. Alternatively a means for pressurising the gas subsequently by mechanical action may be provided (so-called "pump and spray" systems).

The first body (11) can be spherical, but may be of any other shape which would allow it to cooperate with a corresponding feeding means (14). These shapes include ovoid, rings, cylinders or conoids. The second body (12) can be spherical, but may be of any other shape. These shapes include ovoids, cylinders, rings or conoids. In a preferred embodiment of the invention, the second body (12) has an annular shape so that it can totally surround the first body (11) allowing to exert an further improved magnetic interaction. Similarly, the first body (11) could also be annular.

The magnetic interaction between the first (11) and second bodies (12) can be obtained in various ways. In a preferred embodiment, the first body (11) is made of a soft magnetic material and the second body (12) is made of a hard magnetic material. A soft magnetic material has a remanence which is substantially zero. Such materials generally contain iron, nickel or cobalt. This includes various grades of steel. A hard magnetic material has a remanence which is substantially non zero. Such materials include bounded or sintered ferrites, alnico, and various materials containing rare earth such as Neodymium Iron Boron or Samarium Cobalt. In another embodiment of the invention, the first body (11) is made of hard materials and the second body (12) of soft materials. In yet another embodiment, the first (11) and second (12) bodies may be made of hard magnetic materials. The intensity of the magnetic interaction and the weight of the first (11) body-second (12) body mechanical system should be tuned so that the first body (11) can move fast enough from a non-obstructing position to obstructing position and reverse, and so that the first body (11) can be kept into place when the product is flowing, without being entrained in a viscous flow. The intensity of the magnetic interaction can be tuned in various ways. A first way to tune the intensity of the magnetic interaction is through use of different materials. As an example, a hard material-hard material interaction is generally more intensive than a hard material-soft material interaction. As an other example, sintered material will generally involve a more intense magnetic interaction than bounded materials. As yet another example, rare earth containing materials will normally allow a more intense magnetic interaction than alnico materials or ferrites. An other way to tune the intensity of the magnetic interaction can be obtained through modification of the magnetisation direction of the materials. Other ways comprise modifications of shape or volume of the magnets as well as dimensioning, because the magnetic interaction varies greatly with the distance. The weight of the first body-second body mechanical system can be tuned as well by choice of materials or by modification of shape or volume. The tuning choices should be optimised taking account of various criteria, such as environmental, corrosion or price issues. For example, ferrite is a material generally cheaper than rare earth containing materials. As an other example, materials containing iron may be corroded in an aqueous environment. For instance, this may be prevented by isolating the second body (12) into an other hollow body (13), whereby it is not in contact with a corrosive environment. The corrosion may be due to certain product and/or propellant characteristics, like the pH.

The movements allowed for the first (11) and second (12) bodies are not limited as long as their position is appropriate for obstruction in the desired orientation, for instance when propellant losses should be prevented. For example, the first (11) and second (12) bodies can have parallel movements (Fig. 1a,b and Fig. 2a,b), or the second body (12) may have amplified movements (Fig. 3a,b), in order to enhance the obstructing strength of the first body (11).

An embodiment of a valve according to the present invention is shown in Figures 1 a and b. The valve comprises a hollow body (10), a feeding means (14), a first body (11) and a second body (12).

In this embodiment, the feeding means (14) comprises an opening (15) allowing communication between the valve and the container, as well as a part (19) which can cooperate with the first body (11) in such a manner that the feeding means (14) is obstructed by the first body (11) when the container is hold upright (Fig. 1a). The content of the container can exit the container by passing through the open valve (Fig. 1b). In case of use with a flowable material sprayed out thanks to the pressure produced by a propellant, the communication (15) between the valve and the container should preferably be placed so that the propellant has to go through the flowable material prior to accessing the communication (15). Consequently, the propellant should not exit while the container has an undesired inclination (Fig. 1a). An undesired inclination is any inclination in which the propellant is capable to exit from the inside of the container without expelling at the same time the product. As described above, this may happen whenever the propellant is not obliged to pass through

the product when the valve is opened. In the example, on one hand the propellant is above the product when the pressurised container is hold substantially upright (Fig. 1a), and on the other hand the feeding means is an opening (15) connecting the discharging opening (16) at the top of the container with the top of the pressurised container. The first body (11) will obstruct the feeding means (14) when the container is upright (Fig. 1a) so that the product will be pushed through only when the container is inverted (Fig. 1b), whereby the propellant has to go through the flowable material prior to accessing the communication, so that propellant losses are minimised. In this case, the predetermined orientation is obtained when the container is upright (Fig. 1a). Consequently, the valve has an open position (Fig. 1b) and a closed position (Fig. 1a) corresponding to the predetermined orientation. The closed position of the valve (Fig. 1a) prevents any substantial escape of product and/or propellant from the container. The open position of the valve (Fig. 1b) allows the discharge of the product and/or of the propellant from the container. The valve is in its closed position (Fig. 1b) when the feeding means (14) is obstructed.

An other embodiment of a valve () according to the present invention is shown in Figures 2 a and b. The valve comprises a hollow body (10), two feeding means (14, 17), a first body (11) and a second body (12).

In this embodiment, the first feeding means (14) comprises an opening (15) allowing communication between the valve and the top of the container, as well as a part (19) which can cooperate with the first body in such a manner that it is obstructed by the first body (11) when the container is hold upright. The second feeding means (17) comprises a dip tube (18) connecting the valve to the bottom of the container when the container is hold upright. The two feeding means (14, 17) allow use of the valve in upright (Fig. 2a) as well as in inverted position (Fig. 2b) of the container. In this example, the propellant is above the product when the pressurised container is hold substantially upright. The first body (11) will obstruct the first feeding means (14) when the container is upright (Fig. 2a) in order to prevent losses of propellant, while allowing the product to be pushed through the other feeding mean (17) by the propellant. When the container is inverted (Fig. 2b), none of the feeding means is obstructed, but the product will be pushed through the first feeding mean (14) by the propellant because it is more favourable than going through the dip tube (18). In this aim, the dip tube (18) preferably has a smaller area than the opening (15), so that the propellant flow favourably goes through the flowable material, prior to accessing the valve with minimised propellant losses.

Yet an other embodiment of a valve according to the present invention is shown in Figures 3 a and b. The valve comprises a hollow body (10), two feeding means (14, 17), a first body (11) and a second body (12).

In this embodiment, the first feeding means (14) comprises an opening (15) allowing communication between the valve and the top of the container, as well as a part (19) which can cooperate with the first body (11) in such a manner that it is obstructed by the first body (11) when the container is hold upright (Fig. 3a). The second feeding means (17) comprises a dip tube (18) connecting the valve to the bottom of the container when the container is hold upright, as well as a part (19') which can cooperate with the first body (11) in such a manner that it is obstructed by the first body (11) when the container is hold inverted (Fig. 3b). The two feeding means (14, 17) allow use of the valve in upright (Fig. 3a) as well as in inverted (Fig. 3b) position of the container. In this example, the propellant is above the product when the pressurised container is hold substantially upright. The first body (11) will obstruct the first feeding means (14) when the container is upright (Fig. 3a) in order to prevent losses of propellant, while allowing the product to be pushed through the second feeding mean (17) by the propellant. The first body (11) will obstruct the second feeding means (17) when the container is inverted (Fig. 3b) in order to prevent losses of propellant, while allowing the product to be pushed through the first feeding mean (14) by the propellant. Consequently, in all inclinations the propellant has to go through the flowable material prior to accessing the valve with minimised propellant losses.

Claims

1. A valve for a pressurised container, the valve comprising:

   (a) a hollow body (10) mounted onto the container, the hollow body (10) having an internal volume having at least a feeding means (14);

   (b) a first body (11) retained in the hollow body (10), the first body (11) being mobile with respect to the hollow body (10) and co-operating with the feeding means (14) so that the first body (11) obstructs the feeding means (14) at least in a predetermined orientation of the container; the valve being characterised in that it comprises:

   (c) a second body (12), the second body (12) being in magnetic interaction with the first body (11).

2. A valve as in claim 1, characterised in that the container contains a propellant and a flowable material.

3. A valve as in claim 2, characterised in that the internal volume has a second feeding means (17).

4. A valve as in claim 3, characterised in that the first feeding means (14) opens into the flowable material

when the container is substantially inverted, and the second feeding means (17) opens into the flowable material when the container is substantially upright, and the first body (11) obstructs the first feeding means (14) when the container is substantially upright.

5. A valve as in claim 3, characterised in that the first body (11) obstructs the second feeding means (17) at least in a second predetermined orientation of the container.

6. A valve as in claim 2, characterised in that the propellant is a gas.

7. A valve as in claim 2, characterised in that the flowable material has a viscosity of at least 100 cps.

8. A valve as in claim 2, characterised in that the flowable material is dispensed at a flow rate of at least 2 grams per second.

9. A valve as in claim 2, characterised in that the flowable material is a foam formula.

10. A valve as in claim 2, characterised in that the flowable material contains 5 to 50 % of surfactants, preferably 10 to 30%.

11. A valve as in claim 2, characterised in that the propellant is above the flowable material when the container is substantially upright.

12. A valve as in claim 2, characterised in that the second body (12) is not in contact with the flowable material.

13. A valve as in claim 1, characterised in that the first (11) and/ or second (12) body is a magnet.

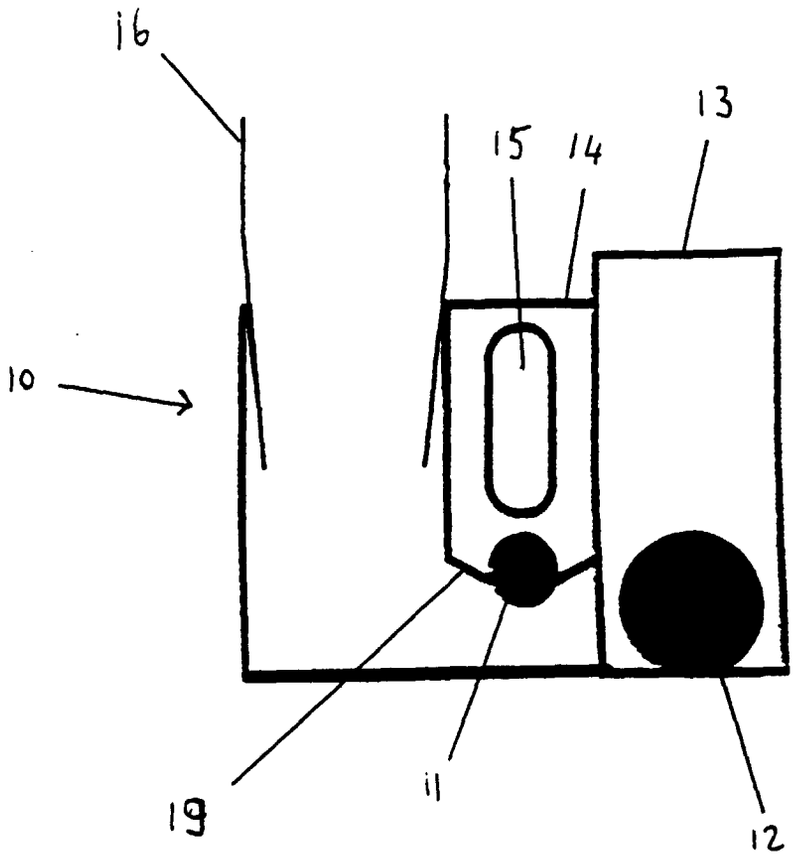

Fig. 1a

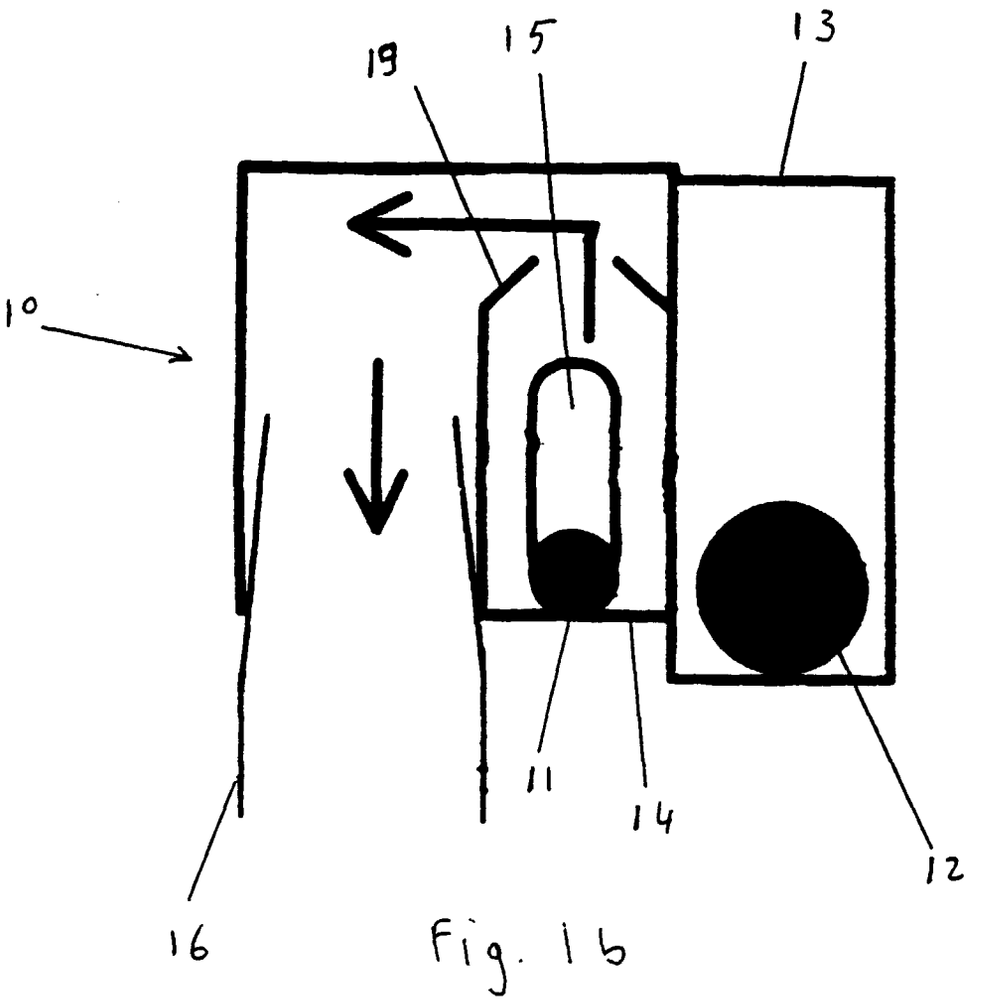

Fig. 1b

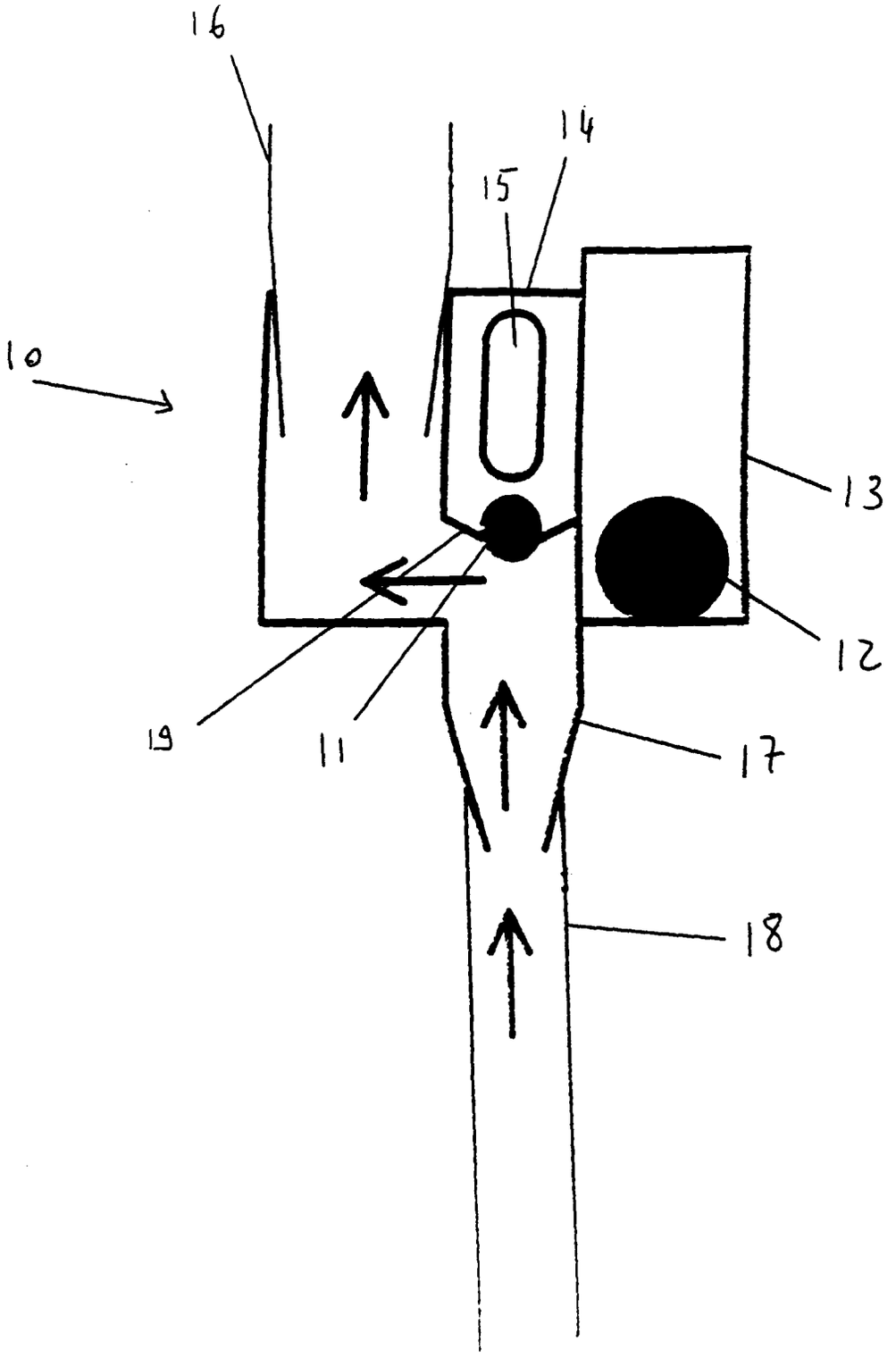

Fig. 2a

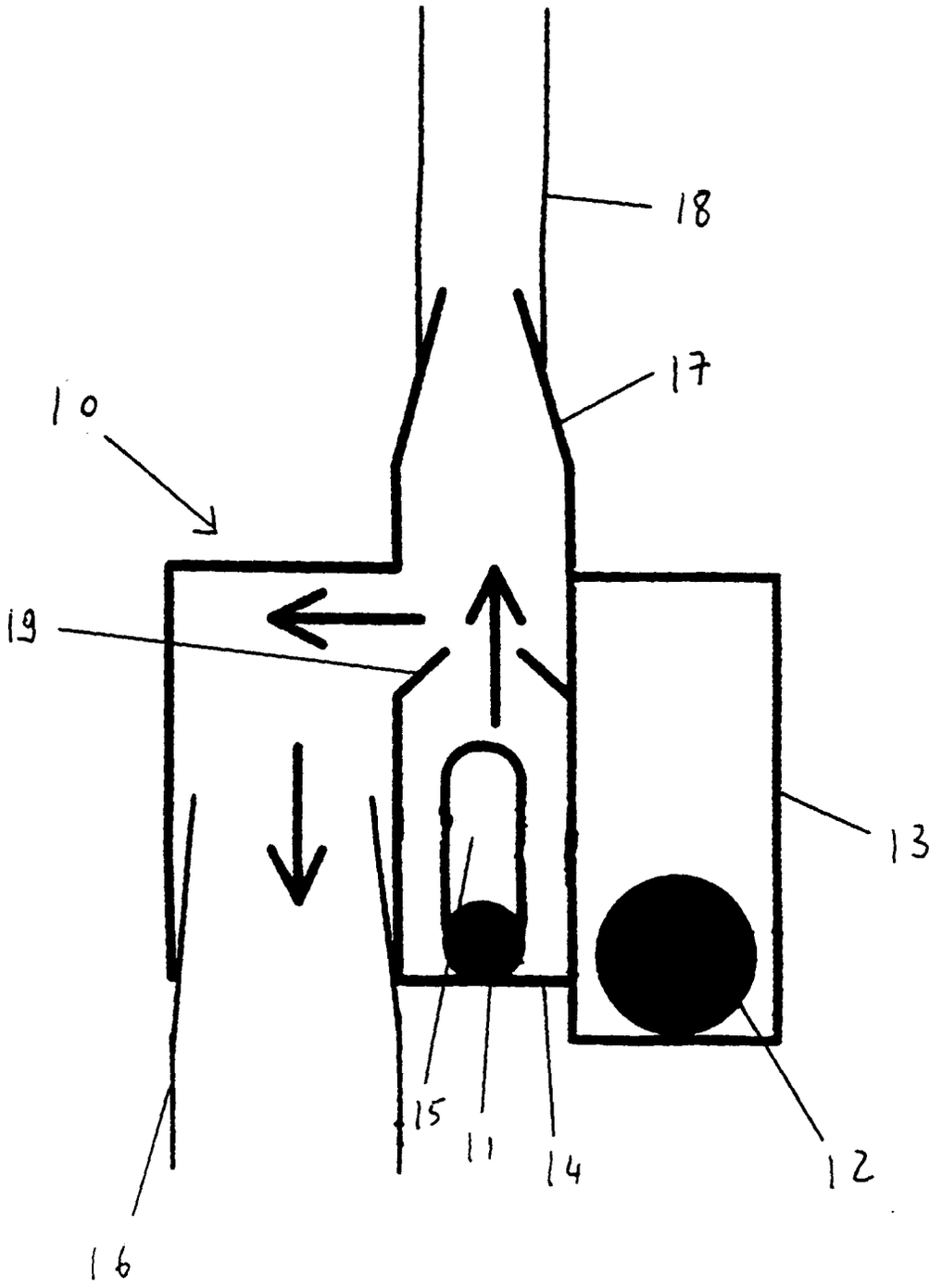

Fig. 2b

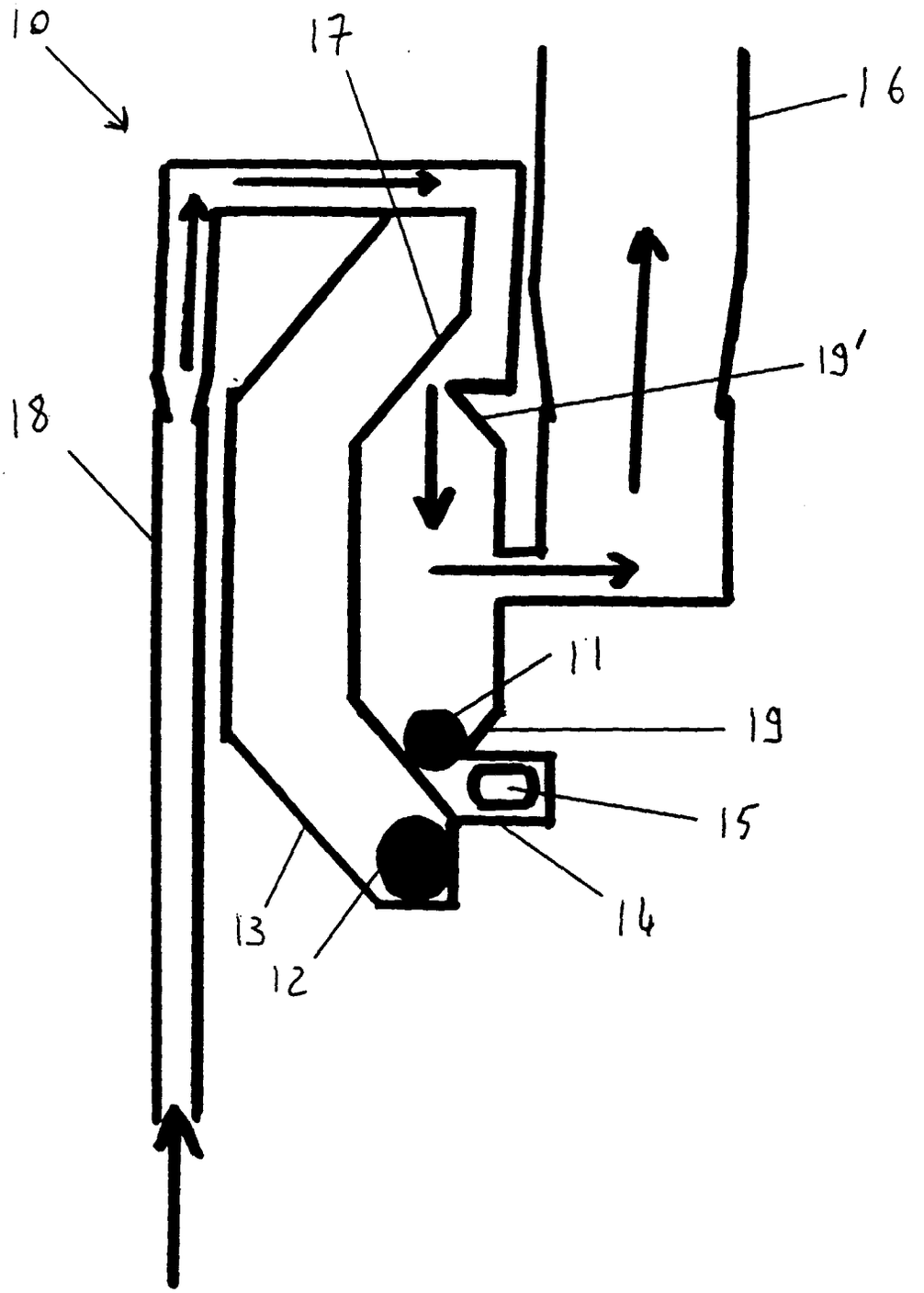

Fig 3a

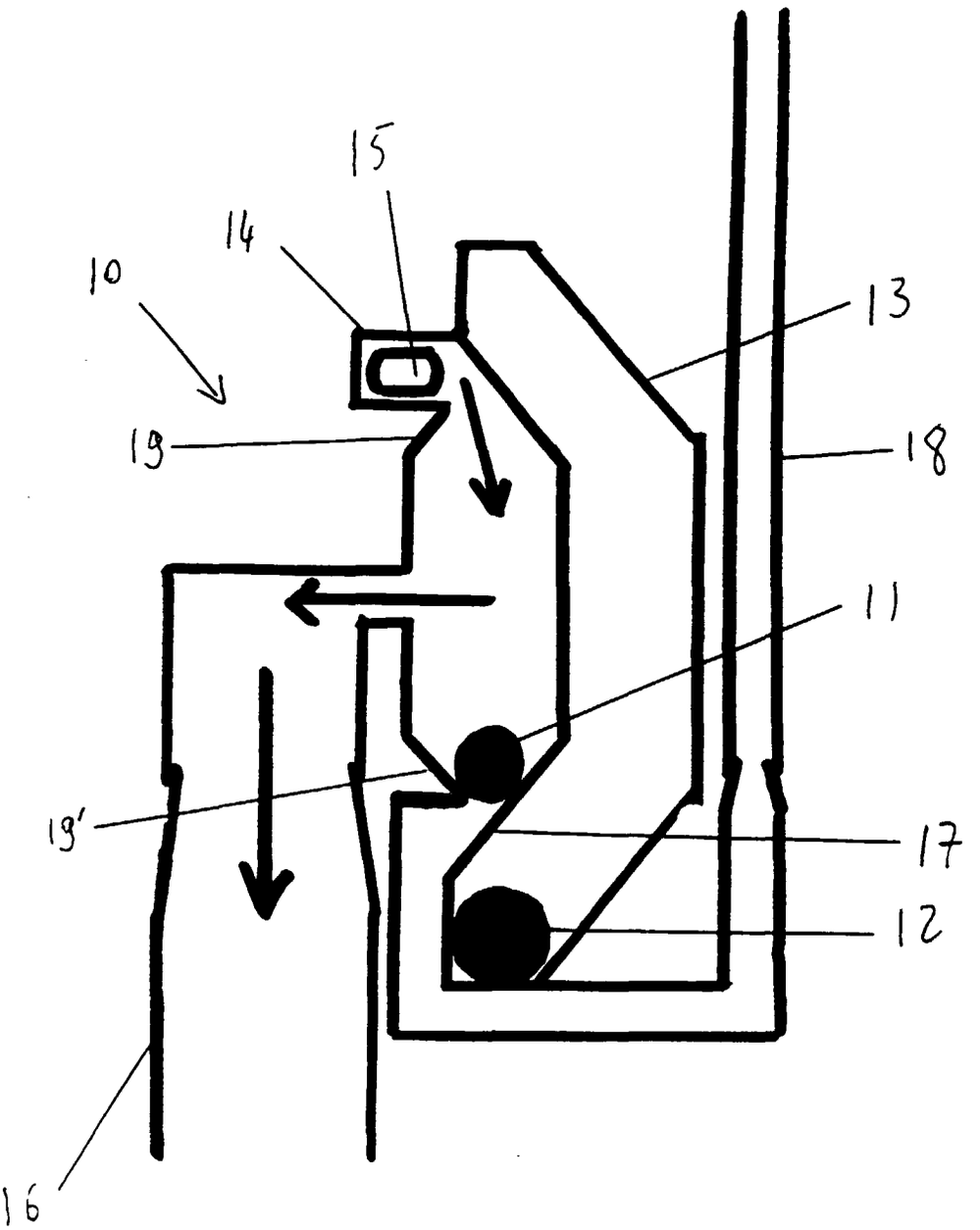

Fig 3b

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 97 20 1826

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	US 3 893 596 A (E.W.BERES) * abstract; figure W * ---	1-6,11	B65D83/14 B05B11/00
A	FR 2 637 870 A (OREAL) * abstract; figures * -----	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

B65D
B05B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	30 October 1997	Zanghi, A

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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