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(19) **HU**(11) Lajstromszám: **E 035 871**(13) **T2****MAGYARORSZÁG**
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Gojara, 9070 Destelbergen (BE)(72) Feltalálók(k):
VANDERSTRAETEN, Erwin, 9050 Gentbrugge (BE)(74) Képviselő:
ARINOVA Szabadalmi és Védjegy Iroda,
Budapest(54) **Nyomákszabályozó eszköz, adagoló, mely tartalmazza a nevezett nyomákszabályozó eszközt és gyártási
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(54) **PRESSURE CONTROL DEVICE, DISPENSER COMPRISING SAID PRESSURE CONTROL DEVICE AND METHOD OF MANUFACTURING**

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(73) Proprietor: **Gojara
9070 Destelbergen (BE)**

(72) Inventor: **VANDERSTRAETEN, Erwin
9050 Gentbrugge (BE)**

(74) Representative: **Eeckhaoudt, Sabine Maria A.
Eeckhaoudt IP bvba
Gloxiniastraat 28
9940 Evergem (BE)**

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EP 3 186 165 B1

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Description

TECHNICAL FIELD

[0001] The present invention relates to a pressure control device for maintaining a constant predetermined excess pressure in a fluid dispensing container. The present invention further concerns a method for manufacturing a pressure control device according to an embodiment of the invention. The invention is of particular importance in the technical fields of aerosol sprays. This type of spray finds uses in foam dispensers, toiletry articles, and cosmetics.

[0002] Devices of the invention are particularly useful as replacements for systems based on chlorofluorocarbon propellants, mixtures of volatile hydrocarbons or ethers, as they provide a more environmentally friendly alternative based on compressed air or inert gas. Preferably the container is plastic and replaces aluminum cans. This provides further economic and ecological benefits.

BACKGROUND

[0003] Dispensing devices based on propellants are known. Propellants are damaging to the environment and are being banned. An alternative on the basis of pressurized air was recently introduced to the market. This pressure control system as described for instance in EP 1 725 476 comprises a pressure control device and a fluid dispensing container. The pressure is controlled by means of a valve mechanism wherein a stem with a broader cylindrical end portion protruding from a piston is used to dynamically open or close a sealing material. The valve mechanism of this type of dispenser is sensitive to damage, among others at the assembly stage, which can lead to instabilities in the working pressure, causing the system sometimes to fail. In addition, this mechanism is made out of a large number of parts and requires a labor intensive production process. Hence, improvements are desired.

[0004] It is an object of the present invention to provide a pressure control system which is less sensitive to malfunction and consequently more reliable. It is another objective to reduce the number of parts and reduce the number of steps in the production process, making the process and device less expensive.

SUMMARY OF THE INVENTION

[0005] Against this background the invention provides in a pressure control device for maintaining a constant predetermined pressure in a container according to claim 1.

[0006] A main advantage of the present invention is that the pressure control device can be pressurized after implementation and filling of the liquid dispensing bottle. Since the second chamber is encompassing the first

chamber, a very compact pressure control device will be obtained so that the total usable space in the bottle is much larger as in known embodiments. As the pressure control device can be fabricated in advance and can be implemented easily in existing plastic bottles, the existing production and filling procedures can be maintained. As less parts are required for the assembly, cost savings can be realized.

[0007] In another aspect, the invention provides a pressure control system comprising a fluid dispensing container and a pressure control device according to an embodiment of the invention, in accordance with claim 9.

[0008] In a further aspect, the invention provides in a method for manufacturing a pressure control device according to an embodiment of the invention, according to claim 12.

[0009] In yet another aspect, the invention provides in a method for manufacturing a pressure control system, according to claim 14.

[0010] In a final aspect, the invention provides in uses of a pressure control device and system according to an embodiment of the invention, according to claim 16.

[0011] Further advantages of the invention are disclosed in the dependent claims and in the following description in which an exemplified embodiment of the invention is described with respect to the accompanying drawings.

FIGURES

[0012]

Figures 1 and 3 are graphic representations of pressure control devices (1) according to an embodiment of the invention, wherein a fluid communication channel (9) is provided with an annular protrusion (6) in the form of a hollow needle (26). Figure 1 depicts the pressure control device (1) in open position; Figure 3 depicts the closed position.

Figures 2 and 4 are a graphic representation of a pressure control device (1) according to an embodiment of the invention, which is additionally provided with a so-called knife (13).

Figures 5 to 15 provide three dimensional representations or cross-sections thereof of the pressure control devices (1) of Fig 1-3 and Fig 2-7.

Figures 16-17 provide schematic representations of experimental data.

Figures 18-36 provide graphic representations of alternative embodiments of the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0013] Unless otherwise defined, all terms used in dis-

closing the invention, including technical and scientific terms, have the meaning as commonly understood by one of ordinary skill in the art to which this invention belongs. By means of further guidance, term definitions are included to better appreciate the teaching of the present invention.

[0014] As used herein, the following terms have the following meanings: "A", "an", and "the" as used herein refers to both singular and plural referents unless the context clearly dictates otherwise. By way of example, "a compartment" refers to one or more than one compartment.

[0015] "About" as used herein referring to a measurable value such as a parameter, an amount, a temporal duration, and the like, is meant to encompass variations of +/-20% or less, preferably +/-10% or less, more preferably +/-5% or less, even more preferably +/-1% or less, and still more preferably +/-0.1% or less of and from the specified value, in so far such variations are appropriate to perform in the disclosed invention. However, it is to be understood that the value to which the modifier "about" refers is itself also specifically disclosed. "Comprise," "comprising," and "comprises" and "comprised of" as used herein are synonymous with "include", "including", "includes" or "contain", "containing", "contains" and are inclusive or open-ended terms that specifies the presence of what follows e.g. component and do not exclude or preclude the presence of additional, non-recited components, features, element, members, steps, known in the art or disclosed therein.

The recitation of numerical ranges by endpoints includes all numbers and fractions subsumed within that range, as well as the recited endpoints.

[0016] A further advantage of the invention is that, since only normal air or any other suitable inert gas is used for the pressure filling, the process facilities, equipment and manufacturing environment and operating procedures do not need to take account of the special safety requirements normally needed for dangerous flammable propellants.

[0017] The inventor has come up with a solution to overcome problems with the prior art dispensers. The improvement consist in the presentation of a new pressure control device.

[0018] In particular, the invention provides in a pressure control device for maintaining a constant predetermined pressure in a fluid container which is arranged for dispensing a fluid contained in the container from the fluid container at said pressure, the pressure control device comprising a cylinder having an open end and a closed end, and a stopper movable within said cylinder to define a first chamber, a second chamber encompassing the cylinder of the first chamber, the second chamber fillable with a gas which in use has a higher pressure than said pressure in the container, at least one fluid connection between the second chamber and the container, and a closing member movable relative to the cylinder for releasing and closing said fluid connection between

the second chamber and the fluid dispensing container depending on the position of the closing member relative to the cylinder, the position of the closing member relative to the second chamber being at least dependent on the prevailing pressure in the fluid dispensing container and the prevailing pressure in the first chamber, while in use the fluid connection is released when the pressure in the fluid dispensing container decreases below the predetermined pressure, so that gas flows from the second chamber to the fluid dispensing container and the pressure in the fluid dispensing container increases until the fluid connection is closed by the closing member as a result of the increased pressure in the fluid dispensing container, characterized in that, said fluid connection is an opening in the wall of the second chamber facing the fluid container and said opening is provided with a circumferential protrusion extending from the outer side of the wall towards the fluid dispensing container; preferably by a height H of 0.1-2.0 mm.

[0019] The provision of a protrusion is advantageous as it provides for an easy lift of the closing member when the pressure in the container drops. The device is not based on a valve mechanism involving a stem on which the compressed air in the pressure reservoir acts. As much as 8 bar pressure may act on a stem of the prior art pressure control device ($1 \text{ bar} = 10^5 \text{ Pa}$).

[0020] In a preferred embodiment the protrusion extends by 0.2-1.0 mm, more preferably 0.3-0.8 mm from the outer side of the wall. In a more preferred embodiment the protrusion extends by 0.4-0.7 mm from the outer side of the wall. Most preferably the extension is 0.6 mm. The protrusion is present around the opening provided by the fluid connection without interruptions to avoid leaks, i.e. circumferential. In a preferred embodiment the circumferential protrusion is an annular protrusion; i.e. a circle around the opening.

[0021] In a preferred embodiment of a pressure control device according to the invention, said piston comprises a rim part provided with an elastomer material for actuating said circumferential protrusion. Preferably said elastomer material is a silicone or a rubber material. This type of material is deformable which is advantageous to close of said opening.

[0022] With the term elastomer as used herein, is meant a rubbery material composed of long chainlike molecules, or polymers, that are capable of recovering their original shape after being stretched to great extent-hence the name elastomer, from "elastic polymer". Elastomers are polyisoprene, the polymer constituent of natural rubber and synthetics, such as styrene-butadiene rubber, butadiene rubber, acrylonitrile-butadiene copolymer (nitrile rubber), isobutylene-isoprene copolymer (butyl rubber), polychloroprene (neoprene), polysulfide (Thiokol), polydimethyl siloxane (silicone), fluoroelastomer, polyacrylate elastomer, polyethylene (chlorinated chlorosulfonated), styrene-isoprene-styrene (SIS, styrene-butadiene-styrene (SBS) block copolymer, EPDM-polypropylene blend. Advantageously said elastomer

material is an acrylonitrile butadiene rubber (NBR). It has the advantage of being air tight. Another preferred elastomer is a fluoroelastomer, commercialized under the trade name Viton.

[0023] In a preferred embodiment said elastomer material has a Shore A hardness of 50-95, more preferably 60-90, even more preferably 65-80, most preferably 70. Preferably an acrylonitrile butadiene rubber material of Shore A hardness 70 is used or a fluoroelastomer of Shore A hardness 75. The Shore A scale is used to measure the hardness of elastomers, rubber-like materials, and plastomer materials like polyurethane. The higher the number the harder the material. The method of measurement using a durometer is described in standard ISO 7619-1:2010

[0024] In a preferred embodiment of a pressure control device according to the invention, said annular protrusion is formed by a hollow needle inserted in the fluid connection. In a preferred embodiment of a pressure control device according to the invention, said annular protrusion is formed by a knob with an opening in communication with said fluid connection.

[0025] In a preferred embodiment of a pressure control device according to the invention, said wall of the first chamber facing the fluid container is provided with a knife-shaped protrusion arranged concentrically around the container of the first chamber and positioned between the container wall and said fluid connection and the protrusion is of equal height H as the annular protrusion of the fluid connection.

[0026] In a preferred embodiment of a pressure control device according to the invention, said first chamber has a diameter of 15.0-30.0 mm, preferably 18.0-28.0 mm, more preferably 20.0-25.0 mm, most preferably 22.0-24.0 and/or said stopper from said first chamber has a height h of 5.0-15.0 mm, preferably 7.0-13.0 mm, more preferably 8.0-12.0 mm, even more preferably 9.0-11.0 mm, most preferably 10.0 mm. These relatively large diameters have the advantage that friction on the sealing means, in particular on an O-ring, are minimized.

[0027] In a preferred embodiment of a pressure control device according to the invention, said cylinder of the first chamber is formed by a wall of said second chamber; i.e. in a single piece. This has the advantage that less parts require assembly. It also has for effect that no seal is required to connect the first chamber to the second chamber. Advantageously it can be provided by injection moulding.

[0028] In a preferred embodiment of a pressure control device according to the invention, wherein the stopper is comprising a neck and collar, the bottom part of the neck being provided with a sealing material. Preferably the neck is provided with a recess for taking up said sealing material. The sealing material can be an O-ring or an X-ring or halve of an X-ring. In the latter case the flat surface side is directed towards the neck portion of the stopper. Use of an X-ring is preferred over an O-ring because curling of the ring due to the movement of the stopper

can be avoided.

[0029] In an embodiment, a pressure control device of the invention is provided with two O-rings, one in the collar of the stopper for sealing of the fluid connection and the other in the bottom part of the neck of the stopper for sealing of the first chamber. Preferably the O-ring at the stopper bottom is treated to reduce friction. A Teflon spray can be applied to lay a film on the ring in order to reduce friction. As this is an expensive step, it is beneficial to be able to avoid it.

[0030] In another embodiment, a pressure control device is provided with a flat sealing material and an O-ring, wherein the flat sealing material is provided in the collar of the stopper for sealing of the fluid connection and the O-ring is provided in the bottom part of the neck of the stopper for sealing of the first chamber.

[0031] In yet another, and most preferred embodiment, a pressure control device is provided with a flat sealing material and an X-ring, wherein the flat sealing material is provided in the collar of the stopper for sealing of the fluid connection and the X-ring is provided in the bottom part of the neck of the stopper for sealing of the first chamber.

[0032] The sealing material or O-ring that is provided in the collar of the stopper, can be attached to the stopper or can be provided to move around the neck of the stopper. The benefits of this embodiment are explained under Figure 27.

[0033] Preferably the neck is provided with two or more protrusions, preferably equally divided over the circumference of the neck, and the container is provided with receiving means for said two or more protrusion, such that the stopper can move between a first position I wherein the collar part closes off the fluid connection and a second position II wherein the collar part opens the fluid connection.

[0034] In a preferred embodiment of a pressure control device according to the invention, the first and second chamber are of plastic, preferably polyethylene terephthalate, abbreviated as PET, or polyethylene furanoate, abbreviated as PEF. Preferably the stopper is also of polyethylene terephthalate or polyethylene furanoate, which is advantageous for recycling of the components of the pressure control device and system. In another embodiment the stopper is of polyoxymethylene (POM). The advantage of POM is that the hard material is less sensitive to expansion.

[0035] The second chamber is preferably of transparent plastic. It can comprise a transparent plastic bell and a non-transparent, for instance black, bottom part. This is advantageous as it allows the bottom part to be welded to the upper part by laser welding. The black part is laser energy absorbing, whereas the upper part is not.

[0036] In another aspect, the invention provides a pressure control system comprising a fluid dispensing container and a pressure control device according to an embodiment of the invention.

[0037] In a preferred embodiment of the pressure con-

trol system according to an embodiment of the invention, the fluid dispensing container has a dispensing opening with a dispensing valve, and a movable piston is provided in the container between the pressure control device and the dispensing opening, which piston is separating the fluid and the gas, and which is movable towards the dispensing opening by the excess pressure prevailing in the container.

[0038] Preferably the movable piston is designed as a dome with annular ribs. More preferably the movable piston is made of a plastic material.

[0039] In another preferred embodiment of the pressure control system according to an embodiment of the invention, the container has a dispensing opening with a dispensing valve, and a dip-tube is provided from the entry of the dispensing valve to the upper end of the pressure control device, in order to dispense the fluid through the dip-tube by the excess pressure prevailing in the container.

[0040] In a preferred embodiment of the pressure control system according to an embodiment of the invention, the dispensing valve has a spray nozzle.

[0041] In a preferred embodiment of the pressure control system according to an embodiment of the invention, the system in use is pressurized with compressed air to a pressure in the second chamber of 1.0-5.0 bar, preferably 1.5-4.5 bar, more preferably 2.0-4.0 bar, most preferably 2.1-3.0 bar. The pressure control system of the prior art is prepared to contain a minimum of 1.7 bar, preferably 2.2 bar pressure so as to deliver 1.5 bar pressure upon a period of storage. The present system has the advantage that it can go above 3 bar; whereas the prior art system is restricted to 2.5 bar. This is beneficial to provide a better product output, e.g. for viscous products. It can also be used to spray further than was previously possible.

[0042] In another preferred embodiment of the invention, the pressure in the second chamber is 3.1-5.0 bar, preferably 3.3-4.7 bar, more preferably 3.6-4.5 bar, most preferably 3.8-4.2 bar.

[0043] The desired pressure can easily be obtained by either changing the dimensions of the pressure control chamber or the height of the protrusion surrounding the fluid connection.

[0044] According to an advantageous embodiment of the invention, the container is made of plastic, preferably of transparent plastic. Said plastic may consist of polyethylene terephthalate (PET). However, it may also consist of a different plastic such as polyolefins, polyesters, PETG, PBT or polyethylene furanoate (PEF), provided it is suitable for pressurization. With an appropriate selection of plastic, unsuitable deformations can be kept under control.

[0045] According to a further advantageous embodiment of the invention, the container originates from a preform made from a primary plastic material which is formed by a material which is bi-axially stretchable, particularly PET.

[0046] In a further aspect, the invention provides in a method for manufacturing a pressure control device according to an embodiment of the invention. In particular, this process comprises the steps of:

- forming out of a synthetic material of high stability against deformation by pressure, said second chamber with a cylinder shaped wall for receipt of a stopper provided with a closing member to define a first chamber,
- providing said second chamber with a fluid connection and a bottom opening closable with a closure,
- inserting in the cylinder shaped wall of said second chamber said stopper to define a first chamber,
- mounting the stopper and closing member with respect to the fluid connection such that the communication between the second chamber and outside can be closed;

wherein said fluid connection is an opening in the wall of the second chamber facing the fluid dispensing container and said fluid connection is provided with a circumferential protrusion extending from the outer side of the wall towards the fluid dispensing container; preferably extending by a height H of 0.1-2.0mm.

[0047] In a preferred embodiment, said closure is a Nicholson plug. Advantageously it is made of rubber.

[0048] The second chamber is preferably injection moulded; preferably injection moulded from polyethylene terephthalate (PET). This is a simple, industrially applicable, one step process than can be carried out on large scale.

[0049] To obtain the fluid connection, a hole is either drilled into the mould after production or the mould is provided such that a fluid connection is available immediately. The size and shape can be adjusted later, for instance with the provision of an insert.

[0050] The second chamber is preferably dome shaped. The curved edges are advantageous to provide a strong, sturdy construction. Less material is required to provide strength compared to a rectangular shaped construction. A dome shaped second chamber is beneficial to fit into the dome shaped piston. Hence, less space is occupied and more space is available for filling the container with product.

[0051] In another embodiment, the second chamber is cylinder shaped, wherein the cylinder has a diameter which is smaller than the diameter of the container so that product can be allowed to occupy the space between them. With this configuration, product can be filled to the bottom of the container, covering the pressure control device. The consumer sees a container that is filled with product. It provides the perception that the container is more filled.

[0052] The bottom opening is made in the bottom of the second chamber. This can be done by drilling or, which is more advantageous, during the injection blow moulding process in that the outer shape of the moulding

tool has a pin at the bottom for shaping the bottom opening. The bottom opening is advantageously located in a central position of the bottom plate.

[0053] In yet another aspect, the invention provides in a method for manufacturing a pressure control system wherein a pressure control device manufactured according to an embodiment of the invention is positioned inside a fluid dispensing container; preferably formed from a synthetic material by injection stretch blow-moulding.

[0054] The container or bottle is preferably injection stretch blow-moulded (ISBM) from a proper pre-form made of any suitable plastic material like PET or the like. The pre-form has already the shape of a bottle in a smaller format. Pre-forms may first be made separately on very high output production scale and are therefore very economical. The ISBM process has the same advantages of the abovementioned injection blow-moulding process used for producing the cylinder, but with the additional important benefit in that the plastic material is stretched bi-axially, that is both radially and lengthwise, which gives rise to even better stretch and gas barrier properties even with a thin wall thickness of typically 0.3 to 0.6 mm depending on the container design. After stretch blow-moulding the end part of the container bottle may be cut-off to provide an open end for receiving the piston and cylinder. The cutting process can provide cylinders with different sizes with the same tooling or with minimal changes.

[0055] Preferably said fluid dispensing container and said pressure control device are joined by laser welding.

[0056] The bottle with its open end portion is put over the cylinder of the pressure control device. In order to obtain a hermetic seal between the bottle and the cylinder, the bottle is preferably laser-welded to the cylinder. For this reason the bottle is made of a transparent plastic material like PET and the cylinder is at least impregnated at a small distance from the bottle end portion at a ring-cylindrical circumference with an infrared or laser energy absorbing material known as "carbon black". The bottle with the cylinder is turned over its longitudinal axis during a laser beam is directed perpendicularly towards the outer surface of the bottle. The semiconductor laser equipment used may be the NOVALAS-C system of Leister Process Technologies, Sarnen, Switzerland with a wavelength of 820 nm. The power of the used laser beam was 25 Watt (continuous), the rotational speed was 3.5 revolutions/sec and the laser beam was applied during approximately 10 revolutions.

[0057] Although laser welding has been proven as giving the best results for joining the pressure control device to the bottle other suitable joining methods, like ultrasonic welding or gluing with an appropriate plastic adhesive can also be used.

[0058] The main advantages of the described manufacturing method is that the pressure control device can be produced and its first chamber can be pressurized and delivered to the manufacturer of the container, and the manufacturer can produce the container or bottle by

injection stretch blow-moulding, which is a standard known process, cut-off the bottom of the container or bottle, join the pressure control device with the bottle e.g. by laser welding, insert the pressure valve, fill in the liquid over the pressure valve, and finally pressurize the second cylinder through the rubber plug in a conventional manner. The additional production steps can easily be introduced in the known production and filling processes for aerosol containers as used in cosmetics or the like, wherein e.g. the liquid product is filled in through the open neck of the container or through the dispensing valve.

[0059] A further advantage of the invention is that, since only normal air or any other suitable inert gas is used for the pressure filling, the process facilities, equipment and manufacturing environment and operating procedures do not need to take account of the special safety requirements normally needed for dangerous flammable propellants.

[0060] In a method for manufacturing a pressure control system according to an embodiment of the invention, a pressure control device manufactured according to an embodiment of the invention is positioned inside a fluid dispensing, preferably formed from a synthetic material by injection stretch blow-moulding; said fluid dispensing container is provided with fluid for dispensing; said second container is filled with compressed air and the closure for the bottom opening is mounted in the bottom opening of the second container.

[0061] In a final aspect, the invention provides in uses of a pressure control device and system according to an embodiment of the invention. A pressure control system according to an embodiment of the invention can be used as a shaving cream dispenser, an air freshener dispenser, deodorant dispenser, spray paint dispenser.

[0062] The examples which follow illustrate the invention without limiting it.

[0063] A first embodiment of a pressure control device (1) according to the invention is provided in Figures 1 (open position) and 3 (closed position). The pressure control device (1) for maintaining a constant predetermined pressure in a fluid container (not depicted) comprises a container shaped wall in the form of a cylinder (40) having an open end and a closed end, and a stopper (8) movable within said cylinder (40) to define a first chamber (4). A second chamber (3) is encompassing the cylinder (40) of the first chamber (4). It is fillable with a gas, preferably compressed air, which in use has a higher pressure than the pressure in the fluid container (not depicted). At least one fluid connection (9) is provided between the second chamber (3) and the fluid container. A closing member (7) movable relative to the first chamber (4) for releasing and closing said fluid connection (9) is provided between the second chamber (3) and the fluid dispensing container. The position of the closing member (7) relative to the second chamber (3) is at least dependent on the prevailing pressure in the fluid dispensing container and the prevailing pressure in the first chamber (4). In use the fluid connection (9) is released when the

pressure in the fluid dispensing container decreases below the predetermined pressure, so that gas flows from the second chamber (3) to the fluid dispensing container and the pressure in the fluid dispensing container increases until the fluid connection (9) is closed by the closing member (7) as a result of the increased pressure in the fluid dispensing container. Said fluid connection (9) is characterized by an opening in the wall of the second chamber (3) facing the fluid container and said fluid connection (9) is provided with a circumferential protrusion (6) extending from the outer side of the wall towards the fluid dispensing container by a height H of 0.1-2.0 mm.

[0064] As depicted in Figure 5, the system comprises a bottom plate (depicted in black; 2), a pressure container or reservoir (3) with a collecting basin (depicted as transparent; 40) and a form fitting stopper (depicted in white; 8). Parts and where they are located: operation guidance chamber: = the complete space above the stopper (white area, ref nr 8); conducting chamber (40): = the space wherein the stopper is brought in; pressure (control) room (4): is part of the conducting chamber (40) and is the space from the O-ring (in which the stopper is located) to the bottom of the conducting chamber; pressure reservoir (3): = space between the conducting chamber (40) and the bottom (2).

[0065] In Figure 6 a three dimensional representation of the stopper (8) is depicted. The stopper comprises a neck (34) and collar (15). Beneath the collar (15) a closing member (7) is provided. At the bottom of the neck (35) a recess (71) is provided in which an O-ring (5) is provided. Underneath the collar (15) the neck of the stopper is provided with three profiled protruding stripes (10). On the depicted stopper three profiled protruding stripes (10) are provided on the circumference of the stopper neck (34). These are placed at a regular distance from each other. The stopper (8) is executed in plastic. It can be manufactured by injection moulding. The O-ring (5), executed in a silicon, a rubber or other elastic and closing material, is preferably produced simultaneously with the stopper (8).

[0066] In Figure 7 a three dimensional representation is provided of the guidance chamber formed by the container shaped wall (40) of the pressure reservoir (3). This is form fittingly executed with the stopper (8) and provides among other for the receipt of the stopper (8). The guidance chamber (40) is provided with a basin with raised edge. The edge is at least provided with a fluid connection (9). Preferably this air channel is provided with a hollow needle (26). The hollow needle (26) is slightly protruding above the edge, for instance 0.3 mm. Alternatively, the hollow needle (26) can be replaced by a small sphere, or nob/protrusion in the form of a cross section of a sphere, with opening.

[0067] In case several fluid connections (9) are provided, then they are preferably equally spread over the circumference of the chamber rim (17). The fluid connections (9) connect the volume of the pressure chamber with the volume of the operation guide chamber.

[0068] Underneath the upper rim (17) the guidance chamber is provided with a collar with grooves (11). These are form fittingly executed with the protruding stripes (10) on the stopper (8). When the stopper is shifted in the guidance chamber (40) and the stopper is turned 60°, the receiving means (11) serve as channels to take on the ribs/protruding stripes (10) on the stopper collar. After a 60° turn in case of three ribs equally divided on the stopper collar, the stopper is fixed by the bumper (12).

[0069] The stopper (8) in the guidance chamber (40) acts as a piston. Compared to the old system, the piston is carried out larger than the valve (stem/O-ring) in the old system of the prior art. This has the advantage that relative to the surface less friction resistance is carried out on the O-ring (5). This cannot buckle, the system is more robust, less critical.

[0070] In Figure 8 a guidance chamber (40) is depicted provided with the stopper (8). The hollow needle (26)/fluid connection (9) is free. Under the stopper a volume of compressed air is located. Air can flow freely from the pressure container (3) to the working pressure chamber.

[0071] In Figure 9 a guidance chamber (40) is provided wherein the stopper (8) is completely contained. This represents the closed position. As one can see, the closure ring (5), in this case an O-ring, contacts the needle and closes this off.

[0072] In Figure 10 a cross section is provided of the situation depicted in Fig 8. On this Figure one can see well how the hollow needle (26) slightly protrudes from the rim (17) of the chamber, how it is positioned in the fluid connection (9) that connects the pressure container (3) and the working pressure chamber.

[0073] In Figure 11 a cross section is provided of the situation depicted in Fig 9. Here one can see how the hollow needle (26), in closed position of the chambers, is closed off. In addition one can see how the protrusion/bumper (12) on the inside of the rim (17), serves as a brake for the protrusion on the neck of the stopper (8).

[0074] The O-ring provides for closing of the stopper on the side. This provides for air remaining stored underneath the stopper (8) and being compressed there. The O-ring can be separately applied at assembly of the system or it can be sprayed on during the injection moulding production process. The ribs (44-46) on the side walls of the stopper collar provide for positioning and guidance of the stopper (8) in the guidance chamber (40).

[0075] Preferably an edge or knife (13) are additionally provided on the rim of the guidance chamber in the direction of the stopper, as depicted in Figures 12-14; 2 and 4. A cross section and detail are provided in Figures 14 (open position) and 15 (closed position). It can also be seen that the needle protrudes as much as the pointy edge (13). In closed position the protruding edge (13) provides for a seal between the guidance chamber (40) and the working pressure chamber and additional protection after a potential pressure loss compared to the O-ring (and compared to the pressure control chamber; 4).

[0076] If the O-ring is damaged, the pressure control device is still open, unlike the prior art system. With damage to the O-ring, air leaks slowly under the stopper (8). An empty pressure control chamber (4) cannot provide a pushing effect any more.

[0077] With the mechanism of the invention, a small pressure difference on the outside of the pressure control chamber is still sufficient to lift the stopper. In the prior art system the valve no longer functions in case of a small damage or slightest defect/malfunction causing the dispenser to become unusable. With the new system the dispenser remains usable.

[0078] Figure 12, provides a view on a magnified protruding ridge (13) on the guidance chamber. One can see the protruding hollow needle (26). In addition one can see the grooves/receiving means (11) on the inner side of the guidance chamber which are provided to take on the ribs/protruding stripes (10) on the stopper collar after the stopper is shifted in the guidance chamber and turned 60°. The guidance chamber (40) is sufficiently broad for the stopper (8) to move back and forth and to provide a suctioning function. By means of the 60 degree turn the stopper can no longer detach from the basin. With a smooth edge, potentially without interruptions) this can also be obtained and potentially function as a click system.

[0079] The functioning of the pressure control device (1) according to an embodiment of the invention is further illustrated by means of the schematic drawings provided in Figures 1 to 4.

[0080] Through the opening in the bottom (41) air is brought into the pressure container (3) to a pressure of around 7 bar. By means of the fluid communication fluid connection 9, provided with a hollow needle (26) protruding above the rim (6), air flows from the pressure control container (3) to the working pressure chamber (50) where an air pressure is build up. When the desired setting is obtained, and the pressure of the pressure container (3) is approached, then the air pushes on the stopper (8) provided in the guidance chamber (4). The stopper (8) moves towards the direction of the pressure container. When the closure member (7) touches the extending edge of the pressure container (3), the needle (6) and the fluid connections (9) are closed off. The opening in the bottom closure is closed with a rubber stopper (1).

[0081] Upon actuation of the spray bottle, fluid escapes from the container storage. Under pressure of the air the movable cap, moves towards the dispenser opening. The pressure in the working pressure chamber decreases by means of the increasing volume. The decreased pressure on the stopper and the compressed air in the pressure control chamber (4) underneath the stopper (8), provide uplift for the stopper towards the dispenser opening. The fluid connection (9) opens, air flows from the working pressure chamber, and pressure is build up. The stopper (8) moves towards the bottom closure (42) and the working pressure chamber (3) is closed off again.

[0082] The functioning of the pressure control device

(1) explained above is further illustrated by means of the measurement results provided in Figures 16 and 17.

[0083] A working pressure is build up to a desired level, in the graph corresponding to about 1.85 bar. The desired value is obtained by the downward movement. Once the desired level is obtained, the connection between the outer- and inner side of the pressure container and the working pressure chamber closes.

[0084] When one releases pressure or product, the fluid communication channel opens and the pressure decreases (first downward peak on the graph). When pressure is added, the predetermined pressure is obtained (second time 1.85 bar) and maintained. This cycle is repeated a number of times. On the graph one can see that every time pressure drops, a fast build-up of pressure follows. Every time the predetermined value is obtained again. In addition a fast build-up of pressure is obtained (shoulder to the rising peak). This experiment shows the functioning and repeatability of the pressure building mechanism. The mechanism does not break down after (repeated) pressure loss.

[0085] The graph in Fig 17 shows a similar test. The narrow peaks demonstrate that the cycle of closing is almost immediately. Pressure is build up to a set pressure. There is an immediate closure (peaks without shoulder). The difference with the experiment from the previous graph, is the material choice of the silicone ring. This cannot be too hard, it is preferably elastic. An elastic material surrounds the needle and closes off well. When a hard rubber ring is used, the system works less precise. There is still sufficient closure of the needle.

[0086] The opening of the needle is preferably 0.5 mm in diameter. The smaller the opening the easier it is to close and the more precise but also the more slowly the pressure build up.

[0087] Where the prior art prior art system is provided with a 2.2 bar pressure to be able to supply the desired 1.5 bar pressure for product such as raiser foam, a pressure of 1.5 bar is sufficient in the present system. There is no need for a margin.

[0088] Where the prior art system is limited to at most 3 bar pressure, more pressure can be provided in the new system. This can provide access to new applications. The parts are preferably carried out in a plastic, more preferably PET (polyethylene terephthalate). An embodiment wherein the parts of the pressure control device are provided in transparent plastic has the advantage that the consumer can see the mechanism when using the pressure control system. The needle is alternatively in metal.

[0089] Figures 18-20 show further embodiments of a pressure control device according to the invention.

[0090] Figure 18 shows an alternative pressure control device with click-in mechanism made possible by use of a quad-ring. By the term "quad-ring" as used herein is meant a solid elastomeric ring seal with a four-lobed cross-section, also known as x-ring.

[0091] The use of a quad-ring is advantageous as the

four lips create more sealing capacity and at the same time a groove for lubrication, which is very favourable for dynamic sealing. The most important advantage is the high stability for dynamic applications. In the situation that an O-ring rolls in the groove and creates torsion, a quad-ring will slide with no negative results. More resistance to spiral failure is provided.

[0092] This embodiment compared to the embodiment depicted in Fig 5, has no protrusions (10) on the neck of the stopper. The collar serves as guiding means. The collar now serves the purpose of closure, click-system and guidance.

[0093] As can be seen in Figure 18, the pressure reservoir (3) is made of transparent plastic in the form of a bell shape. The wall at the top of the bell has the shape of a cylindrical container (40). The cylindrical container has a closed bottom end and an open top end. The circumference of the top end is provided with a rim from which teeth-like protrusions extend (70). At the extremities the teeth-like shapes are slightly thicker. The bell shaped pressure reservoir has an open bottom end. This bottom is form fitting with a bottom plate (2). The bottom plate was fitted into the open bottom end of the bell shaped pressure reservoir (3). It was laser welded to the bottom plate. The pressure device is further comprising a stopper (8) with a collar provided with a flat closure means executed in an elastomeric material. The neck (34) of the stopper is provided with halve of an X-ring in elastomeric material (5). The flat side of the X-ring is positioned towards the neck of the stopper. The rim part of the container is provided with a fluid connection (9) connecting the inside of the pressure reservoir (3) with the outside. It is provided with a needle which is slightly protruding from the rim surface. In relation to the teeth-like protrusions (70), the fluid connection is provided inside the circle formed by the teeth-like protrusions (70). The teeth-like shapes provide flexibility for insertion of the stopper (8). When the stopper (8) is clicked into the cylindrical container the teeth-like shapes (70) slightly bend outwards and move back into their original position again. Figure 23 provides sections through the pressure control device (1) in open (top figure; left) and closed position (bottom figure; right). The thicker extremities (58) hold the stopper in place.

[0094] Figure 19 provides an embodiment wherein the stopper (8) is executed with a collar (15) having three protrusions (44, 45, 46) that are form fitting with the spacing between the teeth-shaped protrusions (70) on the open end of the cylindrical container (40). The collar of the stopper is not provided with an elastomeric sealing means applied on the circumference of the rim. Instead it is provided in three parts evenly distributed over the rim. They are provided as plugs (47, 48, 49) in the collar of the stopper. The plugs are made from an elastomeric material.

[0095] Figure 20 provides an embodiment wherein the stopper (8) is provided with a movable closure ring (7). Upon positioning of the stopper (8) in the container (40),

the closure ring (7) closes off the needle. Product can be filled in a container with this device, without the risk of product ending up in the pressure container (3). After filling with product, the pressure container can be filled with air. Pressure will build up and the needle (26)/fluid connection (9) will be freed. Pressure will build up in outside the pressure container (3). Once the pressure outside the container is larger than in the first chamber (4), the stopper will be pushed down in the cylinder (40) and the collar (15) of the stopper (8) will move against the closure ring (7). The closure ring is restored in the original position. It functions like a return mechanism.

[0096] Figures 21 and 22 provide a cross-section of the embodiments provided in Figures 18 and 19. The collar of the stopper moves between a position I wherein it closes off the fluid connection and a position II where it is stopped against the thickened rim (58) of the teeth-like protrusions (70).

[0097] Figure 23 provides a further embodiment of a compact pressure control device (1). The stopper (8) has a short neck and is provided with a flat surface elastomer material (7) on the rim part to act on the fluid connection (9). On the bottom part of the neck (35), the stopper (8) is provided with a closure ring, in this case an X-ring (5). At the open end of the cylindrical container (40), a thickening is provided on the inside (58). This prevents the stopper from moving passed this obstruction.

[0098] This embodiment is further provided with a so-called knife (13), a sharp edged protrusion, between the stopper neck (34) and the fluid connection (9). It has an equal height H as the protrusion (6) surrounding the fluid connection (9). It provides protection.

[0099] Figures 24-27 provide pressurized fluid containers (60) comprising a pressure control device (1) according to an embodiment of the invention and a fluid dispensing valve (51). The pressure control system (100) is further provided with either a dip-tube (68) or movable piston (52) with ribs (53-57). The bottom openings (41) are provided with Nicholson plugs (42). The bottom plates in Figures 24-26 are curved and provided with dividers (69). This is especially advantageous for being resistant to deformations when holding pressurized air. As can be seen in Figures 26 and 27, the dip-tube can be provided to reach all the way to the bottom plate (2). The dimensions of the pressure reservoir can be adjusted such that it can be surrounded by fluid. This gives the impression to the consumer that the container is fully used (Figure 27). From Figure 24 it can be seen that the stopper can be provided so that it fits with the indentation (65) in the movable piston (52). This has for effect that a compact stack can be provided. It provides for optimal use of space for holding product. The pressure control systems of Fig 24-27 are further provided with a dispensing valve (50) and spray head with dispensing opening (64).

[0100] Figures 28-30 provide individual parts of a pressure control device (1) before assembly.

[0101] Figure 28 depicts a bell shaped pressure res-

ervoir (3) with a form fitting bottom plate (2) with a central bottom opening (41) and radiating from the central opening are dividers (69). The upper side of the bell shape is provided with tooth-shaped protrusions (70). These protrusions are circumferential to the opening of a cylindrical container (40). On the inward rim part is an opening (9) connecting the inner part of the pressure reservoir (3) with the outside. Also provided is a stopper (8) provided at the bottom with an X-ring (5). The stopper (8) has a collar (15) from which three protrusions (44-46) are extending radially outward. These serve for positioning of the stopper (8). In the stopper rim are provided three elastomer plugs (47, 48, 49). The stopper (8) should be positioned so that at least one of the plugs (47) can act on the opening in the rim of the pressure reservoir (3).

[0102] Figure 29 provides parts for the assembly of a pressure control device (1), comprising a stopper intermediate part, cylinder with two open ends and a bottom plate. The inner part of the bottom plate is form fitting with the opening of the cylinder. The outer part of the bottom plate is form fitting with the opening of the fluid container (not depicted). The cylinder was obtained from stretch blow moulding. After the process the part is cut twice to adjust the length to the required size. The orientation of the stretched material during the blowing process leads to a higher crystalline structure which gives high strength and good gas barrier properties.

[0103] Figure 30 provides a compact pressure control device, comprising a stopper with short neck, a bell shape pressure reservoir (3) that encompasses a cylindrical container (40). On the rim of the bell shape and container are provided three fluid openings (6, 6', 6'') surrounded by three protrusions. A bottom plate (2) is provided comprising a plug (42) that closes of a central bottom opening (41). Radially extending from the central opening are plate dividers (69). The bottom plate (2) is form fitting with the opening of the pressure reservoir (3).

[0104] Figures 31-34 provide several stopper (8) arrangements that can be advantageously used in pressure control devices according to the invention.

[0105] The stopper in Figure 31 is provided with two O-rings. (7, 5). The collar of the stopper is provided with a first O-ring (7) to act on the fluid connection (9). The bottom part of the stopper is provided with a recess to take up the second O-ring (5) for sealing of the first chamber (4).

[0106] The stopper in Figure 32 has a short neck. It is provided in the bottom part with half of an X-ring, the flat surface side facing the stopper neck. The rim part of the stopper is provided with a flat surfaced elastomeric material.

[0107] The stopper (8) in Figure 33 is provided in the bottom part with half of an X-ring (5). The rim part of the stopper is provided with three plugs of an elastomeric material, located evenly spread over the circumference of the rim part. From the rim part are radially protruding three extensions which serve for the positioning of the stopper so the plugs may act on at least one fluid com-

munication channel between the pressure container (3) and outside.

[0108] The stopper in Figure 34 is provided with a protrusion on the neck part of the stopper. On this protrusion a flat surfaced ring of elastomeric ring is resting. This ring will shift to the bottom side of the stopper rim upon insertion of the stopper into the pressure container and closing of that container.

[0109] Figure 35 provides a schematic representation of a pressure control system (100), comprising a fluid container (50) for holding pressurized fluid, a movable piston (52) with ribs (53, 54, 55, 56, 57), the central part of the piston (52) lying on the central opening of a stopper (8) with short neck. The piston is configured such that it rests on the shoulder of the pressure cylinder (3) and does not prematurely close-off the fluid connection (9). The stopper neck is provided with an X-ring (5) enclosed in a cylindrical container (40) thereby providing a first chamber (4). The cylindrical container is part of the wall of a pressure cylinder (3) holding pressurized air. In the wall, in the upper part facing towards the fluid container and piston, is a fluid opening provided with a needle that is slightly protruding from the pressure cylinder wall. The protrusion and opening are covered by a layer of elastomer material as closing member (7) provided on the rim part of the stopper (8) facing the opening (9). In closed position, the elastomer material (7) acts on the opening (8) and closes it. The bottom plate (2) of the pressure container is curved. It is form fitting with the opening of the pressure container (3). Where material is overlapping, the bottom plate is welded to the pressure container (3). The central opening (41) of the bottom plate (2) is closed off with a Nicholson plug (42). The bottom plate is provided with dividers (69).

[0110] Figure 36 provides a schematic representation of a pressure control system (100), comprising a pressure control device (1) that is open. The stopper provided here has a longer neck (8). In its rim part it is provided with a plug (47) that can act on the protrusion (6) and opening (9) between the pressure container (3) and outside facing the movable piston (52). The piston is configured such that it rests on the thickened rim (58) of the teeth-like protrusions (70). In this way, it cannot push the stopper inside thereby prematurely closing off the fluid connection (9).

Claims

1. A pressure control device (1) for maintaining a constant predetermined pressure in a fluid container (50, 60) which is arranged for dispensing a fluid contained in the container from the fluid container at said pressure, the pressure control device (1) comprising a cylinder (40) having an open end and a closed end, and a stopper (8) movable within said cylinder (40) to define a first chamber (4), a second chamber (3) encompassing the cylinder

(40) of the first chamber (4), the second chamber (3) fillable with a gas which in use has a higher pressure than said pressure in the container (50, 60), at least one fluid connection (9) between the second chamber (3) and the container (50, 60), and a closing member (7) movable relative to the cylinder (40) for releasing and closing said fluid connection (9) between the second chamber (3) and the fluid dispensing container (50, 60) depending on the position of the closing member (7) relative to the first chamber (4), the position of the closing member (7) relative to the second chamber (3) being at least dependent on the prevailing pressure in the fluid dispensing container (50, 60) and the prevailing pressure in the first chamber (4), while in use the fluid connection (9) is released when the pressure in the fluid dispensing container (50, 60) decreases below the predetermined pressure, so that gas flows from the second chamber (3) to the fluid dispensing container (50, 60) and the pressure in the fluid dispensing container (50, 60) increases until the fluid connection (9) is closed by the closing member (7) as a result of the increased pressure in the fluid dispensing container (50, 60),

characterized in that, said fluid connection (9) is an opening in the wall of the second chamber (3) facing the fluid dispensing container (50, 60) and said fluid connection (9) is provided with a circumferential protrusion (6, 16, 26) extending from the outer side of the wall (17) towards the fluid dispensing container (50, 60); preferably extending by a height H of 0.1-2.0 mm.

2. The pressure control device (1) according to claim 1, wherein said stopper (8) comprises a collar (15) provided with an elastomer material for actuating said circumferential protrusion (6, 16, 26).
3. The pressure control device (1) according to claim 1 or 2, wherein said circumferential protrusion (6) is formed by a hollow needle (26) inserted in the fluid connection (9) or is formed by a knob (16) with an opening in communication with said fluid connection (9).
4. The pressure control device (1) according to any of claims 1 to 3, wherein said wall (17) of the first chamber facing the fluid container is provided with a knife-shaped protrusion (13) arranged concentrically around the container of the first chamber (4) and positioned between the container wall and said fluid connection (9) and the protrusion is of equal height as the annular protrusion (6) of the fluid connection (9).
5. The pressure control device (1) according to any of claims 1 to 4, wherein said first chamber (4) has a

diameter of 15.0-30.0 mm and/or said stopper (8) from said first chamber (4) has a height (h) of 5.0-15.0 mm.

6. The pressure control device (1) according to any of claims 1 to 5, wherein the stopper (8) is comprising a neck (34) and collar (15), the bottom part (35) of the neck being provided with a sealing material (5), preferably an O-ring or X-ring.
7. The pressure control device (1) according to claim 6, wherein the neck (34) is provided with two or more protrusions (10, 10'), preferably equally divided over the circumference of the neck (34), and the container is provided with receiving means (11) for said two or more protrusion (10, 10'), such that the stopper (8) can move between a first position (I) wherein the closing member (7) closes off the fluid connection (9) and a second position (II) wherein the closing member (7) opens the fluid connection (9).
8. The pressure control device (1) according to any of claims 1 to 7, wherein the first (4) and second chamber (3) are of plastic, preferably polyethylene terephthalate (PET) or polyethylene furanoate (PEF).
9. A pressure control system (100) comprising a fluid dispensing container (50, 60) and a pressure control device (1) according to any of claims 1-8.
10. The pressure control system (100) according to claim 9, wherein the fluid dispensing container (50) has a dispensing opening with a dispensing valve (51), and a movable piston (52) is provided in the container between the pressure control device (1) and the dispensing opening, which movable piston (52) is separating the fluid and the gas, and which is movable towards the dispensing opening by the excess pressure prevailing in the fluid dispensing container (50); preferably the movable piston (52) is designed as a dome with annular ribs (53, 54).
11. The pressure control system (100) according to claim 9, wherein the container (60) has a dispensing opening (61) with a dispensing valve (62), and a dip-tube (68) is provided from the entry of the dispensing valve (62) to the upper end of the pressure control device (1), in order to dispense the fluid through the dip-tube (68) by the excess pressure prevailing in the container.
12. Method for manufacturing a pressure control device (1) according to any of claims 1 to 8, comprising the steps of:
 - forming out of a synthetic material of high stability against deformation by pressure, said second chamber (3) with a cylinder shaped wall (40)

for receipt of a stopper (8) provided with a closing member (7) to define a first chamber (4),
 - providing said second chamber (3) with a fluid connection (9) and a bottom opening (41) closable with a closure (42),
 - inserting in the cylinder shaped wall (40) of said second chamber said stopper (8) to define a first chamber (4),
 - mounting the stopper (8) and closing member (7) with respect to the fluid connection (9) such that the communication between the second chamber (3) and outside can be closed;

characterized in that, said fluid connection (9) is an opening in the wall of the second chamber (3) facing the fluid dispensing container (50, 60) and said fluid connection (9) is provided with a circumferential protrusion (6, 16, 26) extending from the outer side of the wall (17) towards the fluid dispensing container (50, 60); preferably extending by a height H of 0.1-2.0 mm.

13. Method according to claim 12, wherein the second chamber (3) is obtained by injection moulding.
14. Method for manufacturing a pressure control system (100) according to any of claims 9 to 11, wherein a pressure control device (1) manufactured according to claim 12 is positioned inside a fluid dispensing container (50, 60); preferably formed from a synthetic material by injection stretch blow-moulding, said fluid dispensing container (50) is provided with fluid for dispensing, said second container (3) is filled with compressed air and the closure (42) for the bottom opening is mounted in the bottom opening (41) of the second container (3).
15. Method for manufacturing a pressure control system (100) according to claim 14, wherein said fluid dispensing container (50, 60) and said pressure control device (1) are joined by laser welding.
16. Use of a pressure control system (100) according to any of claims 9-11, as shaving cream dispenser, air freshener dispenser, deodorant dispenser, spray paint dispenser.

Patentansprüche

1. Eine Drucksteuervorrichtung (1) zur Beibehaltung eines konstanten voreingestellten Drucks in einem Fluidbehälter (50, 60), der angeordnet ist um ein in dem Behälter enthaltenes Fluid aus dem Fluidbehälter bei diesem Druck abzugeben, wobei die Drucksteuervorrichtung (1) besteht aus einem Zylinder (40) mit einem offenen und einem geschlossenen Ende, und einem Stöpsel (8), der im

besagten Zylinder (40) bewegbar ist, um eine erste Kammer zu definieren (4),
 eine zweite Kammer (3) die den Zylinder (40) der ersten Kammer (4) umfasst, wobei die zweite Kammer (3) mit einem Gas befüllbar ist, das im Gebrauch einen höheren Druck hat als der besagte Druck in dem Behälter (50, 60),
 mindestens eine Fluidverbindung (9) zwischen der zweiten Kammer (3) und dem Behälter (50, 60), und ein gegenüber dem Zylinder bewegliches Verschlussstück (7) zur Freigabe und zum Verschluss der besagten Fluidverbindung (9) zwischen der zweiten Kammer (3) und dem Fluidabgabehälter (50, 60) in Abhängigkeit von der Position des Verschlussstücks (7) relativ zur ersten Kammer (4),
 wobei die Position des Verschlussstücks (7) relativ zur zweiten Kammer (3) zumindest von dem herrschenden Druck im Fluidabgabehälter (50, 60) und dem herrschenden Druck in der ersten Kammer (4) abhängt,
 während im Gebrauch die Fluidverbindung (9) freigegeben wird, wenn der Druck in dem Fluidabgabehälter (50, 60) unter den festgelegten Druck sinkt, so dass Gas von der zweiten Kammer (3) zu dem Fluidabgabehälter (50, 60) strömt und der Druck im Fluidabgabehälter (50, 60) ansteigt, bis die Fluidverbindung (9) durch das Verschlussstück (7) infolge des gestiegenen Drucks im Fluidabgabehälter (50, 60) geschlossen ist, **dadurch gekennzeichnet, dass** die besagte Fluidverbindung (9) eine Öffnung in der Wand der zweiten Kammer (3) ist die zum Fluidabgabehälter (50, 60) hinzeigt und die besagte Fluidverbindung (9) mit einem umlaufenden Überstand (6, 16, 26) versehen ist, der sich von der äußeren Seite der Wand (17) im Richtung der Fluidabgabehälter (50, 60) erstreckt; vorzugsweise in einer Höhe H von 0,1 bis 2,0 mm.

2. Drucksteuervorrichtung (1) nach Anspruch 1, wobei der besagte Stöpsel (8) einen Kragen (15) aufweist, der mit einem Elastomermaterial versehen ist zur Betätigung des umlaufenden Überstandes (6, 16, 26).
3. Drucksteuervorrichtung (1) nach Anspruch 1 oder 2, wobei der umlaufende Überstand (6) durch eine in die Fluidverbindung (9) eingesetzte Hohlneedle (26) gebildet wird, oder durch einen Knopf (16) mit einer mit dem Fluidverbindung (9) stehenden Öffnung gebildet ist.
4. Drucksteuervorrichtung (1) nach einem der Ansprüche 1 bis 3, wobei die besagte Wand (17) der ersten Kammer, die dem Fluidbehälter zugewandt ist, mit einem messerförmigen Überstand (13) versehen ist, der konzentrisch um den Behälter der ersten Kammer (4) angeordnet und zwischen der Behälterwand und der besagten Fluidverbindung (9) positioniert ist,

- und der Überstand gleich groß wie der ringförmige Überstand (6) der Fluidverbindung (9) ist.
5. Drucksteuervorrichtung (1) nach einem der Ansprüche 1 bis 4, wobei die besagte erste Kammer (4) einen Durchmesser von 15,0 - 30,0 mm hat und/oder der besagte Stöpsel (8) der besagten ersten Kammer (4) eine Höhe (h) von 5,0 - 15,0 mm hat.
 6. Drucksteuervorrichtung (1) nach einem der Ansprüche 1 bis 5, wobei der Stöpsel (8) aus einem Hals (34) und einem Kragen (15) besteht, und der untere Teil (35) des Halses mit einem Dichtmaterial (5), vorzugsweise einem O-Ring oder X-Ring, versehen ist.
 7. Drucksteuervorrichtung (1) nach Anspruch 6, wobei der Hals (34) mit zwei oder mehr Überständen (10, 10') versehen ist, vorzugsweise gleichmäßig verteilt über den Umfang des Halses (34), und der Behälter mit Aufnahmevorrichtungen (11) für zwei oder mehr Überstände (10, 10') versehen ist, sodass der Stöpsel (8) zwischen einer ersten Position (I), bei der das Verschlussstück (7) die Fluidverbindung (9) verschließt und einer zweiten Position (II), bei der das Verschlussstück (7) die Fluidverbindung (9) öffnet, bewegt werden kann.
 8. Drucksteuervorrichtung (1) nach einem der Ansprüche 1 bis 7, wobei die erste (4) und zweite Kammer (3) aus Kunststoff, vorzugsweise Polyethylenterephthalat (PET) oder Polyethylenfuranoat (PEF), besteht.
 9. Ein Drucksteuersystem (100) bestehend aus einem Fluidabgabebehälter (50, 60) und einer Drucksteuervorrichtung (1) nach einem der Ansprüche 1 bis 8.
 10. Drucksteuersystem (100) nach Anspruch 9, wobei der Fluidabgabebehälter (50) eine Abgabeöffnung mit einem Abgabeventil (51) hat, und sich ein beweglicher Kolben (52) im Behälter zwischen der Drucksteuervorrichtung (1) und der Abgabeöffnung befindet, wobei der Kolben (52) das Fluid und das Gas voneinander trennt, und der vom herrschenden Überdruck, der im Fluidabgabebehälter (50) herrscht, zur Abgabeöffnung hin bewegt werden kann; vorzugsweise ist der bewegliche Kolben (52) als Kuppel mit Ringrippen (53, 54) konstruiert.
 11. Drucksteuersystem (100) nach Anspruch 9, bei dem der Behälter (60) eine Abgabeöffnung (61) mit einem Abgabeventil hat (62), und ein Tauchrohr (68) vom Eingang des Abgabeventils (62) zum oberen Ende der Drucksteuervorrichtung (1) geführt wird, um das Fluid mithilfe des im Behälter herrschenden Überdrucks durch das Tauchrohr (68) abzugeben.
 12. Ein Verfahren zur Herstellung einer Drucksteuervorrichtung (1) nach einem der Ansprüche 1 bis 8, mit den Schritten:
 - das Ausbilden aus einem synthetischen Material mit hoher Stabilität gegen Verformung durch Druck, der zweiten Kammer (3) versehen mit einer zylinderförmigen Wand (40) zum Aufnehmen eines mit einem Verschlussstück (7) versehenen Stöpsels (8) zur Definition einer ersten Kammer (4),
 - Versehen der besagten zweiten Kammer (3) mit einer Fluidverbindung (9) und einer Bodenöffnung (41), die mit einem Verschluss (42) verschließbar ist,
 - Einführen des Stöpsels (8) in die zylinderförmige Wand (40) der besagten zweiten Kammer, um eine erste Kammer (4) zu definieren,
 - die Anbringung des Stöpsels (8) und des Verschlussstücks (7) im Zusammenhang mit der Fluidverbindung (9), sodass die Kommunikation zwischen der zweiten Kammer (3) und der Außenseite geschlossen werden kann;
 13. Verfahren nach Anspruch 12, wobei die zweite Kammer (3) durch Spritzgießen erhalten wird.
 14. Verfahren zur Herstellung eines Drucksteuersystems (100) nach einem der Ansprüche 9 bis 11, wobei die Drucksteuervorrichtung (1) hergestellt gemäß Anspruch 12 an der Innenseite des Fluidabgabebehälters (50, 60) positioniert ist; vorzugsweise geformt aus einem synthetischen Material durch Spritzstreckblasformen, und der besagte Fluidabgabebehälter (50) mit Fluid zur Abgabe gefüllt ist, der besagte zweite Behälter (3) mit Druckluft befüllt wird und der Verschluss (42) für die Bodenöffnung in der Bodenöffnung (41) des zweiten Behälters (3) angebracht ist.
 15. Verfahren zur Herstellung eines Druckregelsystems (100) nach Anspruch 14, wobei der Fluidabgabebehälter (50, 60) und die Drucksteuervorrichtung (1) durch Laserschweißen verbunden werden.
 16. Verwendung eines Druckregelsystems (100) nach einem der Ansprüche 9 bis 11, als Rasiercreme-Spender, Lufterfrischer-Spender, Deodorant-Spender, Spritzlack-Spender.

Revendications

1. Un dispositif de régulation de pression (1) pour le maintien d'une pression constante prédéfinie dans un conteneur de fluide (50, 60) aménagé pour la distribution d'un fluide inclus dans le conteneur à partir du conteneur de fluide à ladite pression, dans lequel le dispositif de régulation de pression (1) comprend un cylindre (40) avec une extrémité ouverte et une extrémité fermée, et un bouchon (8) mobile dans ledit cylindre (40) ainsi définissant une première chambre (4),
une deuxième chambre (3) enveloppant le cylindre (40) de la première chambre (4), la deuxième chambre (3) pouvant être remplie d'un gaz qui, en utilisation, a une pression supérieure à ladite pression dans le conteneur (50, 60),
au moins une connexion fluide (9) entre la deuxième chambre (3) et le conteneur (50, 60), et un moyen d'obturation (7) mobile par rapport au cylindre (40) pour la libération et l'obturation de ladite connexion fluide (9) entre la deuxième chambre (3) et le conteneur de distribution de fluide (50, 60) dépendant de la position du moyen d'obturation (7) par rapport à la première chambre (4),
la position du moyen d'obturation (7) par rapport à la deuxième chambre (3) étant dépendant au moins de la pression régnante dans le conteneur de distribution de fluide (50, 60) et la pression régnante dans la première chambre (4),
la connexion fluide (9), en utilisation, étant libérée lorsque la pression dans le conteneur de distribution de fluide (50, 60) diminue en-dessous la pression prédéfinie, de sorte que le gaz coule de la deuxième chambre (3) au conteneur de distribution de fluide (50, 60) et la pression dans le conteneur de distribution de fluide (50, 60) augmente jusqu'à ce que la connexion fluide (9) soit obturée par le moyen d'obturation (7) suite à la pression augmentée dans le conteneur de distribution de fluide (50, 60),
caractérisé en ce que la connexion fluide (9) est une ouverture dans la paroi de la deuxième chambre (3) face au conteneur de distribution de fluide (50, 60) et ladite connexion fluide (9) est prévue d'une protubérance (6, 16, 26) circumférentielle s'étendant de l'extérieur de la paroi (17) vers le conteneur de distribution de fluide (50, 60); de préférence ayant une hauteur de 0,1 à 2 mm.
2. Le dispositif de régulation de pression (1) suivant la revendication 1, dans lequel ledit bouchon (8) comprend une collerette (15) prévue d'un matériel élastomère pour l'actuation de la protubérance circumférentielle (6, 16, 26).
3. Le dispositif de régulation de pression (1) suivant la revendication 1 ou 2, dans lequel la protubérance circumférentielle (6) est formée d'une aiguille creuse (26) introduite dans la connexion fluide (9) ou est formée par un bouton (16) avec une ouverture en communication avec ladite connexion fluide (9).
4. Le dispositif de régulation de pression (1) suivant une des revendications 1 à 3, dans lequel ladite paroi (17) de la première chambre face au conteneur de distribution de fluide est prévue d'une protubérance en forme de couteau (13) arrangée de façon concentrique autour du conteneur de la première chambre (4) et positionnée entre la paroi de conteneur et ladite connexion de fluide (9) et la protubérance a la même hauteur que la protubérance annulaire (6) de la connexion fluide (9).
5. Le dispositif de régulation de pression (1) suivant une des revendications 1 à 4, dans lequel la première chambre (4) a un diamètre de 15,0 à 30,0 mm et/ou ledit bouchon (8) de ladite première chambre (4) a une hauteur (h) de 5,0 à 15,0 mm.
6. Le dispositif de régulation de pression (1) suivant une des revendications 1 à 5, dans lequel le bouchon (8) comprend un cou (34) et collerette (15), la partie inférieure (35) du cou étant prévue d'un matériel d'étanchéité (5), de préférence un joint torique ou un anneau en X.
7. Le dispositif de régulation de pression (1) suivant la revendication 6, dans lequel le cou (34) est prévu de deux ou plusieurs protubérances (10, 10'), de préférence distribuées de façon égale sur la circonférence du cou (34), et le conteneur est prévu de moyens de réception (11) pour lesdites deux ou plusieurs protubérances (10, 10'), de sorte que le bouchon (8) puisse passer entre une première position (I), dans laquelle le moyen d'obturation (7) obture la connexion fluide (9), et une deuxième position (II) dans laquelle le moyen d'obturation (7) ouvre la connexion fluide (9).
8. Le dispositif de régulation de pression (1) suivant une des revendications 1 à 7, dans lequel la première (4) et la deuxième chambre (3) sont faites de plastique, de préférence de polyéthylène téréphtalate (PET) ou de polyéthylène furanoate (PEF).
9. Un système de régulation de pression (100) comprenant un conteneur de distribution de fluide (50, 60) et un dispositif de régulation de pression (1) suivant une des revendications 1 à 8.
10. Le système de régulation de pression (100) suivant la revendication 9, dans lequel le conteneur de distribution de fluide (50) comprend une ouverture de distribution avec une valve doseuse (51), et un piston mobile (52) est prévu dans le conteneur entre le dispositif de régulation de pression (1) et l'ouverture de

distribution, lequel piston mobile (52) sépare le fluide et le gaz, et qui peut être déplacé vers l'ouverture de distribution suite à l'excès de pression régnante dans le conteneur de distribution de fluide (50); de préférence, le piston mobile (52) est conçu comme un dôme avec des nervures annulaires (53, 54).

11. Le système de régulation de pression (100) suivant la revendication 9, dans lequel le conteneur (60) a une ouverture de distribution (61) avec une valve doseuse (62), et un tube de trempage (68) est prévu de l'entrée du valve doseuse (62) à l'extrémité supérieure du dispositif de régulation de pression (1), pour distribuer le fluide à travers la tube de trempage (68) suite à l'excès de pression régnante dans le conteneur.

12. Une méthode pour la fabrication d'un dispositif de régulation de pression (1) suivant une des revendications 1 à 8, comprenant les phases suivantes :

- le moulage à partir d'un matériel synthétique à haute stabilité contre la déformation suite à la pression, de la deuxième chambre (3) avec une paroi en forme de cylindre (40) pour la réception d'un bouchon (8) prévu d'un moyen d'obturation (7) pour définir une première chambre (4),
- la prévision de ladite deuxième chambre (3) d'une connexion fluide (9) et d'une ouverture de fond (41) qui peut être fermée par un dispositif d'obturation (42),
- l'insertion dans la paroi en forme de cylindre (40) de ladite deuxième chambre dudit bouchon (8) pour définir une première chambre (4),
- le montage du bouchon (8) et du moyen d'obturation (7) par rapport à la connexion fluide (9) de sorte que la communication entre la deuxième chambre (4) et l'extérieur puisse être fermée;

caractérisé en ce que ladite connexion fluide (9) est une ouverture dans la paroi de la deuxième chambre (3) face au conteneur de distribution de fluide (50, 60) et ladite connexion fluide (9) est prévue d'une protubérance circonférentielle (6, 16, 26) s'étendant de l'extérieur de la paroi (17) vers le conteneur de distribution de fluide (50, 60); de préférence ayant une hauteur H de 0,1 à 2,0 mm.

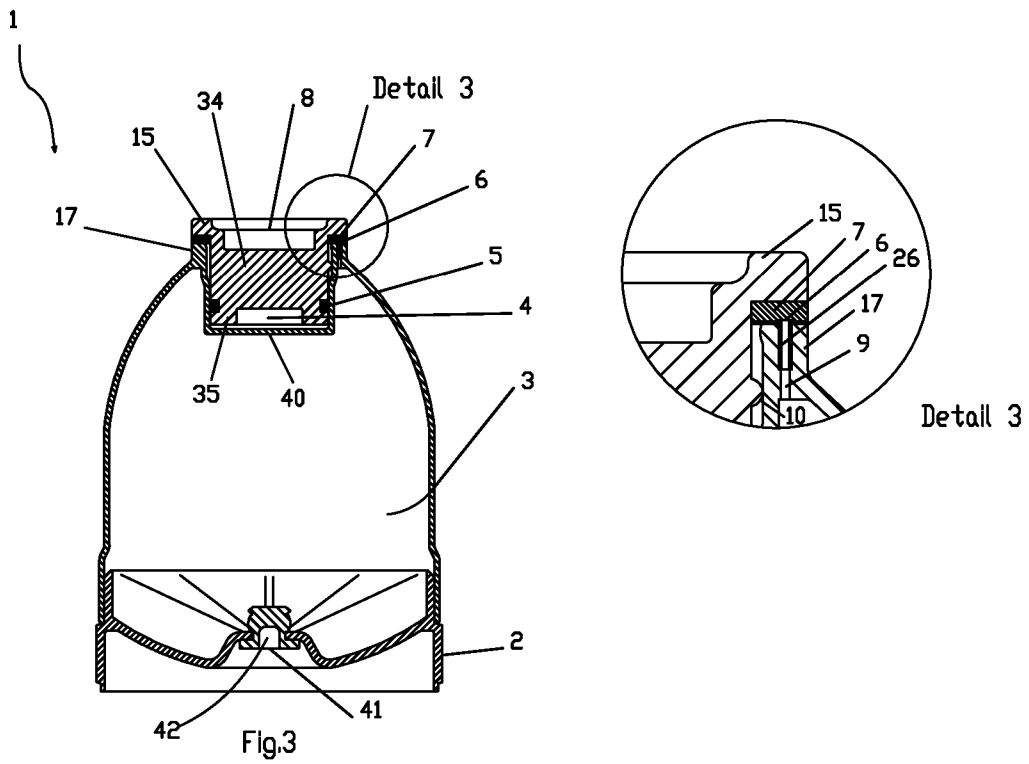
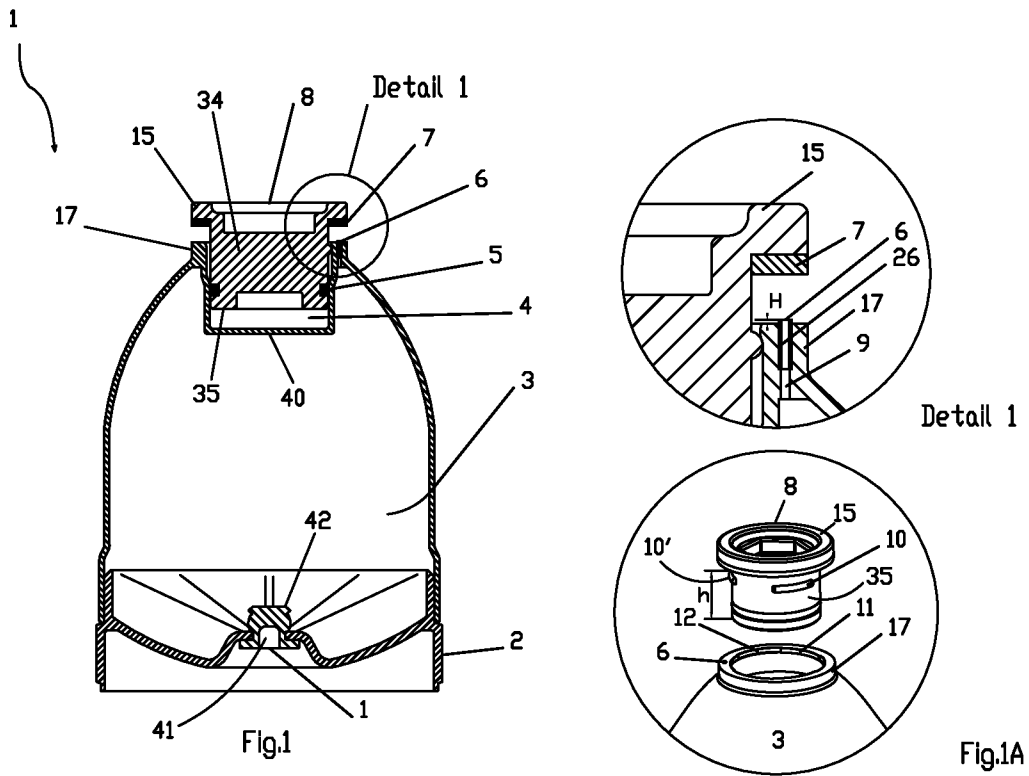
13. La méthode suivant la revendication 12, dans lequel la deuxième chambre (3) est obtenue par moulage par injection.

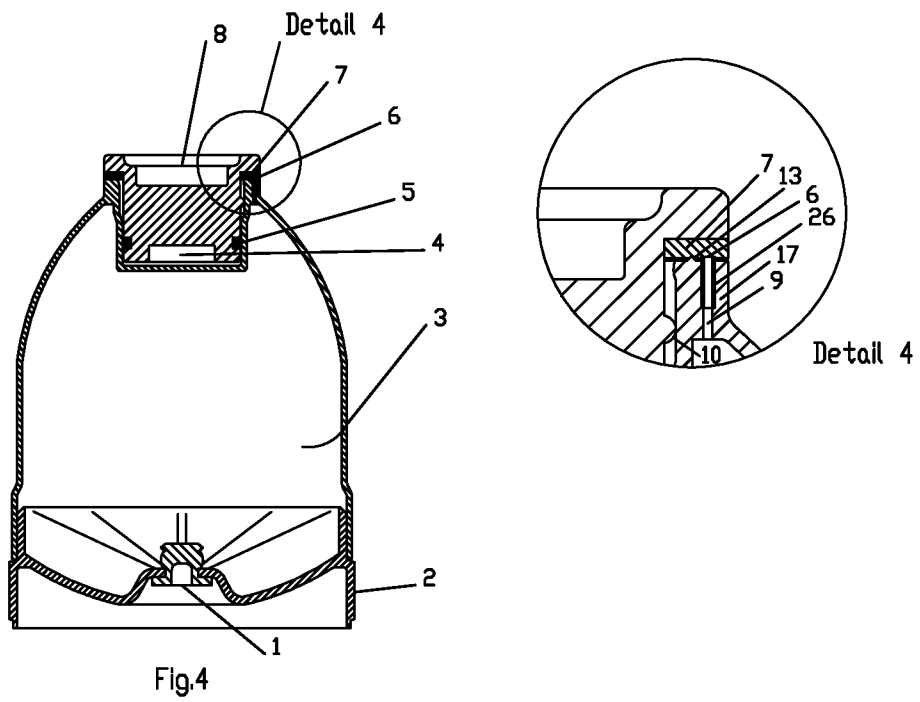
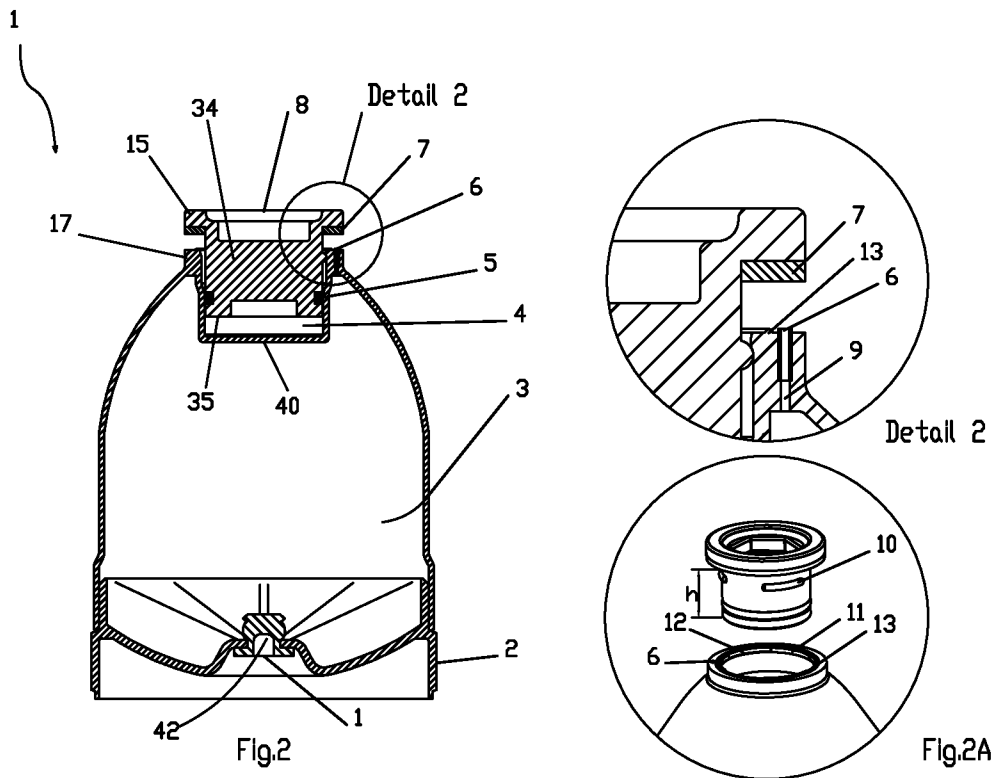
14. La méthode pour la fabrication d'un système de régulation de pression (100) suivant une des revendications 9 à 11, dans lequel le dispositif de régulation de pression (1) fabriqué suivant la revendication 12 est positionné à l'intérieur du conteneur de distribution de fluide (50, 60); de préférence fait d'un matériel

synthétique par le moulage par injection-étirement-soufflage, ledit conteneur de distribution de fluide (50) est prévu de fluide pour la distribution, ledit deuxième conteneur (3) est rempli d'air comprimé et le dispositif d'obturation (42) pour l'ouverture de fond est monté dans l'ouverture de fond (41) du deuxième conteneur (3).

15. La méthode pour la fabrication d'un système de régulation de pression (100) suivant la revendication 14, dans lequel ledit dispositif de régulation de pression (50, 60) et le dispositif de régulation de pression (1) sont reliés par soudure au laser.

16. Une utilisation d'un système de régulation de pression (100) suivant une des revendication 9 à 11, en tant que distributeur de crème à raser, distributeur de désodorisant de locaux, distributeur de désodorisant corporel, distributeur de peinture au pistolet.





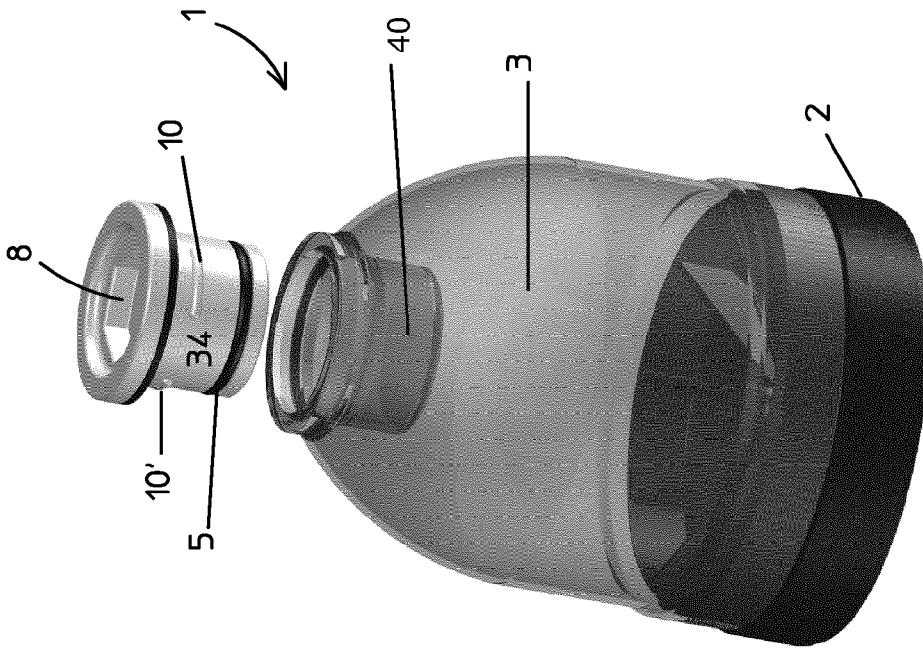


fig.5

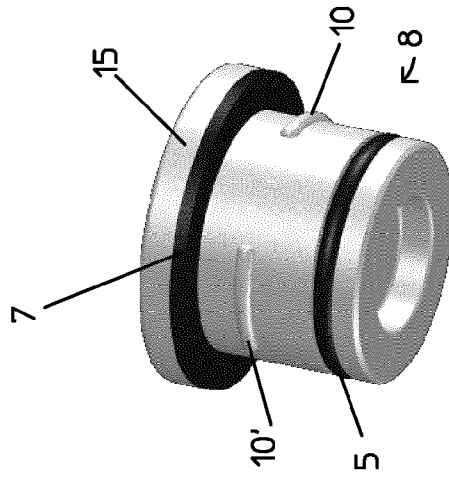


fig.6

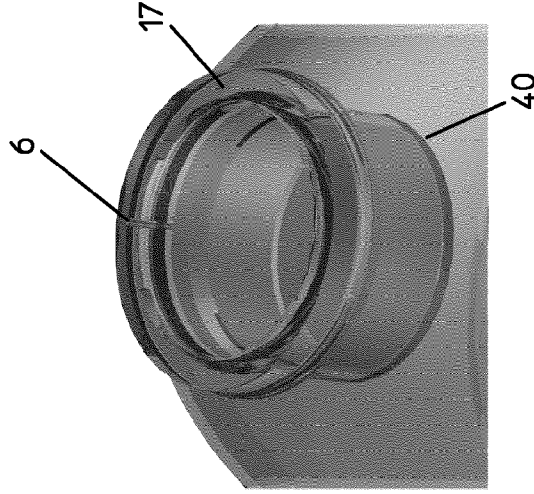
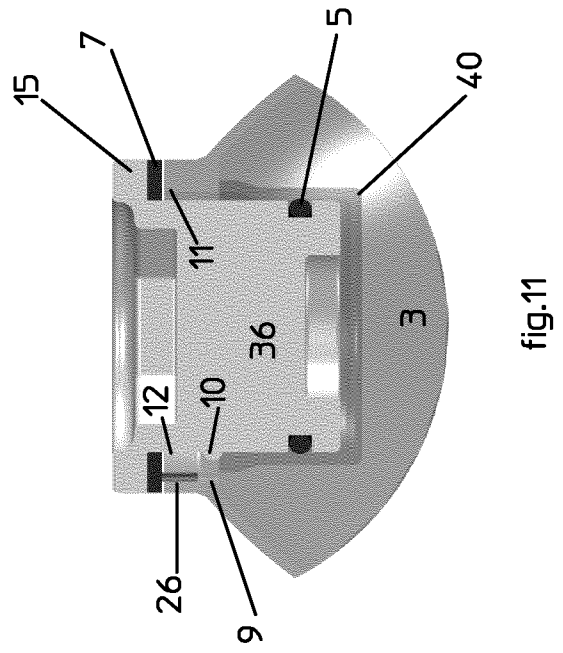
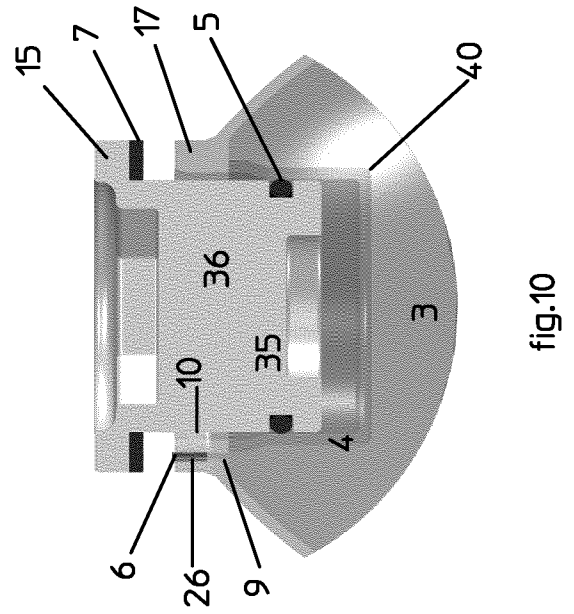
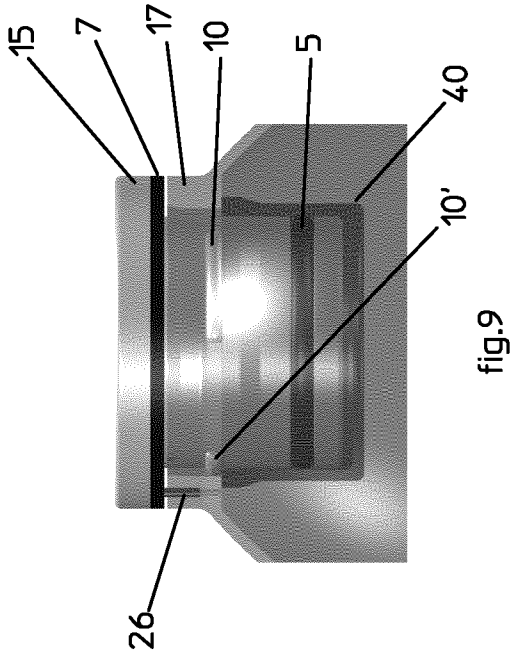
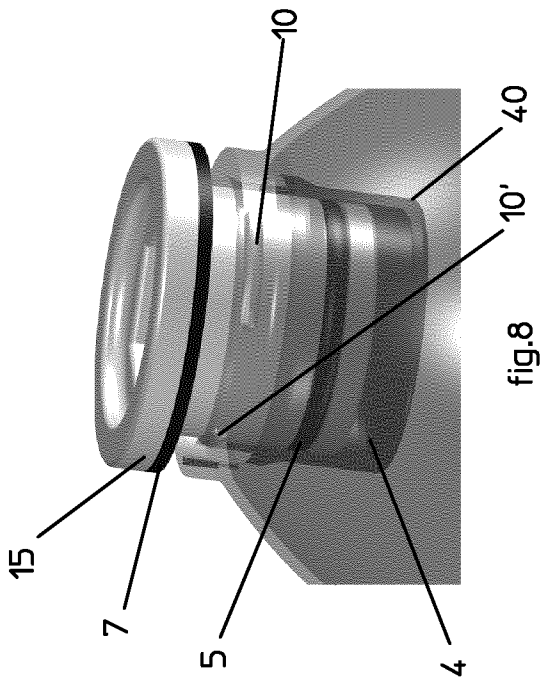


fig.7



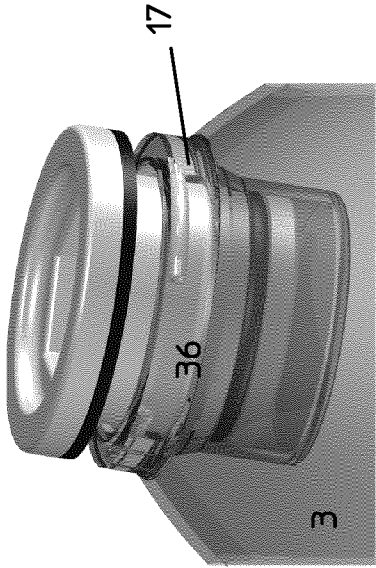


fig.12

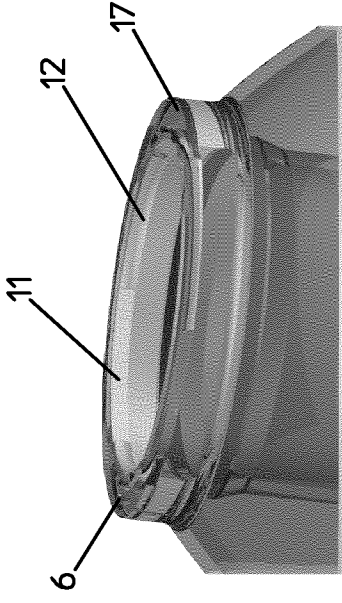


fig.13

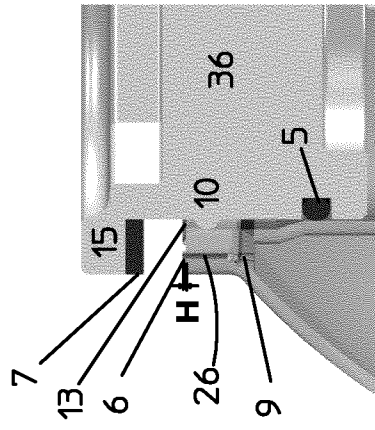


fig.14

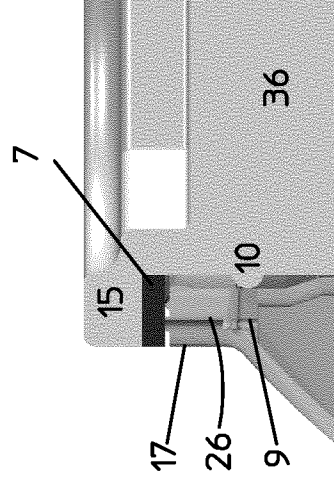


fig.15

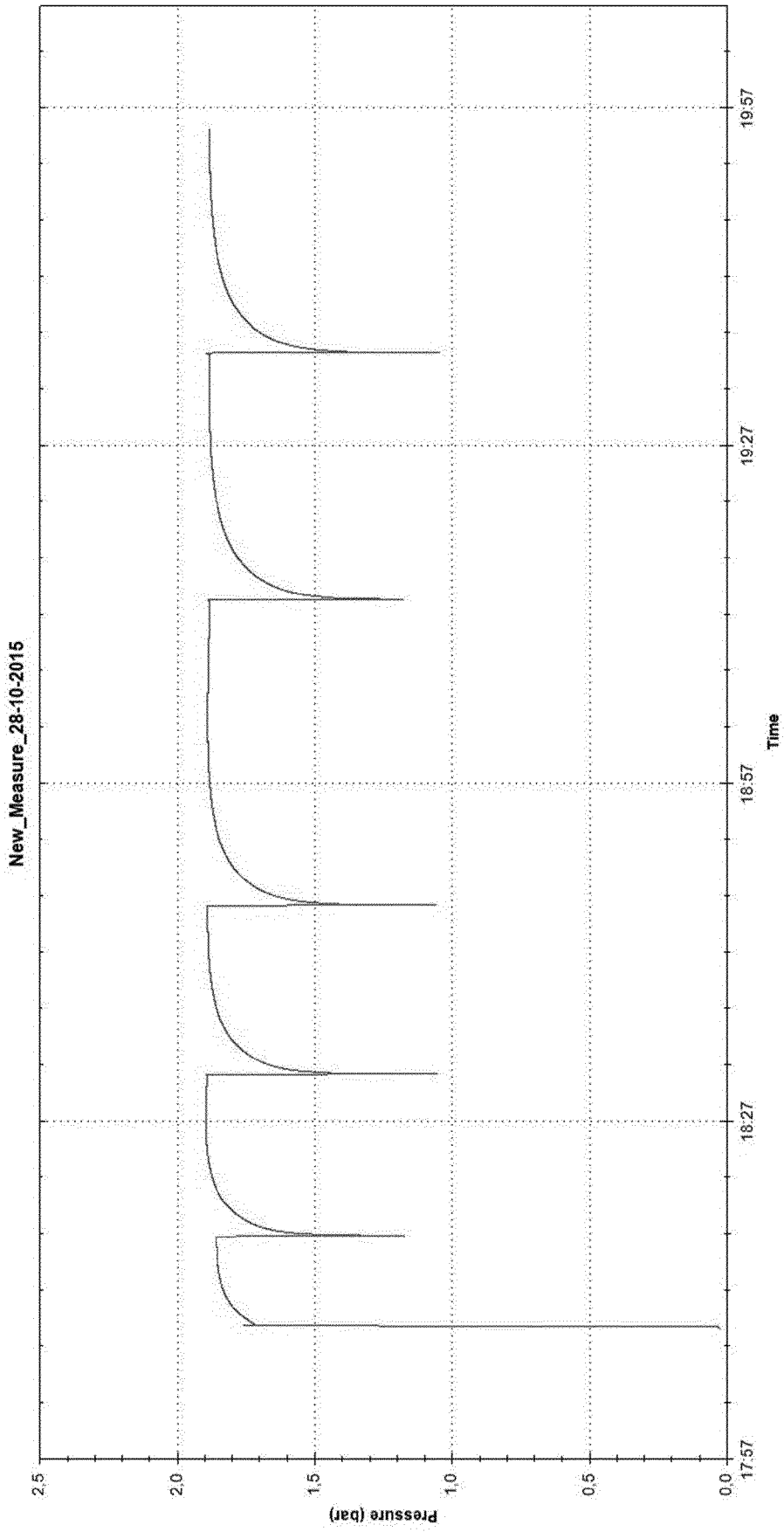


Fig 16

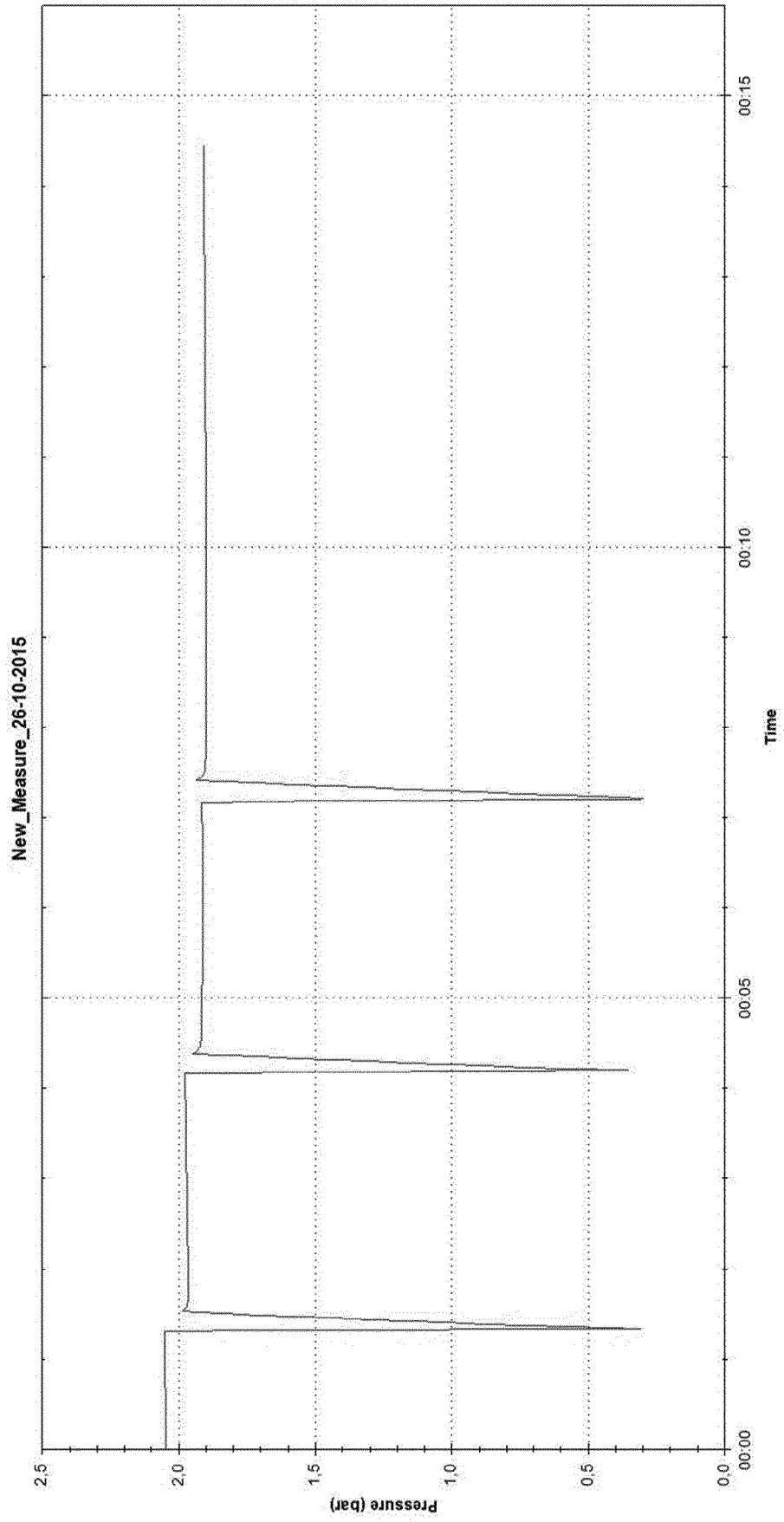


Fig 17

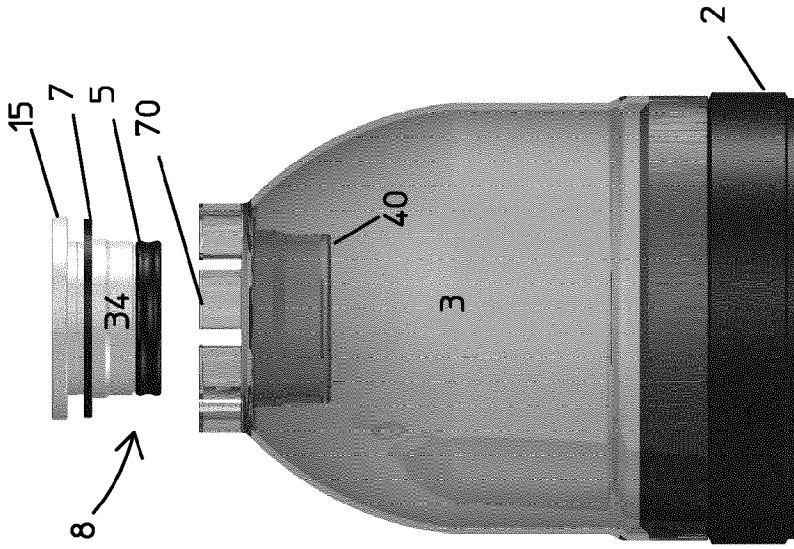


fig.20

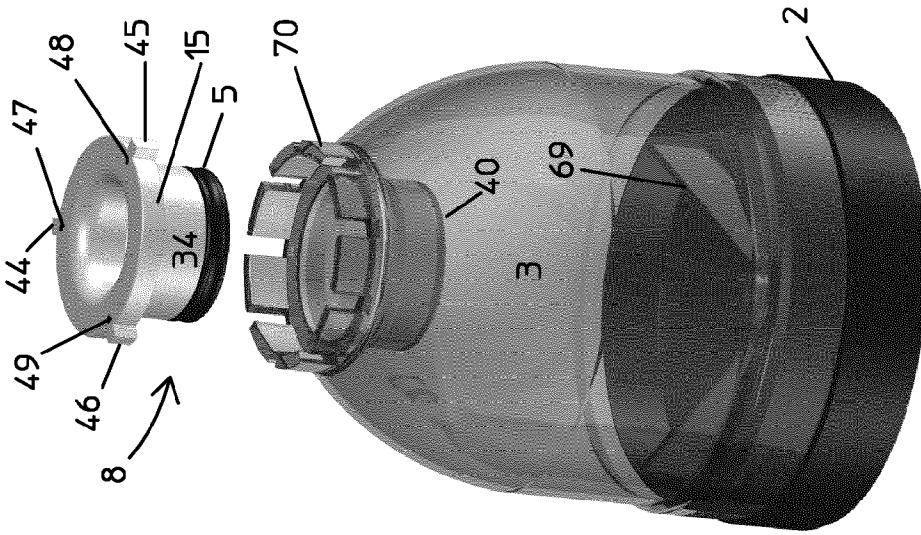


fig.19

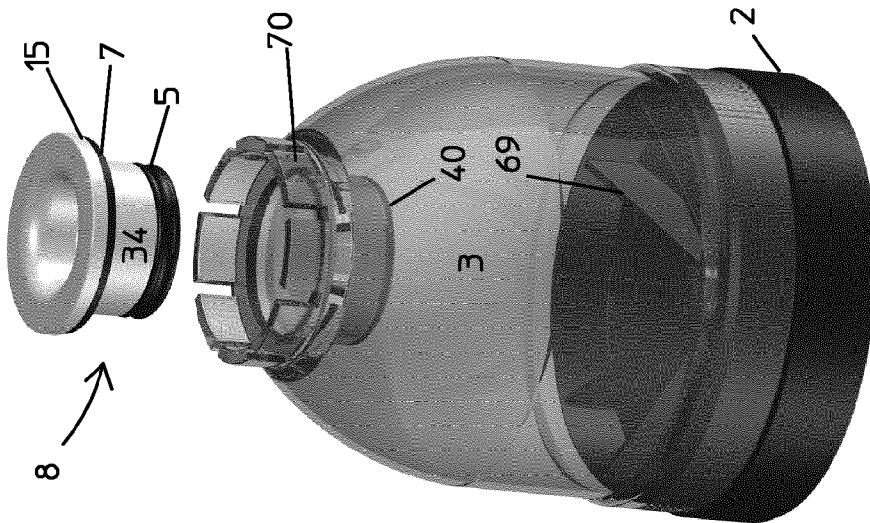


fig.18

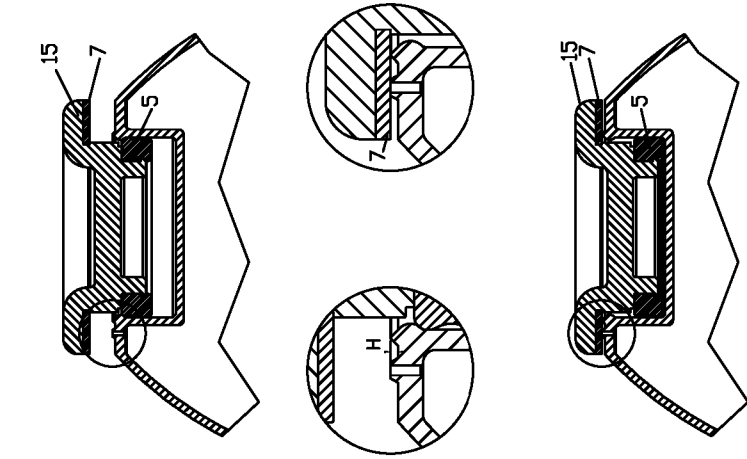


Fig.23

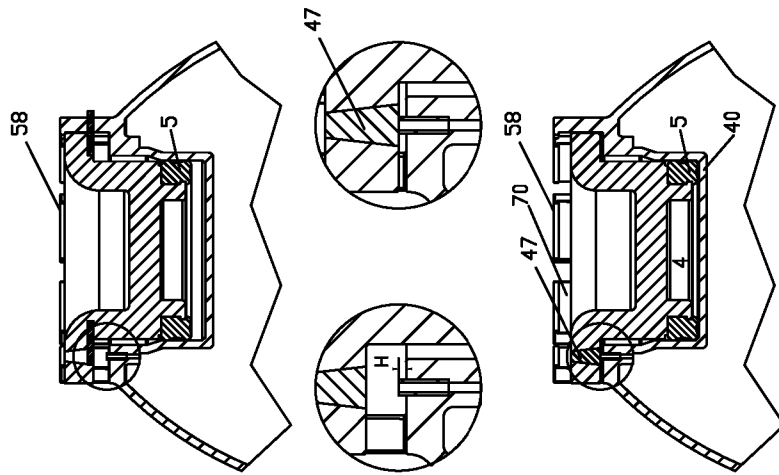


Fig.22

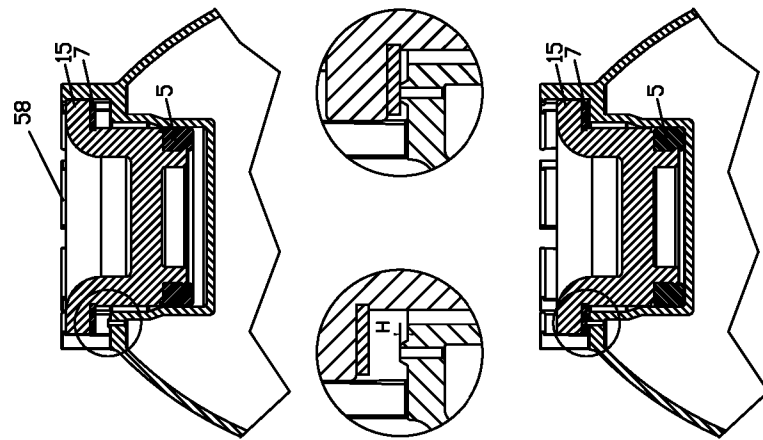


Fig.21

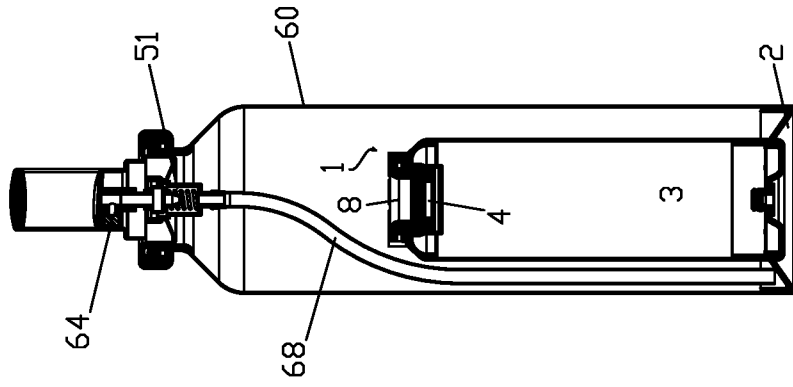


Fig.27

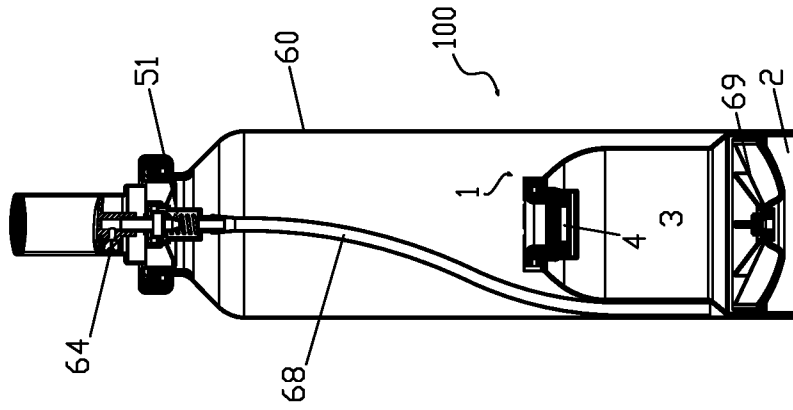


Fig.26

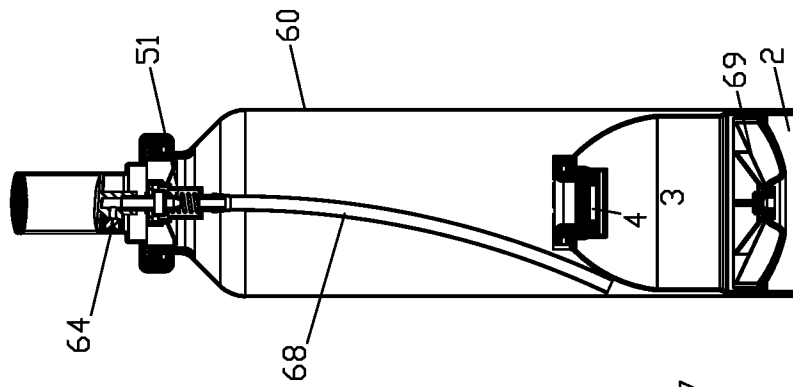


Fig.25

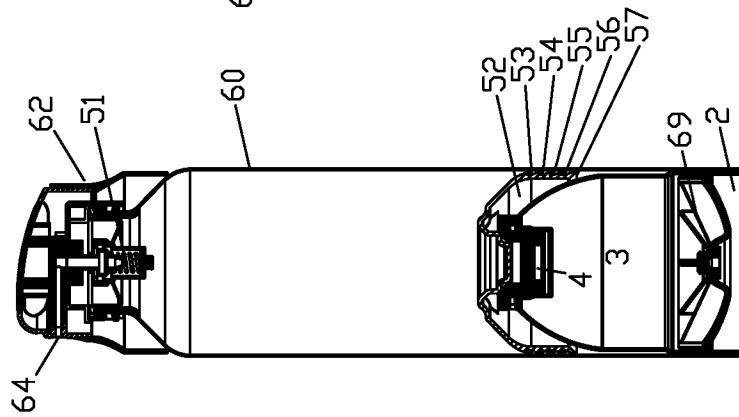


Fig.24

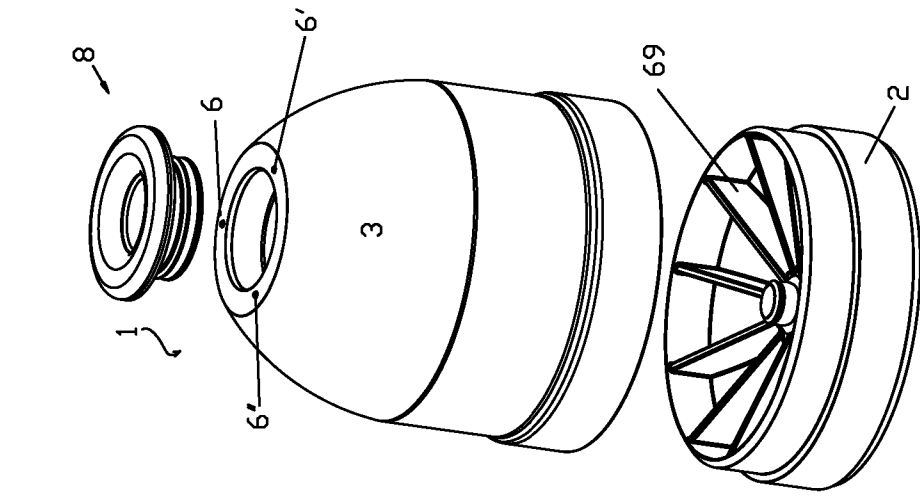


Fig.30

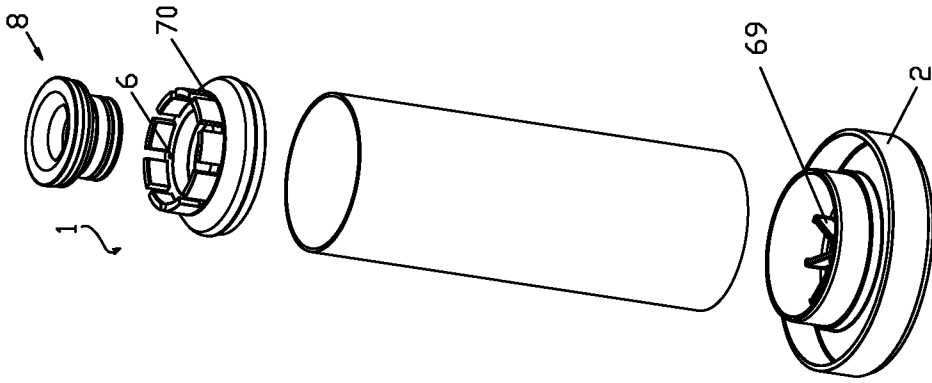


Fig.29

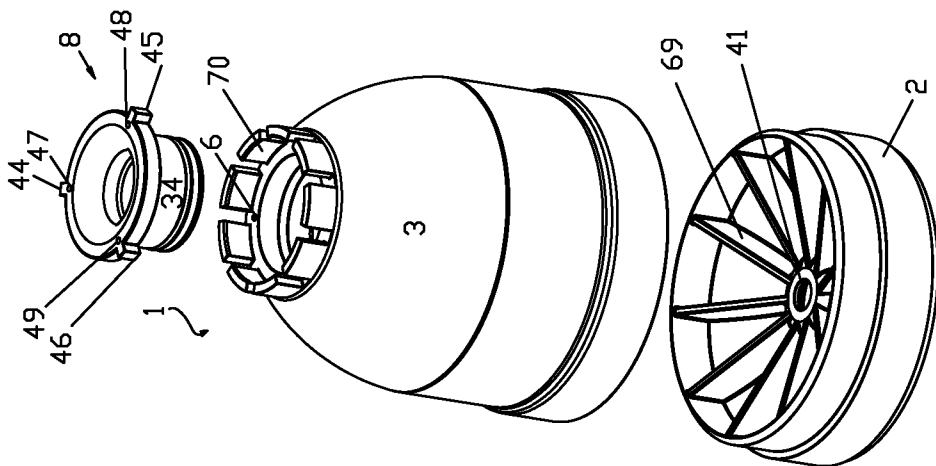


Fig.28

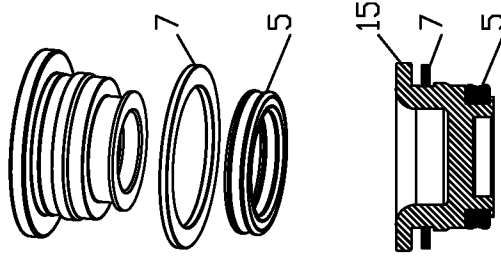


Fig.34

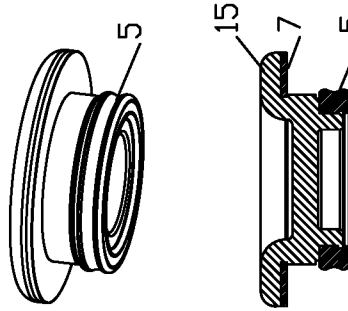


Fig.33

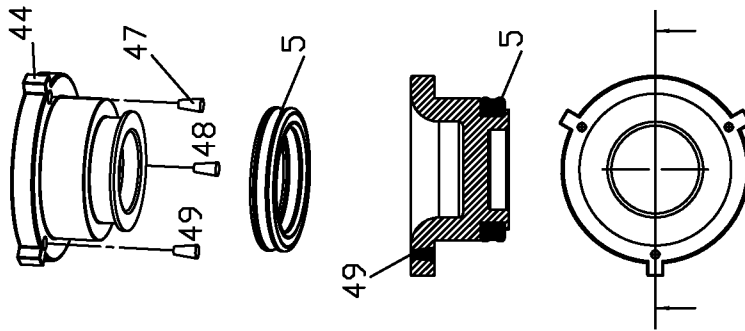


Fig.32

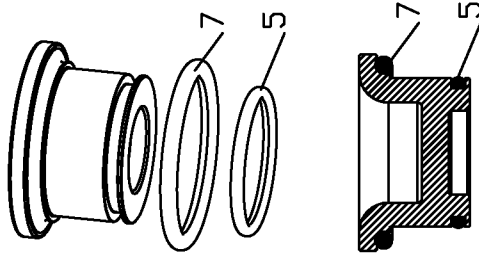


Fig.31

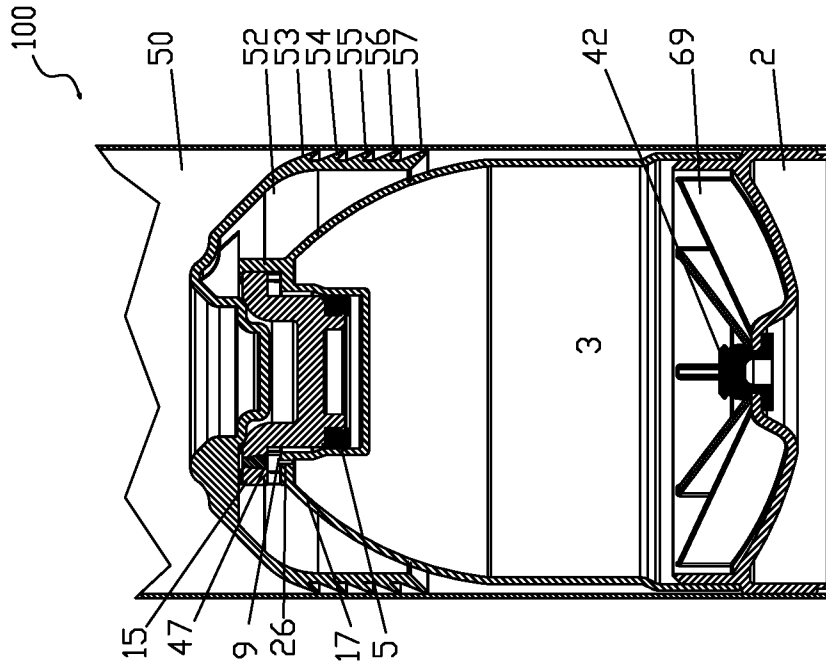


Fig.35

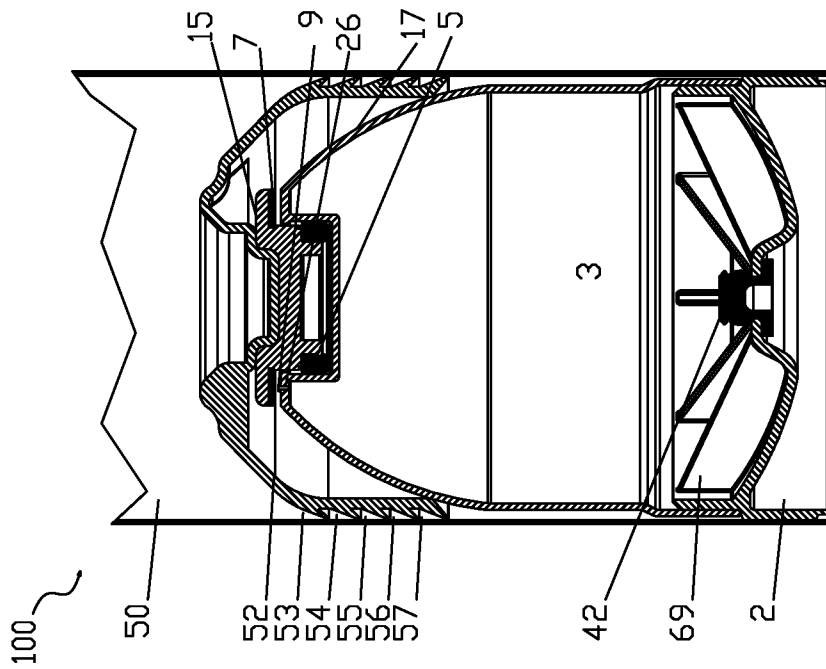


Fig.36

REFERENCES CITED IN THE DESCRIPTION

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NYOMÁSSZABÁLYZÓ ESZKÖZ, ADAGOLÓ, MELY TARTALMAZZA A NEVEZETT NYOMÁSSZABÁLYZÓ ESZKÖZT ÉS GYÁRTÁSI ELJÁRÁS

Szabadalmi igénypontok

1. Nyomákszabályozó eszköz (1) konstans előre kijelölt nyomás fenntartására egy folyadéktárolóban (50, 60), mely arra lett kialakítva, hogy a tárolóban tárolt folyadékot adagolja a folyadéktárolóból nevezet nyomáson, a nyomákszabályozó eszköz (1) tartalmaz egy hengert (40), mely rendelkezik egy nyitott véggel és egy zárt véggel és egy dugóval (8), mely mozgatható a nevezett hengeren (40) belül, mely meghatároz egy első kamrát (4), egy második kamra (3), mely körülöleli az első kamra (4) hengert (40), a második kamra (3) tölthető gázzal, melynek használatban magasabb a nyomása, mint a nevezett nyomás a tárolóban (50, 60), legalább egy folyadék kapcsolat (9) a második kamra (3) és a tároló (50, 60) között, és egy zárelem (7), mely mozgatható a hengerhez (40) képest a nevezett folyadék kapcsolat (9) kiengedésére és lezárására a második kamra (3) és a folyadékadagoló tároló (50, 60) között a zárelem (7) pozíciójától függően az első kamrához (4) képest, a zárelem (7) pozíciója a második kamrához (3) képest függ legalább a folyadékadagoló tárolóban (50, 60) uralkodó nyomástól és az első kamrában (4) uralkodó nyomástól, használat közben a folyadék kapcsolat (9) kienged, mikor a nyomás a folyadékadagoló tárolóban (50, 60) a kijelölt nyomás alá esik, így a gáz átáramlik a második kamrából (3) a folyadékadagoló tárolóba (50, 60) és a nyomás a folyadékadagoló tárolóban (50, 60) megnő, míg folyadék kapcsolatot (9) le nem zárja a zárelem (7) a folyadékadagoló tárolóban (50, 60) megnövekedett nyomás eredményeként, **azzal jellemezve, hogy** a nevezett folyadék kapcsolat (9) egy nyílás a második kamra (3) falán szemben a folyadékadagoló tárolóval (50, 60) és a nevezett folyadék kapcsolat (9) egy körkörös nyúlvánnyal (6, 16, 26) van ellátva, mely a fal (17) külső oldalától a folyadékadagoló tároló (50, 60) felé terjed; lehetőleg 0,1-2,0 mm-es magassággal túlnyúlva.
2. A nyomákszabályozó eszköz (1) az 1. igénypont szerint, ahol a nevezett dugó (8) tartalmaz egy gallért (15) egy elasztomer anyaggal biztosítva a nevezett körkörös nyúlvány (6, 16, 26) működésbe hozásához.
3. A nyomákszabályozó eszköz (1) az 1., vagy 2. igénypont szerint, ahol a nevezett körkörös nyúlvány (6) egy üreges tű (26) által van kialakítva a folyadék kapcsolatba (9) illesztve, vagy egy gomb (16) által van kialakítva egy nyílással, mely kapcsolatot tart a nevezett folyadék kapcsolattal (9).
4. A nyomákszabályozó eszköz (1) az 1-3. igénypontok bármelyike szerint, ahol az első kamra nevezett fala (17) szemben a folyadék tartállyal egy kés alakú nyúlvánnyal (13) van ellátva, mely koncentrikusan van kialakítva az első kamra (4) tartálya körül és a tartály fal és a nevezett folyadék kapcsolat (9) között van elhelyezve és a nyúlvány egyenlő magasságú mint a folyadék kapcsolat (9) gyűrűs nyúlványa (6).
5. A nyomákszabályozó eszköz (1) az 1-4. igénypontok bármelyike szerint, ahol a nevezett első kamra (4) 15,0-30,0 mm átmérővel rendelkezik és/vagy a nevezett dugónak (8) a nevezett első kamrától (4) 5,0-15,0 mm a magassága.

6. A nyomásszabályozó eszköz (1) az 1-5. igénypontok bármelyike szerint, ahol a dugó (8) tartalmaz egy nyakat (34) és gallért (15), a nyak fenékrésze (35) egy lezáró anyaggal (5) van biztosítva, lehetőleg egy o-gyűrűvel, vagy egy x-gyűrűvel.
7. A nyomásszabályozó eszköz (1) a 6. igénypont szerint, ahol a nyak (34) kettő, vagy több nyúlvánnyal (10, 10') van ellátva, lehetőleg egyenlően elosztva a nyak (34) kerületén, és a tartály egy fogadó egységgel (11) van ellátva a nevezett kettő, vagy több nyúlványhoz (10, 10') úgy, hogy a dugó (8) képes mozogni az első pozíció (I), ahol a zárelem (7) lezárja a folyadék kapcsolatot (9) és a második pozíció (II), ahol a zárelem (7) nyitja a folyadék kapcsolatot (9) között.
8. A nyomásszabályozó eszköz (1) az 1-7. igénypontok bármelyike szerint, ahol az első (4) és a második kamra (3) műanyagból van, lehetőleg polietilén-tereftaláttól (PET) vagy polietilén-furanoáttól (PEF).
9. Nyomásszabályozó rendszer (100), mely tartalmaz folyadékadagoló tárolót (50, 60) és nyomásszabályozó eszközt (1) az 1-8. igénypontok bármelyike szerint.
10. A nyomásszabályozó rendszer (100) a 9. igénypont szerint, ahol a folyadékadagoló tartálynak (50) van egy adagolónyílása egy adagoló szeleppel (51), és egy mozgatható dugattyú (52) van biztosítva a tartályban a nyomásszabályozó eszköz (1) és az adagolónyílás között, mely mozgatható dugattyú (52) elválasztja a folyadékot és a gázt, és amely mozgatható az adagolónyílás felé a folyadékadagoló tartályban (50) uralkodó többletnyomás által; lehetőleg a mozgatható dugattyú (52) domború formájúra legyen tervezve gyűrűs bordákkal (53, 54).
11. A nyomásszabályozó rendszer (100) a 9. igénypont szerint, ahol a tartálynak (60) van egy adagolónyílása (61) egy adagoló szeleppel (51), és egy mérülöcső (68) van biztosítva az adagoló szelep (62) bejáratától a nyomásszabályozó eszköz (1) felső végéhez, annak érdekében, hogy adagolja a folyadékot a mérülöcsővön (68) keresztül a tartályban uralkodó többletnyomás által.
12. Eljárás nyomásszabályozó eszköz (1) gyártására az 1-8. igénypontok bármelyike szerint, mely tartalmazza az alábbi lépéseket:
 - egy szintetikus anyag kialakítása nagy stabilitással nyomás általi deformáció ellen, nevezett második kamra (3) henger alakú fallal (40) egy dugó (8) fogadására egy zárelemmel (7) ellátva, mely egy első kamrát (4) határoz meg,
 - nevezett második kamra (3) ellátása egy folyadék kapcsolattal (9) és egy fenék nyílás (41), mely lezárható egy fedéllel (42),
 - a nevezett második kamra henger alakú falába (40) nevezett dugó (8) illesztése, mely egy első kamrát (4) határoz meg,
 - a dugó (8) és zárelem (7) rögzítése tekintettel a folyadék kapcsolatra (9) úgy, hogy az összeköttetés a második kamra (3) és a külső oldal között lezárható legyen;

azzal jellemezve, hogy a nevezett folyadék kapcsolat (9) egy nyílás a második kamra (3) falán szemben a folyadékadagoló tárolóval (50, 60) és egy nevezett folyadék kapcsolat (9) egy körkörös nyúlvánnyal (6, 16, 26) van ellátva, mely a

fal (17) külső oldalától a folyadékadagoló tároló (50, 60) felé terjed; lehetőleg 0,1-2,0 mm-es magassággal túlnyúlva.

13. Eljárás a 12. igénypont szerint, ahol a második kamrához (3) fröccsöntéssel jutunk hozzá.
14. Eljárás nyomákszabályozó rendszer (100) gyártására a 9-11. igénypontok bármelyike szerint, ahol a 12. igénypont szerint gyártott nyomákszabályozó eszköz (1) behelyezésre került a folyadékadagoló tárolóba (50, 60); lehetőleg szintetikus anyagból előnyújtásos fröccsfúvással, nevezett folyadékadagoló tartály (50) folyadékkal van ellátva adagoláshoz, nevezett második tartály (3) fel van töltve sűrített levegővel és a fedél (42) a fenék nyíláshoz rögzítve lett a második tartály (3) fenék nyílásában (41).
15. Eljárás nyomákszabályozó rendszer (100) gyártására a 14. igénypont szerint, ahol nevezett folyadékadagoló tároló (50, 60) és nevezett nyomákszabályozó eszköz (1) lézerhegesztéssel lett egymáshoz rögzítve.
16. Nyomákszabályozó rendszer (100) használata a 9-11. igénypontok bármelyike szerint borotvakrém-adagolóként, légfrissítő-adagolóként, dezodoradagolóként, festékspray-adagolóként.