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(54) **FLUID DISPENSING**

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(73) Proprietor: **The Salford Valve Company Limited**
Escrick, York YO19 6FD (GB)

(72) Inventors:
• **NASR, Ghasem**
Escrick, York YO19 6FD (GB)

- **NOURIAN, Amir**
Escrick, York YO19 6FD (GB)
- **GOLDBERG, Thomas Guy**
Escrick, York YO19 6FD (GB)
- **TULLOCH, Greig**
Escrick, York YO19 6FD (GB)

(74) Representative: **Secerna LLP**
The Old Fire Station
18 Clifford Street
York YO1 9RD (GB)

(56) References cited:
CH-A5- 669 369 DE-U1- 7 924 419
KR-A- 20120 066 720 US-A- 5 803 319

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Description

[0001] The present invention relates to a method and apparatus for dispensing fluid. In particular, but not exclusively, the present invention relates to the provision of a valve housing having a surface, along which a ball rolls, which is inclined with respect to a primary stem axis of a valve assembly of a fluid dispensing device. The inclination helps determine and thus control the point at which the ball reaches a valve seat and thus closes a fluid flow path.

[0002] Conventional fluid dispensing devices, such as an aerosol can, automatic wall or floor-mounted dispenser unit or the like, contain a pressurised fluid to be dispensed. Such devices typically comprise a valve assembly located at an upper portion of a can or other such container for dispensing an amount of fluid product from the can. A conventional valve assembly used in such devices includes a stem housing, an elongate stem movable within the stem housing between a valve open and valve closed position, and an actuator for moving the stem. The actuator is typically attached to the stem via a simple interference fit. The actuator typically includes a nozzle for dispensing fluid in a predetermined pattern from the can or other fluid container when the actuator is operated manually or automatically. The actuator selectively operates the valve assembly to allow discharge of the fluid as a spray from the nozzle by means of a propellant provided within the can/container.

[0003] Both compressed gas propellant fluid dispensing devices and liquefied gas propellant fluid dispensing devices are known. The former incorporates a propellant which is typically a gas at 25°C (e.g. air, nitrogen or carbon dioxide). Such a compressed gas propellant does not liquefy in the fluid dispensing device. On opening of the valving arrangement, the compressed gas propellant "forces" fluid from the container of the fluid dispensing device through the aforementioned nozzle, thereby providing atomisation. There are, in fact, two principal types of compressed gas propellant fluid dispensing devices. In one type, only a contained liquid stored in the container is "forced-out" by the compressed gas and is thereby supplied to the outlet nozzle. In the other type, a portion of the compressed gas propellant from the container is bled into the contained liquid being supplied to the nozzle which results in a two-phase bubble-laden ("bubbly") flow being provided to the nozzle to produce the spray. This latter format can produce finer sprays than the former.

[0004] In contrast, liquefied gas propellant fluid dispensing devices use a propellant which is present in the container of the fluid dispensing device both in the gaseous and liquid phases, whereby the liquid phase propellant is miscible with the contained liquid (product) to be dispensed. The propellant may, for example, be butane, propane and/or a mixture thereof. On opening of the valving arrangement, the gas phase propellant propels contained liquid product from the container of the fluid dispensing device (including dissolved liquid phase

propellant) through the nozzle.

[0005] Conventionally, to facilitate the spraying of fluid when a can is oriented at an angle substantially deviating to that of an upright position, for example rotated at 45° or more from the upright position, there is provided an "upside-down device" connected to the valve assembly. A conventional upside-down device includes a movable ball which rolls along a constraining passageway aligned with the upright axis of the can and that can open or close a flow path through an external fluid port. This ball opens or closes a flow path through an extra fluid communication passageway between a fluid reservoir and the nozzle of the actuator when the can is rotated by, for example, 45° or more.

[0006] However, such typical upside-down devices can result in undesirable spray characteristics and degrade the performance of fluid dispensing devices due to the dynamics of the movable ball. For example, typical upside-down devices, when in fluid communication with a valve assembly, can result in an excess amount of gas being emitted, known in the art as gas surge/depletion. This can occur when a can is reoriented to an upright position from a rotated position whilst the actuator is being pressed. The gas surge/depletion results in the pressure inside the canister being depleted too quickly which consequently effects spray parameters, for example, the discharge rate, particle size, spray profile and the like of the sprayed fluid over the lifetime of the can. Furthermore, this gas surge conventionally takes place at a predetermined angle of approximately 90° to the upright position. Such a "gas surge angle" is often actually used during operation of fluid dispensing devices and so a user often produces this undesirable gas surge when operating such devices which provides undesirable excessive depletion of gas within the can.

[0007] US5803319 discloses an invertible spray valve and container containing the same.

[0008] It is an aim of the present invention to at least partly mitigate the above-mentioned problems.

[0009] It is an aim of certain embodiments of the present invention to provide apparatus which can control movement of a closure member.

[0010] It is an aim of certain embodiments of the present invention to provide a closure housing that can better control a tipping angle at which a closure member, such as a ball starts to move towards a valve seat where fluid flow is stopped.

[0011] It is an aim of certain embodiments of the present invention to help reduce and/or eliminate gas surge of a fluid dispensing device.

[0012] It is an aim of certain embodiments of the present invention to provide a fluid dispensing device having discharge parameters like discharge rate, particle size and/or spray profile that are substantially uniform when the device is rotated/tipped.

[0013] It is an aim of certain embodiments of the present invention to provide a fluid dispensing device that has a gas surge reduced relative to conventional tech-

niques and which occurs at a substantially different tipping angle to that associated with conventional devices.

[0014] It is an aim of certain embodiments of the present invention to provide a fluid dispensing device which, at an end of a can (or other such container) life, still has a residual internal pressure of 2 bar or greater.

[0015] According to an aspect of the present there is provided apparatus for dispensing fluid, comprising:

a housing body comprising a plurality of external fluid ports, connectable to or configured to be integrally formed with a valve assembly that includes an elongate valve stem associated with a respective primary stem axis; and

a closure member in a first fluid communication passageway in the housing body, that rolls or slides along the passageway on an abutment surface of the housing body to selectively close a fluid flow path through at least one external fluid port; wherein at least an inclined region of the abutment surface is inclined with respect to the primary stem axis, wherein

the housing body further comprises a first and further valve seat at opposed end regions of the first fluid communication passageway; and wherein

the first fluid communication passageway has a cross-section that constantly widens along a length of the passageway, between the first and further valve seats, towards said at least one external fluid port.

[0016] Aptly the closure member is a free ball element and the abutment surface comprises a rolling surface provided to enable the ball element to freely roll in a reciprocating fashion along the first fluid communication passageway as the housing body is tipped. Aptly the first valve seat is at a first end region of the first fluid communication passageway and said closure member is locatable in the first valve seat in a first closure position to thereby close the fluid flow path.

[0017] Aptly the further valve seat is at a further end region of the first fluid communication passageway distal to an internal fluid port of the housing body, said closure member being locatable in the further valve seat in a seated position.

[0018] Aptly a further external fluid port of the housing body in fluid communication with the fluid communication passageway is provided in an external end surface region of the housing body that is substantially orthogonal to an external side surface region of the housing body where said external fluid port is located, said further external fluid port being proximate to said further valve seat.

[0019] Aptly the housing body further comprises a neck region that generally extends away from a remainder of the housing body; and

a still further external fluid port of the housing body is located in an end region of the neck region in fluid communication with an internal lumen that extends along the

neck region from the still further external fluid port to the internal fluid port in the housing body.

[0020] Aptly the housing body further comprises an external fluid exit port for providing fluid to the elongate valve stem.

[0021] Aptly the housing body further comprises a further fluid communication passageway that extends between the external fluid exit port and the internal fluid port in the housing body.

[0022] Aptly the inclined region of the abutment surface is inclined with respect to the primary valve axis by 1° to 20°.

[0023] Aptly the inclined region is inclined by 4° to 10°.

[0024] Aptly the neck region comprises a spigot connected or connectable to a dip tube locatable in fluid communication with a fluid reservoir.

[0025] Aptly the apparatus further comprises a pressurised or pressurisable container for providing a fluid reservoir.

[0026] Aptly the container is for containing a liquid to be discharged.

[0027] Aptly the container is for containing a gas at a temperature of around 25°C at a pressure of at least 30 bar.

[0028] Aptly the container is for containing a gas at a temperature of around 25°C at a pressure of at least 50 bar.

[0029] Aptly the apparatus further comprises an actuator member mounted on or mountable on an end region of the elongate valve stem, the actuator member being selectively urgeable along the primary stem axis in a dispense mode of operation to thereby urge the valve stem into an open configuration that allows fluid to flow through at least one region of the housing body and thereafter through a dispense nozzle of the actuator member.

[0030] Certain embodiments of the present invention provide apparatus which can control movement of a closure member relative to conventional techniques.

[0031] Certain embodiments of the present invention provide apparatus which can control when a closure member, such as a free rolling ball, leaves from and/or arrives at a respective valve seat.

[0032] Certain embodiments of the present invention provide apparatus which reduces gas surge of a fluid dispensing device.

[0033] Certain embodiments of the present invention can provide a fluid dispensing device such as but not limited to an aerosol can, which has a residual pressure of at least 2 bar remaining at an end of a can's (or other such container's) life when there is substantially no product left to dispense.

[0034] Certain embodiments of the present invention provide a fluid dispensing device which has a gas surge at a substantially different angle than in conventional devices.

[0035] Certain embodiments of the present invention provide an "upside down" assembly having a configuration chosen according to use to tailor discharge param-

eters for a desired tipping point.

[0036] Certain embodiments of the present invention provide a fluid dispensing device with a uniform discharge rate, particle size and/or spray profile or the like even when the fluid dispensing device is rotated/tipped.

[0037] Embodiments of the present invention will now be described hereinafter, by way of example only, with reference to the accompanying drawings in which:

Figure 1 illustrates a fluid dispensing device;

Figure 2 illustrates a housing body;

Figure 3 illustrates the fluid dispensing device shown in Figure 1 oriented at 180 degrees to an upright position;

Figure 4 illustrates the fluid dispensing device shown in Figure 1 oriented at 90 degrees anti-clockwise to an upright position;

Figure 5 illustrates the fluid dispensing device shown in Figure 1 oriented at 60 degrees anti-clockwise to an upright position;

Figure 6 illustrates an alternative housing body;

Figure 7 illustrates an alternative housing body; and

Figure 8 illustrates an alternative housing body.

[0038] In the drawings like reference numerals refer to like parts.

[0039] Figure 1 illustrates a fluid dispensing device 100 in a "closed" mode of operation. The fluid dispensing device may, for example, be an aerosol spray device such as an aerosol can which provides fluid to be dispensed as a mist of particles. Only a partial section of such a can is illustrated in Figure 1. It will be appreciated that other fluid dispensing devices which do not emit fluid as an aerosol may also be provided, for example devices emitting creams, gels, foams or the like. The fluid dispensing device 100 comprises a rigid container 105 on the top of which is mounted a valve assembly 110. The valve assembly 110 is held in a central position at the top of the container 105 by way of a mounting cup 115. The mounting cup 115 is selectively crimped around the edges of the rigid container 105 and around a region of the valve assembly 110 to thereby hermetically seal the container. Furthermore, an outer sealing gasket 118 and inner sealing gasket 120 may be provided in the regions proximate the crimped regions of the mounting cup 115 to support the sealing provided by the crimping process. The skilled person will appreciate that alternative methods for providing a sealing engagement may be used in place of crimping, for example interference fits, liquid sealants and the like.

[0040] A fluid reservoir 125 is provided within the

sealed container and generally comprises a quantity of liquid (product) to be dispensed. Any liquid component is free to move in the container and will adopt a surface level due to gravitational effects. The fluid reservoir may be dispensed from the device (upon being "opened") by using a propellant contained within a head space 130 of the sealed container which "forces" the product to exit the container. The propellant may be a compressed gas such as carbon dioxide, nitrogen, air or the like. Alternatively, the propellant may be a liquid gas propellant such as butane, propane or the like. Mixtures of two or more gases may also be used as the propellant. It will be understood that according to certain embodiments of the present invention, the propellant may have some solubility with the fluid reservoir 125 and therefore upon dispersal of liquid product from the fluid reservoir, some propellant held as a liquid may also be dispersed. The gas in the head space may, for example, be at an initial pressure of 5 to 20 bar depending on the type of container in use. The initial pressure may, for example, be 9 to 12 bar. The present invention can also be used with higher pressure cans, for example, cans with an initial pressure of 18 bar or higher.

[0041] The valve assembly 110 comprises an elongate valve stem 135 which can be moved in a reciprocating fashion along a primary stem axis 140 (represented by the broken line in Figure 1) upon pressing and releasing of an actuator 145 mounted to the valve stem. As illustrated in Figure 1, the elongate valve stem 135 sits in a first, closed position when no force is provided on the actuator and is held in this position by a resilient member 148 such as a spring. When the elongate valve stem 135 is in a first, closed position, corresponding to the closed mode of operation of the dispensing device fluid is not able to communicate from an inlet end 149 of the valve stem to a dispense nozzle 150 of the actuator 145. In use, the actuator may be pressed and therefore selectively urged along the primary stem axis 140 to thereby overcome the force on the valve stem provided by the resilient member 148 and thereby urge the elongate valve stem 135 into a further, open position. When the elongate valve stem is in the further, open position, fluid is able to communicate between the inlet end 149 of the valve stem and the dispense nozzle 150, thereby producing an external aerosol spray which may be provided to a target (the further, open position is illustrated and described herein below).

[0042] The valve assembly 110 further comprises an upper assembly body portion 155 and a lower assembly body portion 160 for housing the elongate valve stem and resilient member. The upper assembly body portion 155 and lower assembly body portion 160 of the valve assembly 110 are generally secured using a simple interference fit although it will be appreciated that other appropriate securing means, such as screw threads and the like, may be used. In the first, closed position of the valve stem 135 wherein the resilient member 148 urges the valve stem upwards (as in Figure 1), a projecting

shoulder 165 of the valve stem abuts against an inwardly projecting lip 170 of the upper assembly body portion of the valve assembly to thereby sealingly engage the valve stem. It will be understood that the inner sealing gasket 120, when used, also contributes to sealingly engaging the valve stem. It will be appreciated that certain embodiments of the present invention are usable with other conventional valve assemblies/actuators.

[0043] Upon pressing the actuator and bringing the valve stem into the further, open position, the projecting shoulder 165 disengages from the inwardly projecting lip 170 and a first liquid inlet 175 of the valve stem moves to a location within the upper assembly body portion 155 beneath the inwardly projecting lip 170. This enables fluid communication between the inlet end 149 of the valve stem and the first liquid inlet 175 through at least one intermediate liquid outlet 176 of the valve stem which extends from the inlet end 149 substantially perpendicular to the primary stem axis to an inner wall 177 of the upper assembly body portion 155. Furthermore, axial grooves (not shown) are provided in the projecting shoulder 165 at the interfaces between the at least one intermediate liquid outlet 176 and the inner wall 177 to facilitate flow of fluid into and out of the intermediate liquid outlets 176. Furthermore, a gas flow passageway 178 may be provided in the upper assembly body portion 155 to facilitate fluid communication with a further gas inlet 179 of the valve stem when the valve stem is in the further, open position.

[0044] A neck region 180 of the valve assembly extends from the lower assembly body portion 160 and comprises a spigot 182. The spigot is connected to a housing body 190 according to the embodiment of the present invention shown in Figure 1. The spigot 182 of the valve assembly can catch on an inwardly extending protruding ring of the housing body to help secure the parts and create a fluid tight seal. It will be appreciated that the housing body 190 could alternatively be integrally formed with the remainder of the valve assembly 110 as an extension of the lower assembly body portion 160. Having separate parts enables the housing body 190 and associated components (closure ball and dip tube) to be retrofitted to conventional valve assemblies. The housing body 190 is connected to a dip tube 192 locatable in fluid communication with the fluid reservoir 125 when the can is upright. It will be understood that when the fluid dispensing device 100 is tipped with respect to the primary stem axis 140, the dip tube 192 may no longer be in fluid communication with the fluid reservoir 125. Thus, when tipped, the housing body 190 provides a further fluid pathway in which fluid may still be communicated to the dispense nozzle 150.

[0045] Figure 1 helps illustrate how a captive ball 195 is located in the housing. The ball is a smooth spherical object that freely rolls along a passageway in the housing. Other closure members that roll or slide on an abutment surface of the housing could of course be utilised. The ball is captive in the sense that valve seats at opposed

end regions of a passage in which the ball rolls prevent the ball from escaping.

[0046] Figure 2 illustrates the housing body 190 in more detail. The housing body is a moulded plastic structure integrally formed in which an outer surface 200 has a number of openings. It could alternatively be a multi part structure and be constructed from other rigid, fluid tight materials. Other than the fluid ports the housing body is fluid tight. As shown in Figure 2 an external fluid port 210 is formed as a through hole through the housing body on a side wall 215. The through hole 210 thus provides an external fluid port in the housing body. The through hole shown has an elongate rectangular opening, however it will be appreciated that other shapes and indeed multiple openings could be used. Furthermore, it will be apparent that the through hole may be provided at a different radial or axial location of the side wall 215 to that shown in Figure 2. A first fluid communication passageway 220 extends within the housing body from the first external fluid port 210 towards an internal fluid port 225. The first fluid communication passageway 220 can help provide a fluid flow path for fluid, which may be gas and/or liquid, within the housing from the opening 210 in the side wall of the housing to the open central region within the housing body. The first fluid communication passageway 220 shown in Figure 2 extends from the internal fluid port 225 via a first substantially cylindrical portion 227 that has a constant circular cross section then via a valve seat 230 region into a wider fluid communication passageway portion 237. A further valve seat 240 is located towards an upper (in the orientation shown in Figure 2) end of the first fluid communication passageway. The further valve seat 240 is shown located at a further external fluid port 250. The further external fluid port 250 may be in fluid communication with the first fluid communication passageway. However, it will be appreciated that as an alternative this open area at the top (in the orientation shown in Figure 2) of the housing could be closed or covered to fluid flow. In such circumstances the ball locates on a suitable seating arrangement. The further valve seat 240 provides a seating position for the member that rolls or slides along the first fluid communication passageway to open or close a fluid flow path. The ball adopts this seated position when the can is tipped such that gravity causes the ball to roll to that end.

[0047] Each valve seat 230, 240 is usable to permit a closure member such as a free ball (not shown in Figure 2) to become seated against respective seating surfaces. It will be appreciated that whilst certain embodiments of the present invention are described herein as a closure member in the form of a free ball with spherical form other types of closure member which are able to roll or slide along the first fluid communication passageway and to oscillate as the can is tipped and become seated at respective ends of the fluid communication passageway can be used. For example the closure member could be a body with a plurality of faces such as a snub dodecahedron, or the closure member could alternatively be a

cylindrical or ellipsoid or the like shaped body. When the ball is seated in the lower valve seat 230, fluid flow along the passageway where the ball rolls is no longer possible.

[0048] As illustrated in Figure 2 the housing body further includes a neck region 255 which is a generally cylindrical protrusion extending away from the main area of the housing body from a lower base (in the orientation shown in Figure 2). The neck region 255 ends in a spigot 260 to which a dip tube is connectable. A lumen 265 through the neck region provides a fluid communication passageway between a still further external fluid port 270 and the internal fluid port 225. Thus it will be understood that in the embodiment illustrated in Figure 2 fluid can flow through the first external fluid port 210 and/or the further external fluid port 250 and/or the still further external fluid port 270. Such fluid flows via the internal fluid port 225 into an exit fluid communication passageway 275 and from there via an open mouth 280 into the remainder of the valve assembly. The side wall defining the exit fluid communication passageway 275 may further comprise an inwardly extending protruding ring 282 which can secure the spigot 182 of the valve assembly to create a fluid tight seal. As noted above the housing body 190 could alternatively be integrally formed with the lower assembly body portion 160 with a minor modification since the neck region 180 and spigot 182 of the lower assembly body portion 160 would no longer be needed. This will be apparent to those skilled in the art.

[0049] Figure 3 illustrates the fluid dispensing device 100 shown in Figure 1 in an "upside down" configuration. The fluid dispensing device 100 shown is an aerosol can and is shown in a dispense mode of operation when the can is upside down. Upside down means that the can is rotated approximately through 180 degrees with respect to the can orientation shown in Figure 1. Figure 3 is thus representative of a user picking up the can with a hand, inverting the can and then depressing the actuator 145. This actuation urges the valve stem along the primary stem axis 140 urging it against the biasing effect of the spring. This opens the fluid communication through the first liquid inlet 175 and puts this location in fluid communication with the lumen in the neck 180 on the lower assembly body portion 160 (which now is in a raised position with respect to the previously described upper assembly body portion 155). This likewise puts the internal fluid port 225 in fluid communication with the dispense nozzle 150 of the actuator 145. A spray 300 is shown being dispensed from the upside down can in Figure 3.

[0050] Figure 3 helps illustrate how the quantity of liquid product 125, which is free to move within the cavity of the container, has adopted a new position within the can. The surface 310 of the liquid is shown approximately half filling the container but in the position shown in Figure 3 the dip tube 192 will generally be out of fluid communication with the liquid reservoir 125. As liquid product is exhausted this level will drop over time. In order to provide a flow of fluid for the fluid reservoir 125 so that fluid can be dispensed the external fluid port 210 on the side wall

of the housing body is now located below the surface 310 of the liquid product. As shown in Figure 3 in this upside down configuration the ball 195 has become seated against the further valve seat 240. Fluid flow caused by the pressure of the head space 130 can now occur via the external fluid port 210 and the fluid communication passageway 220 to the internal fluid port 225 and from there to the dispense nozzle 150. It will be apparent to the skilled person that the further valve seat 240 may not form a sealing engagement with the closure member 195 and may only prevent the closure member from escaping the passageway. Thus, it will be understood that, in this orientation, fluid may also flow through the further external fluid port 250 around the closure member (albeit at a slower rate) and thus fluidly communicate with the first fluid communication pathway 220.

[0051] Figure 4 illustrates the aerosol can 100 shown in Figure 3 as the spraying action is continued by keeping the actuator 145 depressed and raising a user's arm. This is a common motion when, for example spraying underarm deodorant. In the orientation shown in Figure 4 the can is shown in an approximately horizontal configuration. That is to say the can has been tipped approximately 90 degrees clockwise with respect to the initial upside down position illustrated in Figure 3.

[0052] As illustrated in Figure 4 the fluid reservoir 125 moves within the confines of the can as the can is tipped remaining gravitationally speaking at the bottom of the can. Notably the ball 195, which closes fluid flow through the first fluid communication passageway 220 when the ball is seated in the valve seat closest to the internal fluid port, remains seated at the end of the fluid communication passageway nearest to the valve assembly.

[0053] At some angle the canister is tipped beyond a point where the ball moves away from the further valve seat 240 that is closer to the actuator/valve assembly. Significantly, in the orientation shown, at least part of the radially outer most region of the inner surface of the fluid communication passageway 220 is inclined with respect to the primary stem axis. That is to say in use the ball rolls backwards and forwards within the housing body 190 along the fluid communication passageway 220 by rolling against an abutment surface provided by the inner surface of the fluid communication passageway. In this embodiment the fluid communication passageway does not have a common cross section. Rather the cross section constantly widens along a length of the passageway towards the external fluid port 210 as one region 410 of the abutment surface is smooth and aligned substantially parallel to the primary stem axis whilst another region of the abutment surface is smooth and is an inclined region 400. As the can is tipped by a user to return it to an upright position the ball 195 eventually falls away from the valve seat to sit on the inclined region of the abutment surface. Because of the angle of inclination the ball at this point in time does not begin to travel up the fluid communication passageway towards the first valve seat 230 which will close fluid flow along the fluid communication passage-

way. Rather the ball remains supported by a portion of the valve seat and the inclined region of the abutment surface. The ball will remain supported by a portion of the valve seat and the inclined region of the abutment surface even when the can is substantially horizontal (that is to say the user has tipped the can 90 degrees clockwise from the upside down position). Therefore, liquid is still able to flow through the external fluid port 210 in the side wall of the housing body. As a user continues to tip the canister further to return it to the upright position a point in time is reached where the inclined region becomes substantially horizontal with respect to the earth. At this point in time the ball will begin to roll along the abutment surface towards the valve seat 230. The ball rolls past the region of the side wall of the housing body that provides the external fluid port but does not at this point close off fluid flow through that port since the diameter of the ball is not great enough to close and entirely cover the cross section of the fluid communication passageway. As the ball continues to roll along the abutment surface the ball will eventually reach the valve seat 230 and this will close off fluid flow between the external fluid port 210 and the internal fluid port 225.

[0054] It will be appreciated that liquid may be held within the passageway even when the surface 310 of the liquid is lower (that is to say closer to earth) than the external fluid port 210. The liquid may be held in the passageway, for example, via adhesion to the inner surface of the passageway and/or the closure member. This can result in the ball being restrained to some extent for a predetermined period of time due to the surface tension of the liquid within the passageway resisting movement of the ball. When the gravitational force overcomes the force provided by surface tension of the trapped fluid, the ball will begin to roll along the abutment surface towards the first or further valve seat, depending on the direction the can is being tipped. Thus, the skilled person will readily understand that the ball may not begin to immediately roll along the inclined region of the abutment surface when the inclined region is substantially horizontal with respect to earth and a user may be required to tip the device by, for example, at least 1-2 degrees from the horizontal before the ball will start to roll.

[0055] When the can is tipped 90 degrees clockwise from the upside down position, the fluid reservoir 125 is still in fluid communication with the external fluid port 210 and thus liquid (product) remains able to flow through the fluid communication passageway 220 to the dispense nozzle 150. At the same time, the dip tube is not in fluid communication with the fluid reservoir or may only be partly in fluid communication therewith.

[0056] It is notable that in a conventional can where the ball rolls along and closes a fluid communication passageway when the can is approximately horizontal, the only remaining open fluid communication pathway is through the dip tube. This results in a substantial portion of gas in the head space being forced along the dip tube and emitted out of the nozzle. This is known in the art as

gas surge or gas depletion.

[0057] By contrast by inclining a region of the abutment surface according to certain embodiments of the present invention the point in time in which the ball reaches the valve seat 230 is retarded with respect to a similar closure member of a conventional device. This means that the fluid communication passageway 220 may remain open until an end of the dip tube is re-located in the fluid reservoir 125. Thus, at the point in time at which the ball reaches the valve seat 230, the dip tube is located in the fluid reservoir and therefore no, or only a small amount of, gas surge takes place. For example, in certain embodiments of the present invention, only the gas that remains trapped in the dip tube when the end of the dip tube is re-located in the fluid reservoir may contribute to the gas surge. Aptly, this can result in the residual pressure of the can being greater than 2 bar when substantially all of the liquid product has been used.

[0058] Figure 5 illustrates the can 100 in a further state in which the can is further tipped back towards the vertical orientation. That is to say when the can has been moved from the "upside down" orientation shown in Figure 3 via the generally horizontal position shown in Figure 4 to a semi-upright position shown in Figure 5. The can in Figure 5 is still in an open mode of operation with the actuator 145 still depressed and spray 300 still being ejected. In this orientation the angle of tipping means that the body 125 of liquid product is angled across the inside of the can and the upper surface 310 of the liquid is shown below the level of the external fluid port 210 in the side wall of the housing body. As illustrated in Figure 5 the ball 195 has at this point rolled along the fluid communication passageway and is seated on the valve seat 230 thus closing a flow path through the external fluid port 210 and along the fluid communication passageway 220. From this position the canister can be further tipped into the upright position with little further significant change in spray characteristics.

[0059] As discussed above, certain embodiments of the present invention may enable the gas surge to be removed or at least partially reduced. Furthermore, the angle at which the gas surge takes place may also be controlled by incorporating an inclined region of the abutment surface within the housing body. For example, the gas surge may take place when the can has been tipped to an angle between 100 and 130 degrees clockwise from the upside down position. Aptly, the angle at which the reduced gas surge takes place may be when the can is tipped between 115 and 125 degrees clockwise from the upside down position. A user operating the aerosol spray device will be less likely to continue spraying the fluid at these tipping angles, and may therefore avoid causing a surge of gas. Furthermore, as the user is likely to stop spraying before reaching these tipping angles, the user will not experience any dip in performance and/or spray characteristics. This will contribute to the effect of having a greater residual pressure (than conventionally) at the end of a can's (or other suitable container's) life when

substantially all of the product has been sprayed. The angle of inclination can thus be selected when a container is designed according to use to align the inclination to tailor when/if gas surge risk occurs.

[0060] The opposing process of tipping the can in an anticlockwise direction from the upright position will now be described. For example, such as when a user depresses the actuator 145 when the can is in the upright position and begins to tip the can through a semi-right position (shown in Figure 5), a substantially horizontal position (shown in Figure 4) to an upside down position (shown in Figure 3). As the can is tipped from the upright position to the semi-upright position there is no significant change in the spray characteristics. However, at a certain angle just before the can becomes substantially horizontal the ball will start to roll along the passageway due to the inclined region of the abutment surface which is inclined 'down hill' for this tipping motion. This causes a fluid communication pathway to open which therefore allows liquid (product) to flow through the external fluid port 210 and fluidly communicate with the dispense nozzle 150. Thus, by inclining a region of the abutment surface, the point in time in which the ball reaches the valve seat 240 is sooner than a similar closure member of a conventional device. Thus, the spray characteristics of the canister are thereby effectively independent of the angle of operation as fluid communication between the internal fluid port 225 and the dispense nozzle 150 is substantially continuous as the can is tipped through 180 degrees from the upright position to the upside down position. It will therefore also be appreciated that fluid communication between the internal fluid port 225 and the dispense nozzle 150 will also be substantially continuous (and thus the spray characteristics will therefore be substantially uniform) as the can is re-tipped back to the upright position from the upside down position.

[0061] Figure 6 illustrates an alternative housing body according to an embodiment not encompassed by the wording of the claims but considered as useful for understanding the invention. In this embodiment, the housing body 600 comprises a first fluid communication passageway 620 having a common cross-section along substantially a whole length of the fluid communication passageway. The housing body 600 further comprises an abutment surface which is a substantially cylindrical surface having a principal axis 630 (represented by the broken line in Figure 6) inclined away from the primary stem axis (not shown) in a direction towards the elongate valve stem (not shown). It will be understood that in this embodiment the closure member (not shown) may reciprocate along the passageway but will only open the passageway to allow fluid flow when an outer edge of the ball proximate the abutment surface rolls to a position above (in the orientation shown in Figure 6) a lower end 605 of the external fluid port 610. This is because the diameter of the ball is substantially equal to the cross section of the fluid communication passageway. Likewise, the ball will therefore only close the fluid commu-

nication passageway when the outer edge of the ball proximate the abutment surface rolls to a position below the lower end 605 of the external fluid port. If the ball is slightly smaller in diameter the closure occurs when the ball seats on the lower valve seat 640. It will be understood by the person skilled in the art that the inclined region of the abutment surface in this embodiment will enable movement of the ball to be controlled in a similar fashion to the housing body illustrated in Figure 2. However, the opening and/or closing of the fluid communication pathway 620 will have a greater dependency of the positioning of the ball within the passageway. That is to say that if a ball is used which has a diameter which is substantially equal to the cross-section of the passageway, the fluid communication passageway will only open and/or close once the outer edge of the ball proximate the abutment surface has reached and rolled passed the lower end of the external fluid port 610 (in one direction or the other).

[0062] Figure 7 helps illustrate an alternative housing body according to another embodiment not encompassed by the wording of the claims but considered as useful for understanding the invention. In this embodiment, the housing body 700 comprises a first fluid communication passageway 720 which has a common cross-section along substantially a whole length of the passageway and an abutment surface which is a substantially cylindrical surface having a principal axis 730 (represented by the broken line in Figure 7) inclined towards the primary stem axis (not shown) in a direction towards the elongate valve stem (not shown). As with the embodiment shown in Figure 6, it will be appreciated that the fluid communication passageway 720 of Figure 7 will only open and/or close once an outer edge of the ball proximate the abutment surface has reached and rolled passed a lower end 705 of the external fluid port 710 (in one direction or the other) due to the diameter of the ball being approximately equal to the cross-section of the passageway. Alternatively if a ball having a slightly smaller diameter is used fluid flow along the passageway 720 stops when the ball is seated on the lower valve seat 740.

[0063] It will be apparent that in this embodiment the inclined surface will result in a different effect on the ball (than the embodiment of Figure 6, for example) when the can is tipped about its axis. That is to say that when the ball is tipped from the upright position towards the upside down position, the ball will remain seated at the first valve seat 740 when the can reaches a substantially horizontal position. Likewise, when tipping the can from the upside down position to the upright position, the ball will begin to roll along the inclined surface of the abutment surface away from the further valve seat 750 prior to the can reaching a horizontal position (when the inclined surface is substantially horizontal). This effect may be advantageous, for example, when the can is filled with a lower ratio of liquid product to propellant and/or a dip tube is used which has an end that sits proximate to a radially outer surface of the rigid container. For example, where

the dip tube extends towards a radially outer edge of the rigid container in the direction in which the spray 300 will be emitted. The inclined surface in this embodiment will therefore ensure that the nozzle will have a greater likelihood, than that of a conventional device, of being in fluid communication with the liquid (product) as the can is tipped about 180 degrees (whilst the actuator is depressed).

[0064] Figure 8 illustrates an alternative housing body according to an embodiment of the present invention. In this embodiment, the fluid communication passageway 820 has a cross-section that constantly widens along a length of the passageway towards an external fluid port 810 and substantially all of the abutment surface is inclined with respect to the primary stem axis. For example, a radially outermost region 850 of an inner surface of the passageway is inclined away from the primary stem axis, and a radially innermost surface 860 of the inner surface of the passageway is inclined toward the primary stem axis, in a direction toward the valve stem. It will be understood that the inclined regions could also be reversed so that that cross-section constantly narrows along a length of the passageway toward the external fluid port. Depending upon an orientation of tipping the ball will roll on a respective (lower at that moment in time) surface. The inclination of that surface can be preselected to tailor the can's spray characteristics according to likely use.

[0065] The apparatus of the present invention may be used as part of an aerosol spraying device, or a device for dispensing creams, gels or foams. Such a device may be used to deliver various materials, preferably materials dissolved or dispersed in water. For example, the liquid in the container may contain a range of materials selected from the group consisting of pharmaceutical, agrochemical, fragrance, air freshener, odour neutraliser, sanitizing agent, paint, oil (including cooking oil), sun-screen chemical, depilatory chemical (such as calcium thioglycolate), epilatory chemical, cosmetic agent, shaving cream, shaving gel, deodorant, anti-perspirant, anti-bacterial agents, anti-allergenic compounds, and mixtures of two or more thereof. Furthermore, the container may contain a foamable composition, optionally containing any of the materials disclosed immediately hereinbefore. The water in the container may optionally contain one or more organic solvents or dispersants in order to aid dissolution or dispersion of the materials in the water. Preferred solvents include ethanol and/or liquid butane.

[0066] Throughout the description and claims of this specification, the words "comprise" and "contain" and variations of them mean "including but not limited to" and they are not intended to (and do not) exclude other moieties, additives, components, integers or steps. Throughout the description and claims of this specification, the singular encompasses the plural unless the context otherwise requires. In particular, where the indefinite article is used, the specification is to be understood as contemplating plurality as well as singularity, unless the context requires otherwise.

Claims

1. Apparatus for dispensing fluid, comprising:

5 a housing body (190) comprising a plurality of external fluid ports (210, 250, 270), connectable to or configured to be integrally formed with a valve assembly (110) that includes an elongate valve stem (135) associated with a respective primary stem axis (140); and
10 a closure member (195) in a first fluid communication passageway (220) in the housing body, that rolls or slides along the passageway on an abutment surface of the housing body to selectively close a fluid flow path through at least one external fluid port (210); wherein
15 at least an inclined region of the abutment surface is inclined with respect to the primary stem axis; wherein
20 the housing body further comprises a first (230) and further (240) valve seat at opposed end regions of the first fluid communication passageway; and wherein
25 the first fluid communication passageway has a cross-section that constantly widens along a length of the passageway, between the first and further valve seats, towards said at least one external fluid port (210).

30 2. The apparatus as claimed in claim 1, wherein:
the closure member (195) is a free ball element and the abutment surface comprises a rolling surface provided to enable the ball element to freely roll in a reciprocating fashion along the first fluid communication passageway as the housing body is tipped.
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3. The apparatus as claimed in any preceding claim, wherein:
the first valve seat (230) is at a first end region of the first fluid communication passageway and said closure member is locatable in the first valve seat in a first closure position to thereby close the fluid flow path.
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45 4. The apparatus as claimed in claim 3, wherein:
the further valve seat (240) is at a further end region of the first fluid communication passageway distal to an internal fluid port (225) of the housing body, said closure member being locatable in the further valve seat in a seated position.
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5. The apparatus as claimed in any of claims 1-3, further comprising:
a further external fluid port (250) of the housing body in fluid communication with the fluid communication passageway is provided in an external end surface region of the housing body that is substantially orthogonal to an external side surface region of the
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housing body where said external fluid port (210) is located, said further external fluid port being proximate to said further valve seat.

6. The apparatus as claimed in claim 5, further comprising:

the housing body (190) further comprises a neck region (255) that generally extends away from a remainder of the housing body; and a still further external fluid port (270) of the housing body is located in an end region of the neck region in fluid communication with an internal lumen (265) that extends along the neck region from the still further external fluid port to an internal fluid port (225) in the housing body.

7. The apparatus as claimed in claim 4, further comprising:

a further external fluid port (250) of the housing body in fluid communication with the fluid communication passageway is provided in an external end surface region of the housing body that is substantially orthogonal to an external side surface region of the housing body where said external fluid port (210) is located, said further external fluid port being proximate to said further valve seat.

8. The apparatus as claimed in claim 7, further comprising:

the housing body (190) further comprises a neck region (255) that generally extends away from a remainder of the housing body; and a still further external fluid port (270) of the housing body is located in an end region of the neck region in fluid communication with an internal lumen (265) that extends along the neck region from the still further external fluid port to the internal fluid port (225) in the housing body.

9. The apparatus as claimed in any of claims 1-3 or claim 5, wherein:

the housing body (190) further comprises an external fluid exit port for providing fluid to the elongate valve stem.

10. The apparatus as claimed in claim 9, wherein:

the housing body (190) further comprises a further fluid communication passageway that extends between the external fluid exit port and an internal fluid port (225) in the housing body.

11. The apparatus as claimed in claim 4 or any of claims 6-8, wherein:

the housing body (190) further comprises an external fluid exit port for providing fluid to the elongate valve stem.

12. The apparatus as claimed in claim 11, wherein: the housing body (190) further comprises a further fluid communication passageway that extends between the external fluid exit port and the internal fluid port (225) in the housing body.

13. The apparatus as claimed in any preceding claim, wherein:

the inclined region of the abutment surface is inclined with respect to the primary stem axis (140) by 1° to 20°, and optionally by 4° to 10°.

14. The apparatus as claimed in any preceding claim, further comprising:

a pressurised or pressurisable container (105) for providing a fluid reservoir (125), wherein the container is for containing a liquid to be discharged; and

the container is for containing a gas at a temperature of around 25°C at a pressure of at least 30 bar, and optionally a gas at a temperature of around 25°C at a pressure of at least 50 bar.

Patentansprüche

1. Vorrichtung zur Flüssigkeitsabgabe, umfassend:

einen Gehäusekörper (190), der eine Vielzahl von externen Fluidöffnungen (210, 250, 270) umfasst, die mit einer Ventilbaugruppe (110) verbindbar oder so konfiguriert sind, dass sie einstückig mit dieser geformt ist, die einen länglichen Ventilschaft (135) beinhaltet, der einer jeweiligen primären Schaftachse (140) zugeordnet ist, und

ein Verschlusselement (195) in einem ersten Fluidkommunikationsdurchgang (220) im Gehäusekörper, das entlang des Durchgangs auf einer Anlagefläche des Gehäusekörpers rollt oder gleitet, um einen Fluidströmungsweg durch mindestens eine externe Fluidöffnung (210) selektiv zu schließen; wobei mindestens ein geneigter Bereich der Anlagefläche in Bezug auf die primäre Schaftachse geneigt ist, wobei

der Gehäusekörper ferner einen ersten (230) und einen weiteren (240) Ventilsitz an gegenüberliegenden Endbereichen des ersten Fluidkommunikationsdurchgangs umfasst, und wobei

der erste Fluidkommunikationsdurchgang einen Querschnitt aufweist, der sich entlang der Länge des Durchgangs zwischen dem ersten und weiteren Ventilsitz in Richtung der mindestens einen externen Fluidöffnung (210) konstant erweitert.

2. Vorrichtung nach Anspruch 1, wobei:
das Verschlusselement (195) ein freies Kugelelement ist und die Anlagefläche eine Rollfläche umfasst, die dazu vorgesehen ist, dem Kugelelement zu ermöglichen, frei hin und her entlang des ersten Fluidkommunikationsdurchgangs zu rollen, wenn der Gehäusekörper gekippt wird. 5
3. Vorrichtung nach einem der vorhergehenden Ansprüche, wobei:
sich der erste Ventilsitz (230) an einem ersten Endbereich des ersten Fluidkommunikationsdurchgangs befindet und das Verschlusselement im ersten Ventilsitz in einer ersten Schließposition platzierbar ist, um dadurch den Fluidströmungsweg zu schließen. 10 15
4. Vorrichtung nach Anspruch 3, wobei:
sich der weitere Ventilsitz (240) an einem weiteren Endbereich des ersten Fluidkommunikationsdurchgangs distal zu einer internen Fluidöffnung (225) des Gehäusekörpers befindet, wobei das Verschlusselement im weiteren Ventilsitz in einer Sitzposition platzierbar ist. 20
5. Verfahren nach einem der Ansprüche 1 bis 3, ferner umfassend:
eine weitere externe Fluidöffnung (250) des Gehäusekörpers in Fluidkommunikation mit dem Fluidkommunikationsdurchgang ist in einem externen Endflächenbereich des Gehäusekörpers vorgesehen, der im Wesentlichen orthogonal zu einem externen Seitenflächenbereich des Gehäusekörpers ist, in dem sich die externe Fluidöffnung (210) befindet, wobei sich die weitere externe Fluidöffnung in der Nähe des weiteren Ventilsitzes befindet. 25 30 35
6. Vorrichtung nach Anspruch 5, ferner umfassend:
der Gehäusekörper (190) umfasst ferner einen Halsbereich (255), der sich im Allgemeinen vom Rest des Gehäusekörpers weg erstreckt; und eine noch weitere externe Fluidöffnung (270) des Gehäusekörpers befindet sich in einem Endbereich des Halsbereichs in Fluidkommunikation mit einem inneren Lumen (265), das sich entlang des Halsbereichs von der noch weiteren externen Fluidöffnung zu einer internen Fluidöffnung (225) im Gehäusekörper erstreckt. 40 45 50
7. Vorrichtung nach Anspruch 4, ferner umfassend:
eine weitere externe Fluidöffnung (250) des Gehäusekörpers in Fluidkommunikation mit dem Fluidkommunikationsdurchgang ist in einem externen Endflächenbereich des Gehäusekörpers vorgesehen, der im Wesentlichen orthogonal zu einem externen Seitenflächenbereich 55
- des Gehäusekörpers ist, in dem sich die externe Fluidöffnung (210) befindet, wobei sich die weitere externe Fluidöffnung in der Nähe des weiteren Ventilsitzes befindet.
8. Vorrichtung nach Anspruch 7, ferner umfassend:
der Gehäusekörper (190) umfasst ferner einen Halsbereich (255), der sich im Allgemeinen vom Rest des Gehäusekörpers weg erstreckt; und eine noch weitere externe Fluidöffnung (270) des Gehäusekörpers befindet sich in einem Endbereich des Halsbereichs in Fluidkommunikation mit einem inneren Lumen (265), das sich entlang des Halsbereichs von der noch weiteren externen Fluidöffnung zu der internen Fluidöffnung (225) im Gehäusekörper erstreckt.
9. Vorrichtung nach einem der Ansprüche 1 bis 3 oder Anspruch 5, wobei:
der Gehäusekörper (190) ferner eine externe Fluidauslassöffnung umfasst, um dem länglichen Ventilschaft Fluid bereitzustellen.
10. Vorrichtung nach Anspruch 9, wobei:
der Gehäusekörper (190) ferner einen weiteren Fluidkommunikationsdurchgang umfasst, der sich zwischen der externen Fluidaustrittsöffnung und einer internen Fluidöffnung (225) im Gehäusekörper erstreckt.
11. Vorrichtung nach Anspruch 4 oder einem der Ansprüche 6 bis 8, wobei:
der Gehäusekörper (190) ferner eine externe Fluidauslassöffnung umfasst, um dem länglichen Ventilschaft Fluid bereitzustellen.
12. Vorrichtung nach Anspruch 11, wobei:
der Gehäusekörper (190) ferner einen weiteren Fluidkommunikationsdurchgang umfasst, der sich zwischen der externen Fluidaustrittsöffnung und der internen Fluidöffnung (225) im Gehäusekörper erstreckt.
13. Vorrichtung nach einem der vorhergehenden Ansprüche, wobei:
der geneigte Bereich der Anlagefläche gegenüber der primären Schaftachse (140) um 1° bis 20° und optional um 4° bis 10° geneigt ist.
14. Vorrichtung nach einem der vorhergehenden Ansprüche, ferner umfassend:
einen unter Druck stehenden oder druckbeaufschlagbaren Behälter (105) zum Bereitstellen eines Fluidvorratsbehälters (125), wobei der Behälter zur Aufnahme einer abzugebenden Flüssigkeit dient; und

der Behälter zur Aufnahme eines Gases mit einer Temperatur von etwa 25 °C und einem Druck von mindestens 30 bar und optional eines Gases mit einer Temperatur von etwa 25 °C und einem Druck von mindestens 50 bar dient.

Revendications

1. Appareil de distribution de fluide, comprenant :

un corps de logement (190) comprenant une pluralité d'orifices de fluide externes (210, 250, 270), pouvant être raccordés à ou conçus pour faire partie intégrante d'un ensemble soupape (110) qui comprend une tige de soupape allongée (135) associée à un axe de tige principal respectif (140) ; et

un élément de fermeture (195) dans un premier passage de communication de fluide (220) dans le corps de logement, qui roule ou glisse le long du passage sur une surface de butée du corps de logement pour fermer de manière sélective un trajet d'écoulement de fluide à travers au moins un orifice de fluide externe (210) ;

au moins une zone inclinée de la surface de butée étant inclinée par rapport à l'axe de tige principal ;

ledit corps de logement comprenant en outre un premier (230) et un autre (240) siège de soupape au niveau de zones d'extrémité opposées du premier passage de communication de fluide ; et

ledit premier passage de communication de fluide comportant une section transversale qui s'élargit constamment le long d'une longueur du passage, entre le premier et les autres sièges de soupape, en direction dudit au moins un orifice de fluide externe (210).

2. Appareil selon la revendication 1 :

ledit élément de fermeture (195) étant un élément à bille libre et ladite surface de butée comprenant une surface de roulement pourvue pour permettre à l'élément à bille de rouler librement dans un mouvement de va-et-vient le long du premier passage de communication de fluide lorsque le corps de logement est incliné.

3. Appareil selon l'une quelconque des revendications précédentes :

ledit premier siège de soupape (230) se trouvant au niveau d'une première zone d'extrémité du premier passage de communication de fluide et ledit élément de fermeture pouvant être placé dans le premier siège de soupape dans une première position de fermeture pour fermer de ce fait le trajet d'écoulement de fluide.

4. Appareil selon la revendication 3 :

ledit autre siège de soupape (240) se trouvant au niveau d'une autre zone d'extrémité du premier passage de communication de fluide distal par rapport à un orifice de fluide interne (225) du corps de logement, ledit élément de fermeture pouvant être placé dans l'autre siège de soupape dans une position de repos sur siège.

5. Appareil selon l'une quelconque des revendications 1 à 3, comprenant en outre :

un autre orifice de fluide externe (250) du corps de logement en communication fluidique avec le passage de communication de fluide étant pourvu dans une zone de surface d'extrémité externe du corps de logement qui est sensiblement orthogonale à une zone de surface latérale externe du corps de logement où ledit orifice de fluide externe (210) est situé, ledit autre orifice de fluide externe se trouvant à proximité dudit autre siège de soupape.

6. Appareil selon la revendication 5, comprenant en outre :

le corps de logement (190) comprenant en outre une zone de goulot (255) qui s'étend généralement dans le prolongement d'un reste du corps de logement ; et

un autre orifice de fluide externe encore (270) du corps de logement étant situé dans une zone d'extrémité de la zone de goulot en communication fluidique avec une lumière interne (265) qui s'étend le long de la zone de goulot dudit autre orifice de fluide externe encore à un orifice de fluide interne (225) dans le corps de logement.

7. Appareil selon la revendication 4, comprenant en outre :

un autre orifice de fluide externe (250) du corps de logement en communication fluidique avec le passage de communication de fluide étant pourvu dans une zone de surface d'extrémité externe du corps de logement qui est sensiblement orthogonale à une zone de surface latérale externe du corps de logement où ledit orifice de fluide externe (210) est situé, ledit autre orifice de fluide externe se trouvant à proximité dudit autre siège de soupape.

8. Appareil selon la revendication 7, comprenant en outre :

le corps de logement (190) comprenant en outre une zone de goulot (255) qui s'étend généralement dans le prolongement d'un reste du corps de logement ; et

un autre orifice de fluide externe encore (270) du corps de logement étant situé dans une zone

- d'extrémité de la zone de goulot en communication fluïdique avec une lumière interne (265) qui s'étend le long de la zone de goulot dudit autre orifice de fluïde externe encore à l'orifice de fluïde interne (225) dans le corps de logement. 5
9. Appareil selon l'une quelconque des revendications 1 à 3 ou la revendication 5 :
ledit corps de logement (190) comprenant en outre un orifice de sortie de fluïde externe pour délivrer un fluïde à la tige de soupape allongée. 10
10. Appareil selon la revendication 9 :
ledit corps de logement (190) comprenant en outre un autre passage de communication de fluïde qui s'étend entre l'orifice de sortie de fluïde externe et un orifice de fluïde interne (225) dans le corps de logement. 15
20
11. Appareil selon la revendication 4 ou l'une quelconque des revendications 6 à 8 :
ledit corps de logement (190) comprenant en outre un orifice de sortie de fluïde externe pour délivrer un fluïde à la tige de soupape allongée. 25
12. Appareil selon la revendication 11 :
ledit corps de logement (190) comprenant en outre un autre passage de communication de fluïde qui s'étend entre l'orifice de sortie de fluïde externe et l'orifice de fluïde interne (225) dans le corps de logement. 30
13. Appareil selon l'une quelconque des revendications précédentes : 35
ladite zone inclinée de la surface de butée étant inclinée par rapport à l'axe de tige principal (140) de 1° à 20°, et éventuellement de 4° à 10°.
14. Appareil selon l'une quelconque des revendications précédentes, comprenant en outre : 40
un récipient sous pression ou pouvant être mis sous pression (105) destiné à fournir un réservoir de fluïde (125), 45
ledit récipient étant destiné à contenir un liquide devant être évacué ; et
ledit récipient étant destiné à contenir un gaz à une température d'environ 25°C à une pression d'au moins 30 bars, et éventuellement un gaz à une température d'environ 25°C à une pression d'au moins 50 bars. 50
55

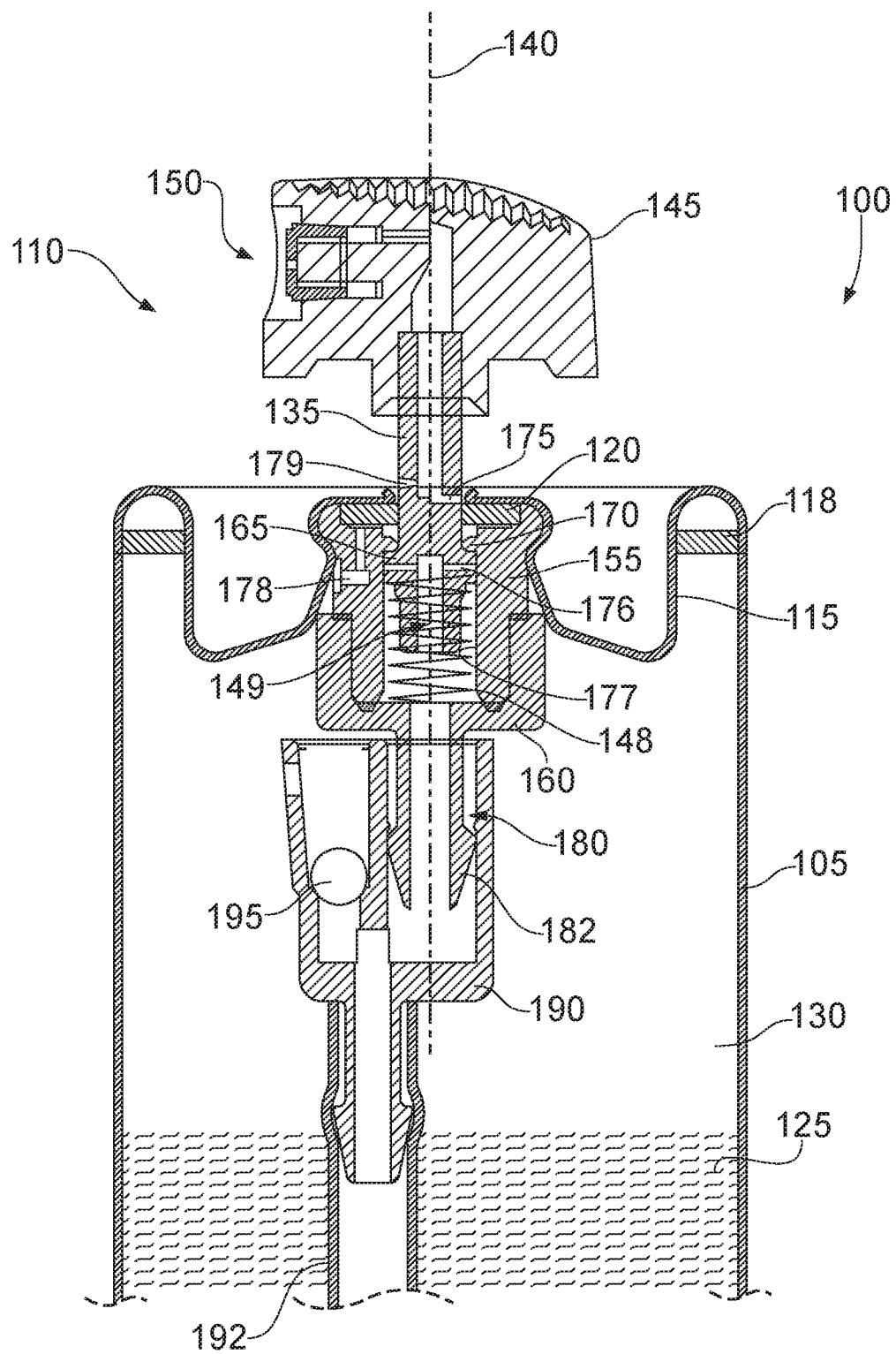


FIG. 1

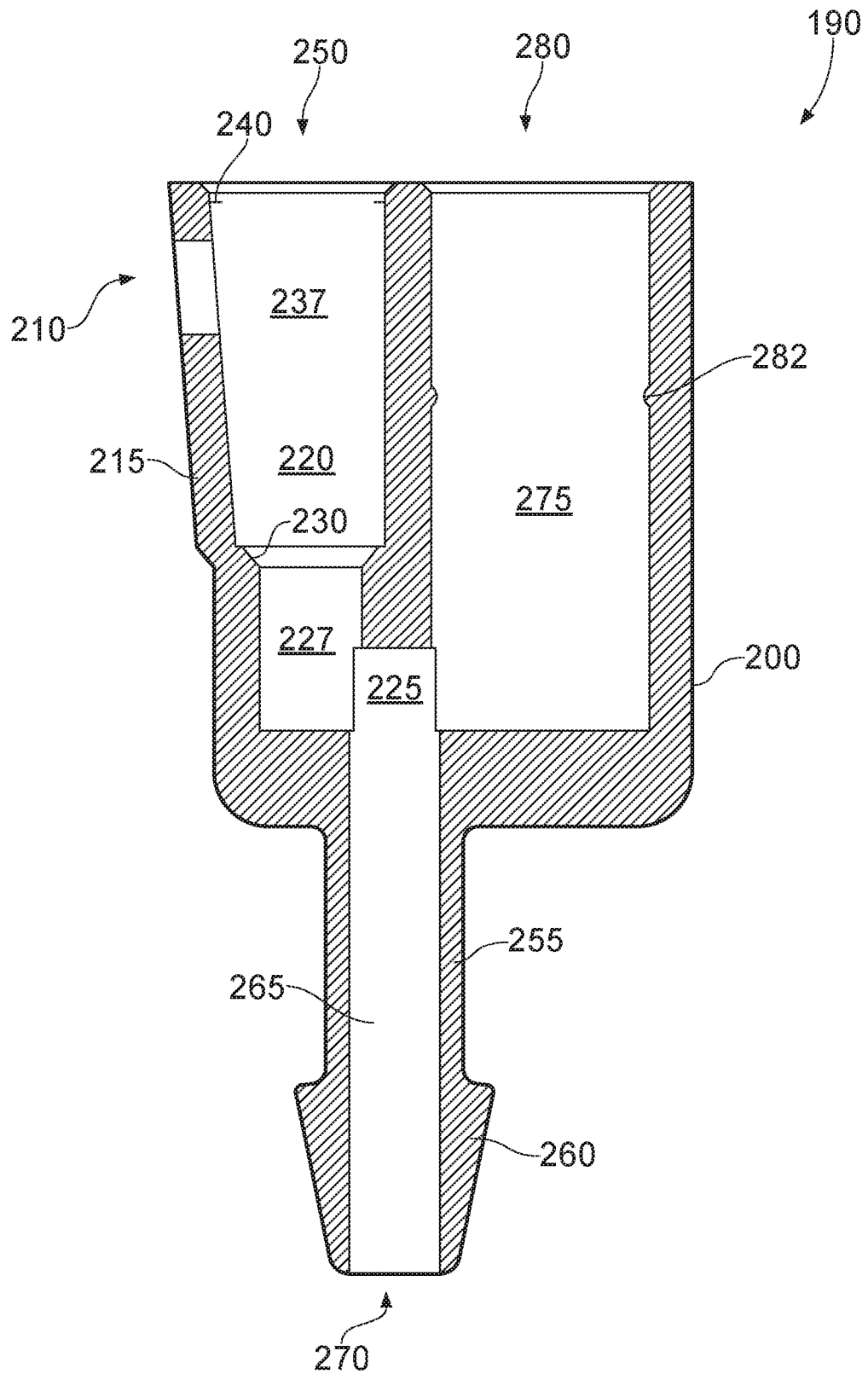


FIG. 2

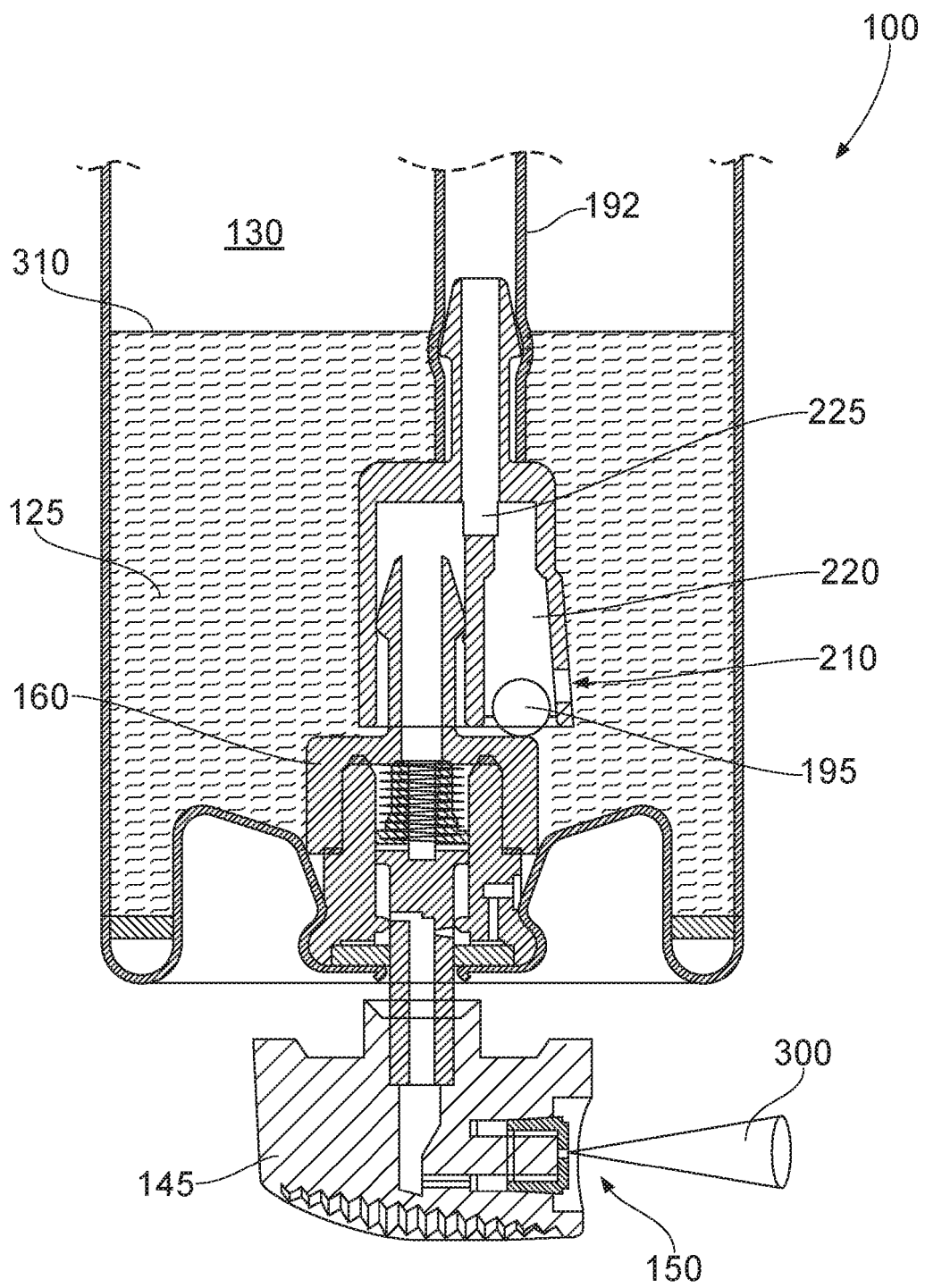


FIG. 3

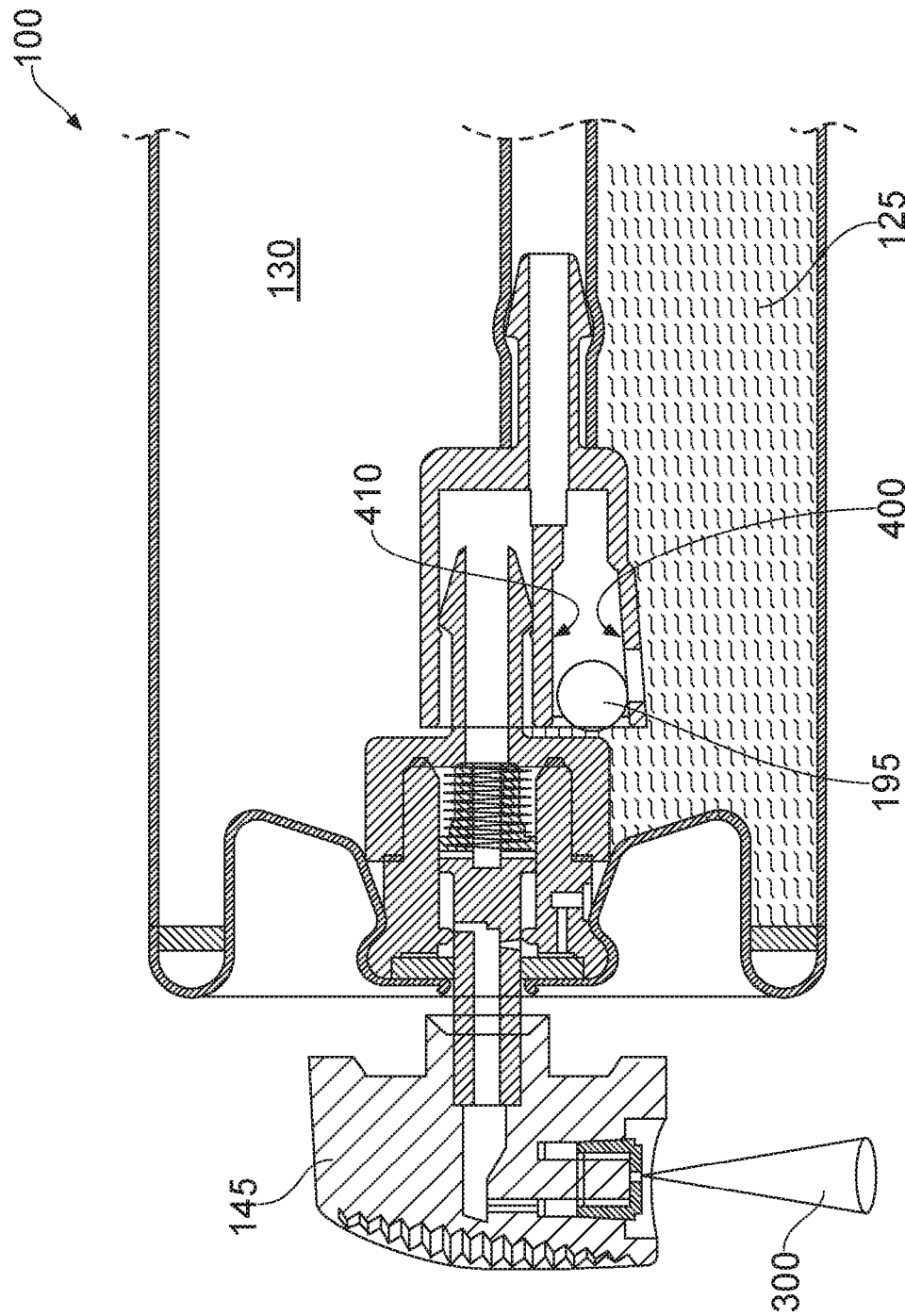


FIG. 4

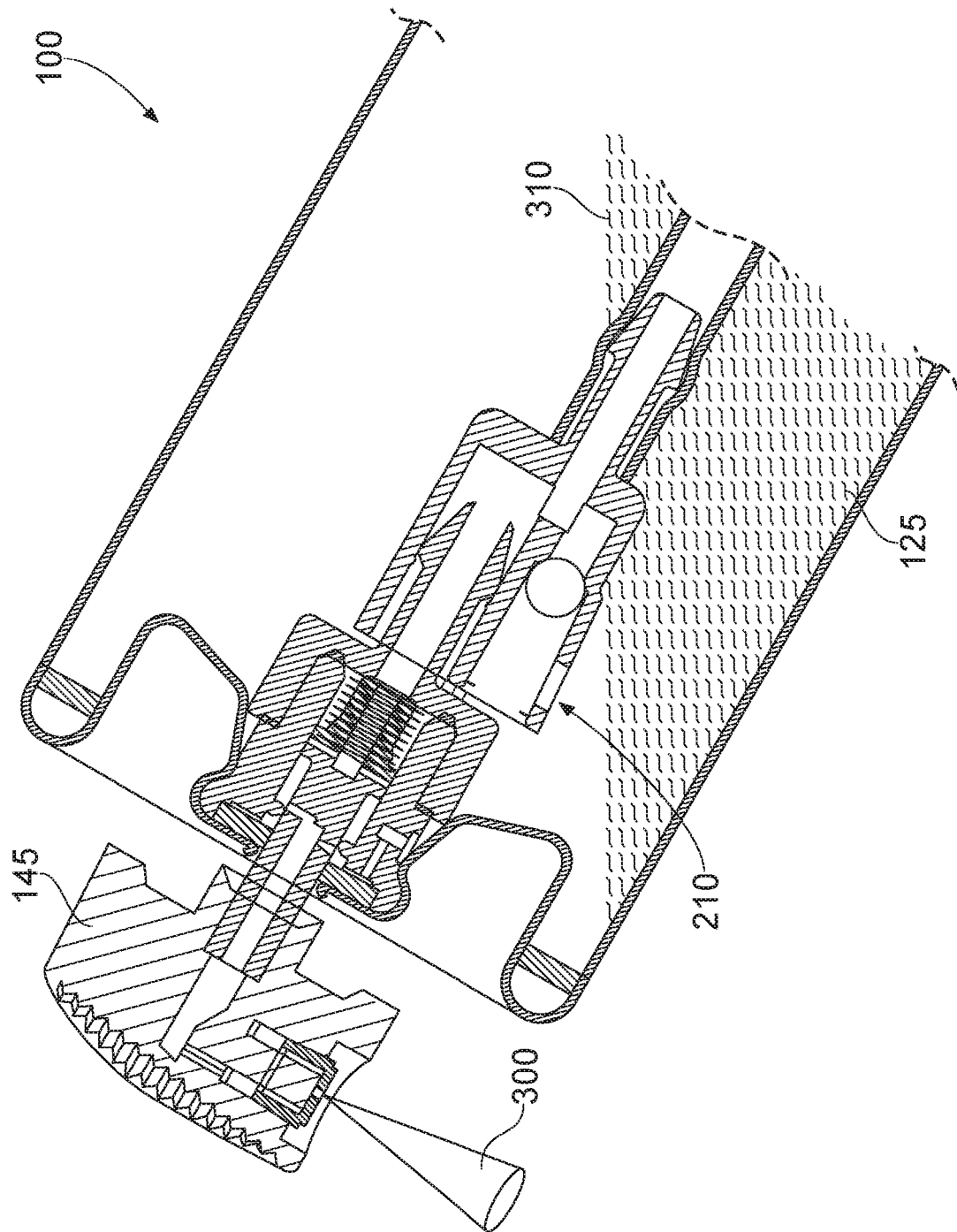


FIG. 5

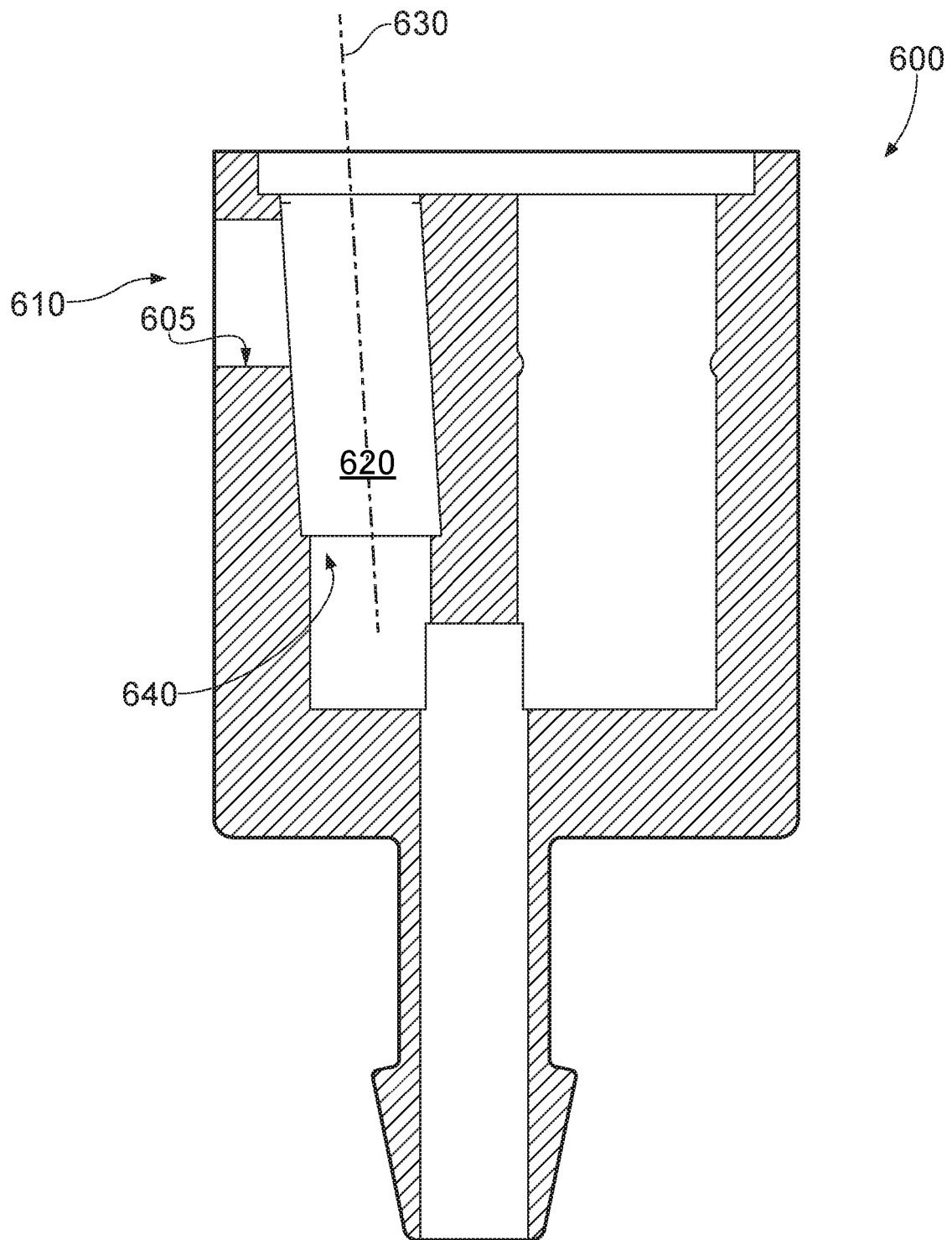


FIG. 6

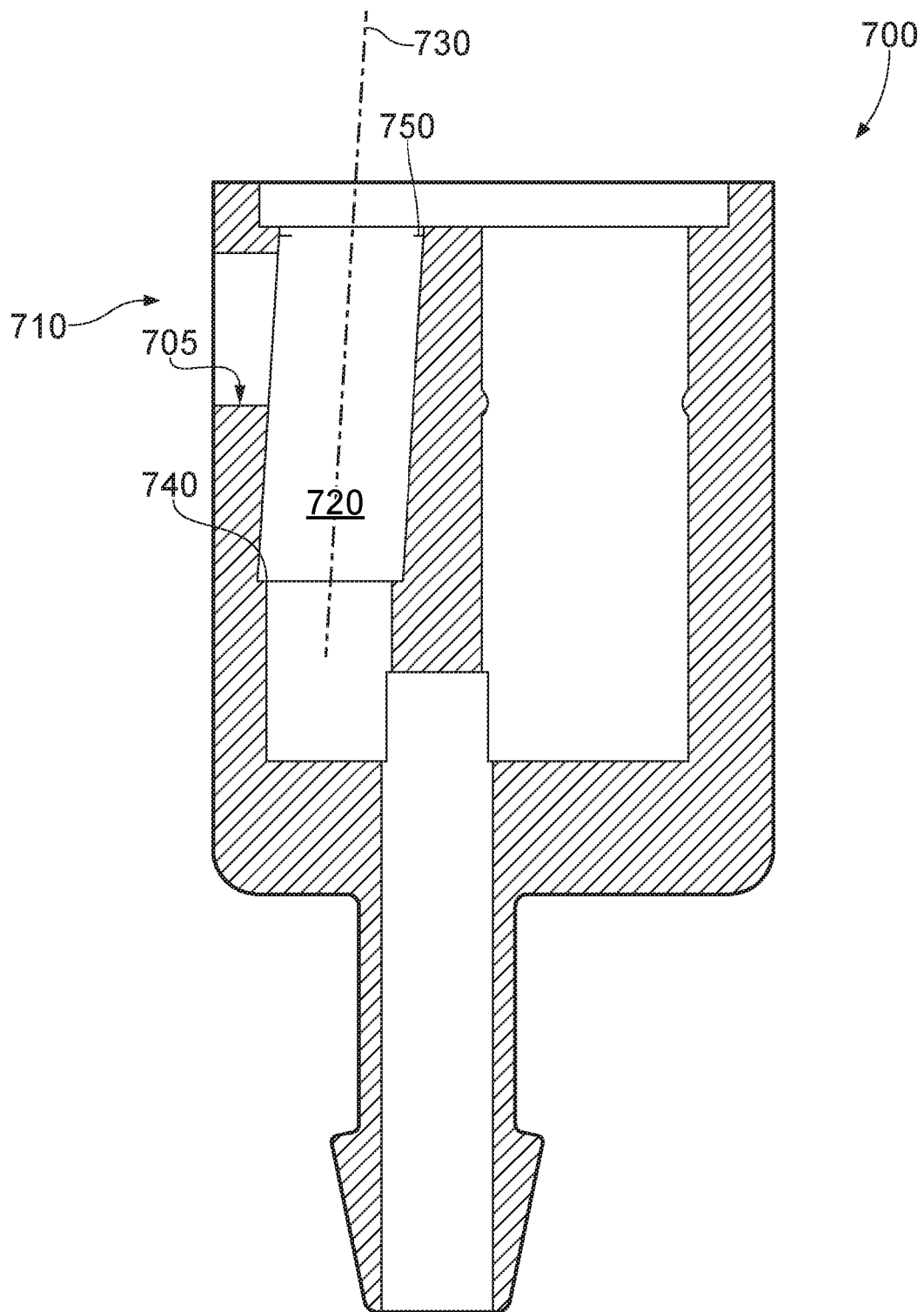


FIG. 7

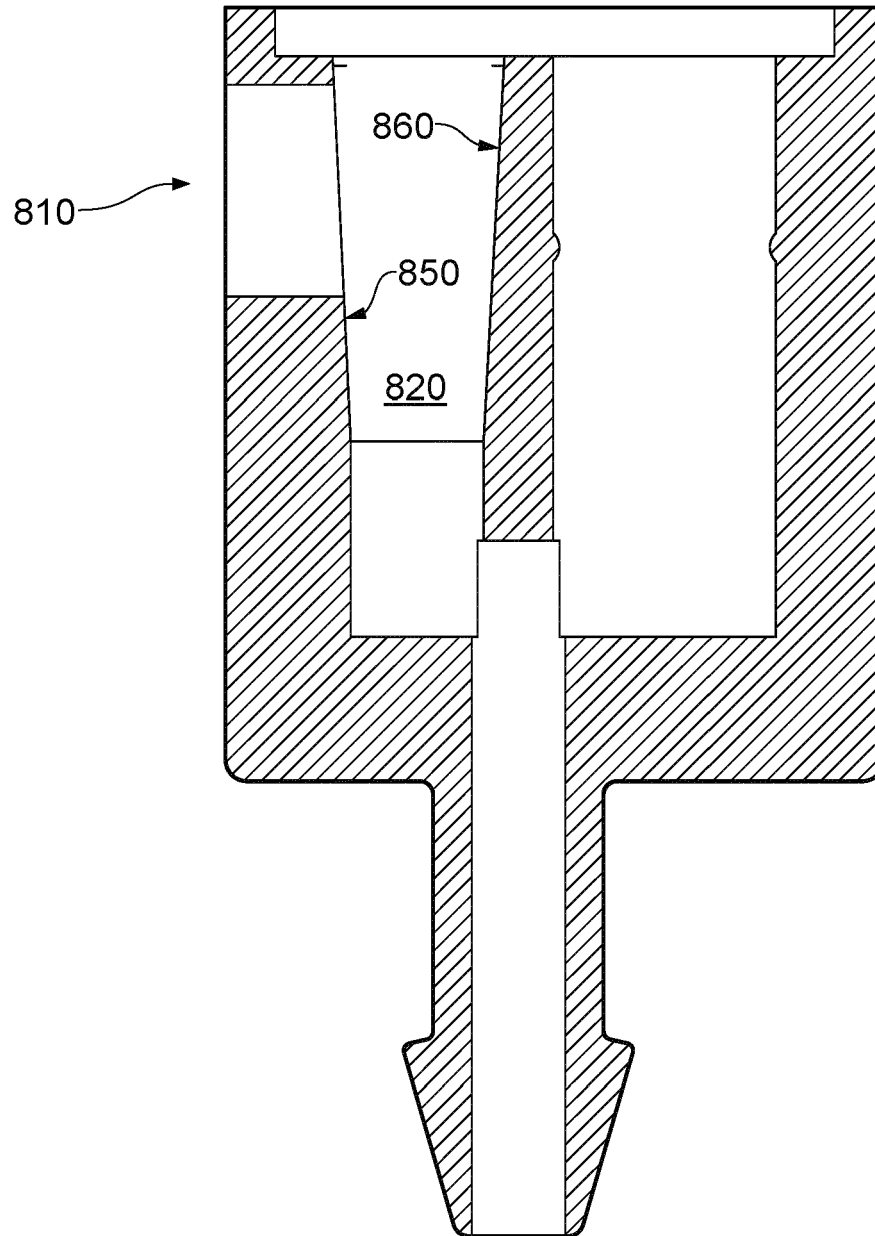


FIG. 8

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 5803319 A [0007]