Dec. 24, 1963 C. A. MONTAGUE, JR 3,115,277

PRESSURE CAN DEVICE

Filed Jan. 22, 1963

FIG. 1

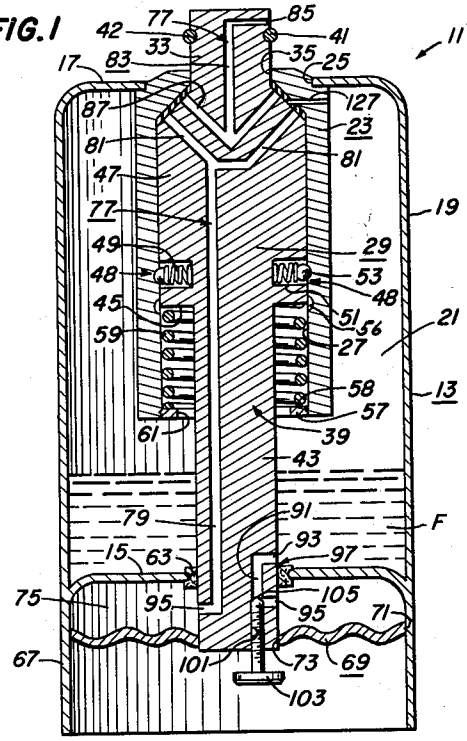


FIG. 2

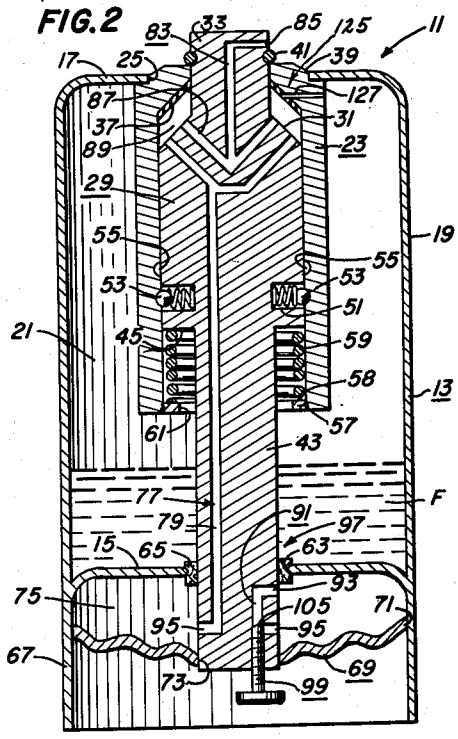


FIG. 3

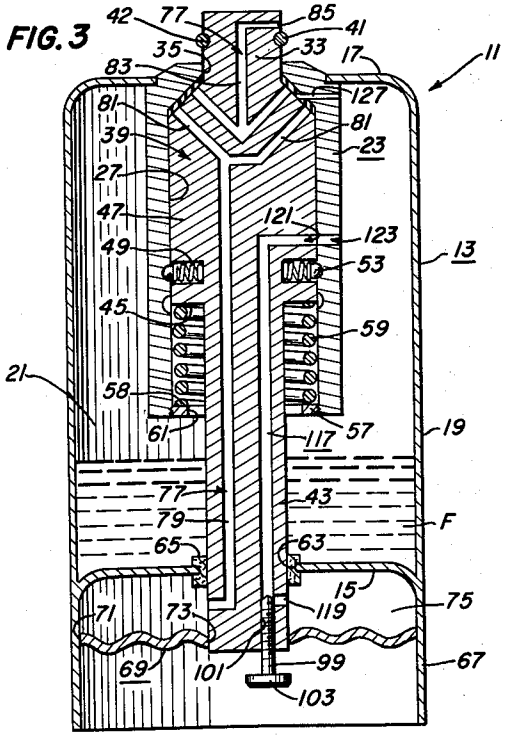
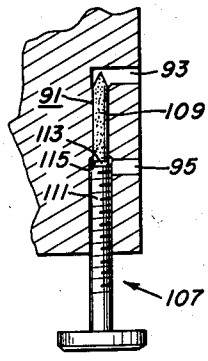


FIG. 4



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PRESSURE CAN DEVICE

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This invention relates to a pressure can device in which means is provided for selectively either discharging the contents of the can manually or discharging the contents of the can automatically at selected intervals of time. For purposes of clarity, in the present specification, when the term "pressure can" is used, it is deemed to mean that type of enclosed can which is commonly known as an aerosol can and which contains a fluid under pressure therein that is adapted to be expelled therefrom by the pressure in the can.

One of the objects of the present invention is to provide an improved pressure can device which may be selectively either automatically or manually operable to discharge the contents of the can.

A further object is to provide such a device in which all of the mechanisms for causing the discharge of the contents thereof are built into the can itself, and the device is self-contained.

A further object is to provide such a device which includes a main valve operable responsive to a diaphragm that is acted upon by fluid being bled from the main chamber of the can into an auxiliary chamber in the can.

A further object is to provide such a device in which means is provided for causing the movements of the main valve to be positive in action.

A further object is to provide such a device that has means for adjusting the frequency of the automatic discharge of the contents of the can.

A further object is to provide such a device in which is provided means to manually discharge the contents of the can without interfering with the adjustment of the automatic discharge thereof.

A further object is to provide such a device that is highly effective in operation and yet economical to manufacture.

A further object is generally to improve the design and construction of pressure can devices.

The means by which the foregoing and other objects of the present invention are accomplished and the manner of their accomplishment will be readily understood from the following specification upon reference to the accompanying drawings, in which:

FIG. 1 is a cross-sectional view taken as on a vertical plane through the center of the pressure can device of the present invention, illustrating the main valve in a closed position.

FIG. 2 is a view similar to FIG. 1, but showing the main valve in an open position.

FIG. 3 is a view similar to FIG. 1 of a modification of the pressure can device.

FIG. 4 is a fragmentary enlarged sectional view showing a modified adjustment means for restricting the amount of bleed-off from the main chamber of the can.

Referring now to the drawings in which the various parts are indicated by numerals, and referring first more particularly to FIGS. 1 and 2, the pressure can device 11 of the preferred embodiment includes an airtight container or can 13 having a bottom 15, a top 17, and a preferably cylindrical side wall 19 interconnecting bottom 15 and top 17 to establish an enclosed main chamber 21 in the interior of can 15 that receives the fluid, such as fluid F, which is under pressure. It will be understood that fluid F may be either in the liquid form, gaseous form, or combinations of both, depending upon the product to be dispensed.

A valve casing 23 is fixedly attached to top 17 in a central opening 25 in the top and depends downwardly into main chamber 21. Valve casing 23 is provided with a central vertically extending bore 27 in which is slidably received a stem 29 for vertical movement. Stem 29 is tapered inwardly to establish a slanted shoulder 31 that extends upwardly to a reduced portion 33 of stem 29 which slidably extends through a reduced portion 35 of bore 27 in the upper end of valve casing 23. Valve casing 23 is also tapered inwardly in a manner corresponding to shoulder 31 where it is preferably coated with a seating material, such as soft rubber or the like, to establish a resilient slanted seat 37 that is adapted to be contacted by shoulder 31 to close main valve 39, as will be better understood in the description to follow later in the specification.

Reduced portion 33 extends upwardly beyond valve casing 23 where a stop, such as a ring 41, is fitted into a groove 42 and projects outwardly over the valve casing to limit downward movement of stem 29 and stop the stem in a lowered position, as shown in FIG. 2. It will be understood that the upward movement of stem 29 will be limited by shoulder 31 abutting seat 37 to stop the stem in an upward position, as shown in FIG. 1.

Stem 29 is also reduced adjacent the lower part thereof, which is illustrated as at 43, and establishes a shoulder or annular surface 45 adjacent the junction of the upper end of reduced lower portion 43 and the enlarged portion 47 of stem 29.

Snap latches 48 are provided for holding main valve 39 in a closed or an open position, and each includes a spring 49 provided in a socket 51 in the side of enlarged portion 47, and which spring urges a ball bearing 53 against the interior of valve casing 23. In addition, a recess 55 is provided in the interior of valve casing 23 for each of snap latches 48 and is adapted to be engaged by a ball bearing 53 when main valve 39 is in said closed position to snap-lock the valve in this positon. An additional recess 56 is provided in the interior of valve casing 23 for each of snap latches 48 and is adapted to be engaged by a ball bearing 53 when main valve 39 is in said open position to snap-lock the valve in this position.

A ring 57 is threaded into the lower end of casing 23 to establish an annular seat 58 for seating the lower end of a compression spring 59 that surrounds reduced lower portion 43 and contacts annular surface 45 at the upper end of the spring to urge stem 29 upwardly towards the closed position of main valve 39. It should be noted that in some instances it may be desirable to omit spring 59.

Reduced portion 43 extends downwardly through the lower open end 61 of valve casing 23 and thence through the central opening 63 in bottom 15. Suitable sealing means or packing 65 is provided in opening 63 to slidably contact reduced portion 43 to seal off any flow of fluid F through opening 63.

Side wall 19 is extended downwardly below bottom 15 for a portion to establish a skirt 67. A preferably annular shaped diaphragm 69 is fixedly attached adjacent the outer edges 71 thereof to the interior of skirt 67 and is fixedly attached adjacent the central opening therein as at 73 to reduced lower portion 43 in spaced relationship below bottom 15 to establish an enclosed auxiliary chamber 75.

An outlet passage 77 leads from auxiliary chamber 75 to the exterior of can 13, and the passage is divided into two parts: (1) a lower passage portion 79 leading from auxiliary chamber 75 through stem 29 and which passage portion is divided into branches 81 that extend through shoulder 31; and (2) an upper passage portion 83 extending from the outlet port 85, which is on the upper portion of stem 29 that is exteriorly of can 13, and which passage portion is divided into branches 87

that extend to shoulder 31. It will be understood that main valve 39 acts to open and close communication between lower passage portion 79 and upper passage portion 83. Thus, when main valve 39 is open, as shown in FIG. 2, lower passage portion 79 is communicated with upper passage portion 83 through the space 89 between seat 37 and shoulder 31; and when the main valve is closed, as shown in FIG. 1, it will be seen that communication is cut off between lower passage portion 79 and upper passage portion 83.

An additional passage 91 is provided in stem 29 and extends from an upper port 93 to a lower port 95 that opens into auxiliary chamber 75. Upper port 93 is placed in such a position that when stem 29 is in the upper position to close main valve 39, the port is communicated with main chamber 21 so that fluid F and pressure may bleed off from the main chamber through additional passage 91 and into auxiliary chamber 75. When stem 29 is moved into a lowered position and main valve 39 opened, as seen in FIG. 2, upper port 93 is moved from its position in communication with main chamber 21 and therebelow so that bleeding of fluid F is cut off. In effect, the above mentioned structure establishes an auxiliary valve 97 for blocking off and opening flow through additional passage 91.

An adjustable restriction means is provided for additional passage 91 and is preferably in the form of a needle valve that includes a needle valve stem 99 threadedly engaged in a threaded bore 101 which extends vertically upwardly from the lower end of stem 29 to additional passage 91. The lower end of needle valve stem 99 is provided with the usual head 103 so that the needle valve can be turned to cause the pointed upper end 105 thereof to vary the restriction of the flow through additional passage 91. Needle valve stem 99 is arranged so that at its upper limit of travel it will completely block off the flow through additional passage 91, which is desirable in some cases where manual operation alone is desired.

In describing the operation of the pressure can device 11, it will be assumed that the parts are in the positions shown in FIG. 1 and that bleeding off of the fluid F has just begun. It will be understood that main valve 39 will be held in the closed position by the combined forces of compression spring 59, snap latches 48, and the force of the pressure in main chamber 21 against annular surface 45. When fluid F begins to bleed through additional passage 91, the diaphragm 69 will be in the normal at-rest or retracted position, as shown in FIG. 1. It will be understood that the effective area of diaphragm 69 acted upon by the pressure in auxiliary chamber 75 is greater than the effective area of annular surface 45 acted upon by the pressure in main chamber 21. Also, it will be understood that the following two forces are opposing each other: (1) the force caused by the pressure in auxiliary chamber 75 acting on diaphragm 69; and (2) the force due to the combination of the effect of snap latches 48, spring 59, and the force of the pressure in main chamber 21 against annular surface 45. When the pressure in auxiliary chamber 75 has reached a sufficient amount so that the force acting on diaphragm 69 is sufficient to override the opposing forces heretofore described under (2) above, stem 29 will be snapped out of its upper position and will be moved downward by the diaphragm to the lowered position, shown in FIG. 2, which opens main valve 39 and permits expulsion of fluid F from auxiliary chamber 75 through outlet passage 77 to the exterior of the device. Then, the pressure in auxiliary chamber 75 decreases, and when it is decreased to a sufficient amount which can no longer be effective to override the forces tending to move main valve 39 into a closed position, stem 29 will be moved upwardly to close the main valve and stop the flow through outlet passage 77 and to again allow fluid to be bled into auxiliary chamber 75, whereupon the above described cycle will be repeated. Thus, the fluid in can 13 will be automatically ejected in spurts, with the intervals of time between the spurts depending upon the setting of valve stem 99.

A supplementary valve 125 is preferably provided and is actuated simultaneously with the opening and closing of main valve 39. Supplementary valve 125 preferably includes a supplementary passage 127 that is restricted in relation to lower passage portion 79. Passage 127 leads from main chamber 21 through valve casing 23 and through seat 37 where it communicates with space 89 when main valve 39 is open and is blocked off when the main valve is closed. Thus, supplementary valve 125 permits flow from main chamber 21 into outlet passage 77 to supplement the flow of fluid F being expelled. Also, it will be understood that supplementary valve 125 provides a means whereby the pressure can device 11 can be manually operated. Thus, for manual operation, stem 29 is pushed downwardly by thumb pressure on the top of stem 29 to allow expulsion of fluid F through supplementary passage 127, space 89, and out the upper end of outlet passage 77.

A modified form of the needle valve stem is shown in FIG. 4, wherein it will be seen the upper end of the needle valve stem 107 is formed of foraminous material for a reduced portion as at 109, which provides a very effective construction when it is desired to allow very small quantities of fluid F and pressure to be bled-off at a very slow rate from main chamber 21, as, for example, when it is desired that the ejection of the fluid be at widely spaced intervals of time. At the juncture of foraminous portion 109 and the main body portion 111 of needle valve stem 107, a frusto-conical shoulder 113 is provided, which abuts a mating seat 115 when needle valve stem 107 is in its uppermost position to block off flow through additional passage 91.

In the modification shown in FIG. 3, the valving means for the additional passage between main chamber 21 and auxiliary chamber 75 occurs between the enlarged portion 47 of stem 29 and valve casing 23. Thus, additional passage 117 extends from the port 119, which is exposed to auxiliary chamber 75, through stem 29 to a port 121 in the side of enlarged portion 47, which port 121 is adapted to align with a port 123 through valve casing 23 when main valve 39 is in a closed position, so that the fluid F can bleed off from main chamber 21 to auxiliary chamber 75, as heretofore described for the principal embodiment. It will be understood that when main valve 39 is opened, port 121 will be blocked off by valve casing 23.

From the foregoing description it can be seen that a very efficient pressure can device 11 is provided which can be selectively operated either manually or automatically. In addition, it can be seen that the device is positive in action since the opening and closing of main valve 39 occurs with a snap due to snap latches 48. Further, the device of the present invention is a complete unit in itself and does not have to have other mechanisms to cause expulsion of the fluid. Additionally, the device is economical to manufacture.

Although the invention has been described in some detail by way of illustration and example for purposes of clarity or understanding, it is to be understood that it is not to be so limited since changes and modifications may be made therein which are within the full intended scope of this invetnion as hereinafter claimed.

I claim:

1. In a device of the type including an enclosed can having a main chamber therein containing a fluid under pressure, the combination therewith comprising means establishing an auxiliary chamber in said can, outlet passage means leading from said auxiliary chamber to the exterior of said can, main valve means in said can for movement between an open position to allow flow through said outlet passage means and a closed position to block flow through said outlet passage means, additional passage

means leading from said main chamber to said auxiliary chamber to allow the fluid under pressure in said main chamber to bleed off to said auxiliary chamber, means in said can coupled to said main valve means responsive to the pressure in said auxiliary chamber for opening said main valve means when the pressure is increased to a predetermined amount and for closing said main valve means when the pressure is decreased to a predetermined amount.

2. In a device of the type including an enclosed can having a main chamber therein containing a fluid under pressure, the combination therewith comprising means including a diaphragm establishing an auxiliary chamber in said can, said diaphragm being movable between retracted and expanded positions, outlet passage means leading from said auxiliary chamber to the exterior of said can, main valve means in said can for movement between an open position to allow flow through said outlet passage means and a closed position to block flow through said outlet passage means, said main valve means having a surface exposed to said main chamber, additional passage means leading from said main chamber to said auxiliary chamber to allow the fluid under pressure in said main chamber to bleed off to said auxiliary chamber, said main valve means being normally held in said closed position responsive to the pressure in said main chamber acting on said surface, said diaphragm being normally in a retracted position, upon an increase in the pressure in said auxiliary chamber to a pre-determined amount due to the bleeding of fluid from said main chamber to said auxiliary chamber said diaphragm being effective to override the pressure in said main chamber acting on said surface to open said main valve means whereby the fluid from said auxiliary chamber is expelled through said outlet passage means and the pressure in said auxiliary chamber is decreased, upon a decrease in the pressure in said auxiliary chamber to a pre-determined amount due to the expulsion of the fluid therefrom said diaphragm being no longer effective to override the pressure in said main chamber acting on said surface whereby said main valve means is moved to a closed position to stop the flow through said outlet passage means.

3. In a device of the type including an enclosed can having a main chamber therein containing a fluid under pressure, the combination therewith comprising means including a diaphragm establishing an auxiliary chamber in said can, said diaphragm being movable between retracted and expanded positions, outlet passage means leading from said auxiliary chamber to the exterior of said can, main valve means in said can for movement between an open position to allow flow through said outlet passage means and a closed position to block flow through said outlet passage means, said main valve means having a surface exposed to said main chamber, additional passage means leading from said main chamber to said auxiliary chamber to allow the fluid under pressure in said main chamber to bleed off to said auxiliary chamber, adjustable restriction means in said additional passage means for controlling the flow therethrough, auxiliary valve means in said additional passage means for movement between an open position to allow flow through said additional passage means and a closed position to block flow through said additional passage means, said auxiliary valve means and said main valve means being coupled to said diaphragm and responsive to movements of said diaphragm, said main valve means being normally held in said closed position responsive to the pressure in said main chamber acting on said surface, said diaphragm being normally in a retracted position, upon an increase in the pressure in said auxiliary chamber to a predetermined amount due to the bleeding of fluid from said main chamber to said auxiliary chamber said diaphragm being effective to override the pressure in said main chamber acting on said surface to open said main valve means and close said auxiliary valve means whereby the fluid from said auxiliary chamber is expelled through said outlet passage means and the pressure in said auxiliary chamber is decreased, upon a decrease in the pressure in said auxiliary chamber to a pre-determined amount due to the expulsion of the fluid therefrom said diaphragm being no longer effective to override the pressure in said main chamber acting on said surface whereby said main valve means is moved to a closed position to stop the flow through said outlet passage means and said auxiliary valve means is moved to an open position to begin again the bleeding of the fluid from said main chamber to said auxiliary chamber for subsequent operational cycles.

4. A pressure can device comprising an enclosed can having a main chamber therein containing a fluid under pressure; said can including a top, a bottom, and a side wall interconnecting said top and said bottom; a valve casing attached to said top and depending into said main chamber, said casing being provided with a bore including a tapered seat extending to a reduced portion of said bore, said bore adjacent the lower end thereof opening into said main chamber, a stem including a tapered shoulder adapted to sealingly about said seat, said stem being provided with an outlet passage including a lower passage portion extending from adjacent the lower end of said stem to said shoulder and an upper passage portion extending from said shoulder in spaced relationship to said lower passage portion to the exterior of said can, said stem being slidably mounted in said bore for movement between an upper position in which asid shoulder is abutted against said seat to block communication between said lower passage portion and said upper passage portion and a lower position in which said shoulder is spaced below said seat and communication is established between said lower passage portion and said upper passage portion, said stem including a surface exposed to said main chamber and responsive to pressure in said main chamber to normally urge said stem into said upper position, said side wall extending below said bottom to provide a skirt on said can, a diaphragm attached to said skirt in spaced relationship below said bottom to establish an auxiliary chamber, said bottom being provided with an opening, said stem slidably and sealingly extending through said opening with the lower end of said lower passage portion being in communication with said auxiliary chamber, said stem being attached to said diaphragm and responsive to movement thereof, said stem being provided with an additional passage extending from a first port normally exposed to said main chamber to a second port exposed to said auxiliary chamber for slowly bleeding off fluid and pressure from said main chamber to said auxiliary chamber, said diaphragm having a greater effective area than said surface of said stem and being responsive to an increase in pressure in said auxiliary chamber to a pre-determined point to expand and move said stem to said lower position whereby said outlet passage is opened and fluid in said auxiliary chamber is expelled and the pressure in said auxiliary chamber is reduced, said diaphragm being responsive to a reduction in the pressure in said auxiliary chamber to a pre-determined point to retract said diaphragm and move said stem to said upper position whereby said outlet passage is closed for the repetition of the opening and closing cycles.

5. The device of claim 4 in which a supplementary passage is provided through said valve casing leading from said main chamber through said seat where it communicates with the space between said shoulder and said seat when said stem is in said lower position, whereby supplementary flow of fluid is permitted from said main chamber to the exterior of said can and means is provided for manual operation by downward pressure on said stem.

6. The device of claim 5 in which supplementary means is provided between said main chamber and said outlet passage means for causing the flow of fluid from said main chamber responsive to manual pressure on said stem.

7. The device of claim 4 in which a foraminous restriction means is provided in said additional passage.

8. The device of claim 4 in which adjustable restriction means is provided in said additional passage.

9. The device of claim 4 in which snap-latch means are provided for snap-latching said stem in said upper position and said lower position.

10. A pressure can device comprising an enclosed can having a main chamber therein containing a fluid under pressure; said can including a top, a bottom, and a side wall interconnecting said top and said bottom; a valve casing attached to said top and depending into said main chamber, said casing being provided with a bore opening into said main chamber, a stem provided with an outlet passage therethrough with one end thereof being open to the outside atmosphere, said stem being slidably mounted in said bore to cooperate with said valve casing to provide a main valve means for said outlet passage, said stem including a surface exposed to said main chamber and responsive to pressure in said main chamber to normally urge said stem into a closed position of said main valve means, said side wall extending below said bottom to provide a skirt on said can, a diaphragm attached to said skirt in spaced relationship below said

bottom to establish an auxiliary chamber, said bottom being provided with an opening, said stem slidably and sealingly extending through said opening with the lower end of said outlet passage being in communication with said auxiliary chamber, said stem being attached to said diaphragm and responsive to movement thereof, said diaphragm having a greater effective area than said surface and being responsive to an increase in pressure in said auxiliary chamber to a pre-determined point to expand and move said stem to open said main valve means and allow flow through said outlet passage whereby fluid in said auxiliary chamber is expelled and the pressure in said auxiliary chamber is reduced, said diaphragm being responsive to a reduction in the pressure in said auxiliary chamber to a pre-determined point to retract said diaphragm and move said stem to close said main valve means and cut off flow through said outlet passage.

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