Feb. 1, 1955 W K. TELLER ET AL 2,701,163

METERING AEROSOL BOTTLE

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Fig. 1

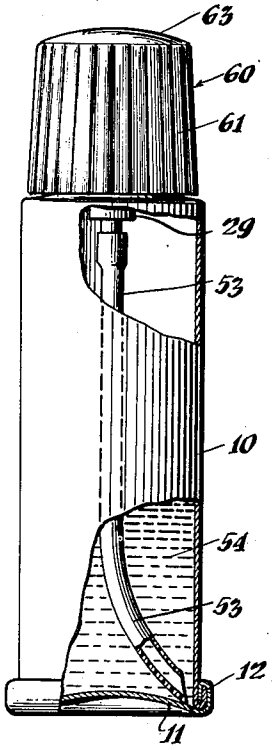


Fig. 2

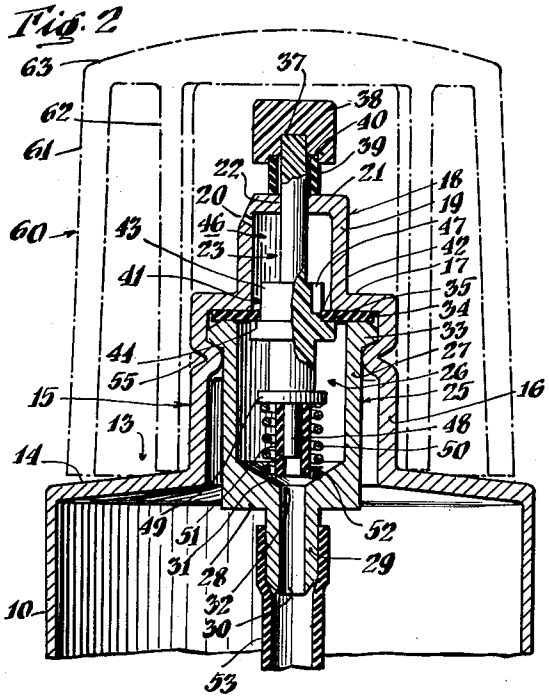


Fig. 3

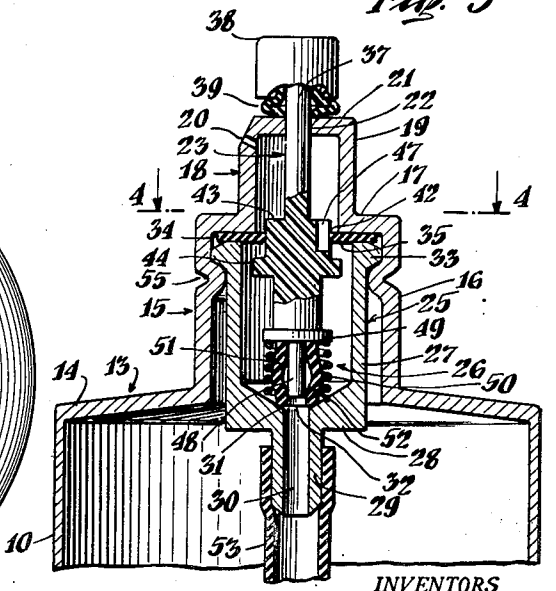
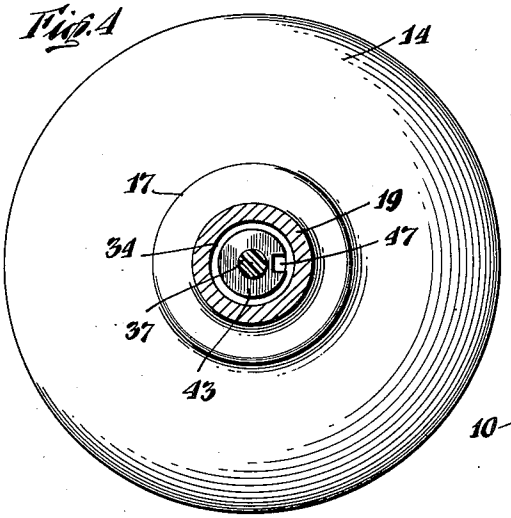


Fig. 4



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METERING AEROSOL BOTTLE

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7 Claims. (Cl. 299—95)

This invention relates to aerosol bottles and more particularly to aerosol bottles having means for dispensing the liquid contents in measured individual quantities which are discharged in the form of individual puffs of mist or spray.

The principle of dispensing liquids or active ingredients mixed with a suitable aerosol forming liquid such as dichlorodifluoromethane or other "liquefied gas" is, of course, well known. Speaking generally, one means for dispensing and dispersing materials from a container as an "aerosol" has come to be known as an "aerosol bomb" or "aerosol bottle." The propelling agent used in such bottles is preferably one that is liquefiable at refrigerated temperature and which will boil at fairly low temperature, say ordinary room temperature, so that it will develop the desired vapor pressure or propelling force in the container under normal conditions of use. There are now available in the market various propelling agents having the desirable characteristics making them suitable for use in aerosol bottles such as, for example, the products known as the "Freons" and "Genetrons." Suffice it to say that propelling agents having the desired characteristics for use in so-called low pressure aerosol bottles are available which are compatible with ingredients known to be effective as deodorants or antiperspirants.

Aerosol bottles containing active deodorant ingredients mixed with a propelling agent, such as Freon, have for some time been sold in the market. An important factor to be considered in connection with aerosol bottles is the valve arrangement which releases the liquid from the container to be discharged as a mist or spray. This is particularly important with respect to aerosol bottles containing a body deodorant or an antiperspirant which is discharged from the bottle as a spray or mist through a valve which is actuated or operated by the user who sprays the contents from the bottle from time to time upon various parts of the user's body.

The valves which have heretofore been used in these aerosol bottles (herein for convenience of description called "deodorant spray bottles") have been such that they do not provide means for measuring or metering the discharge when the valve is actuated. That is, when the user actuates the valve by pressing or exerting a force on the stem to open the valve, it remains open and continues to discharge the liquid from the bottle until the user releases the pressure or force. Consequently, either through failure to recognize the principle of operation of the valve or perhaps for some other reason, the user frequently, and often unconsciously, uses more of the contents of the bottle when making an application of deodorant upon his person, than is needed to be effective. While this is not necessarily harmful to the person, the use of those valves, which do not provide means for measuring or metering the discharge, results very frequently in what amounts to wasting much of the contents of the deodorant spray bottle. Manifestly, avoidance of waste is desirable.

It is an object of this invention to provide an aerosol spray bottle which overcomes the above-mentioned drawback characteristic of non-metering valves.

According to the invention, an aerosol bottle is provided in which the valve arrangement for dispensing the liquid contents is such that the liquid is discharged only in measured individual quantities and the liquid is discharged only in individual measured puffs of mist or spray. That is, upon actuation of the valve by exerting manual force, there is discharged only a small measured amount

of liquid from a measuring chamber and the discharge from the main body of liquid in the bottle is effectively shut off from the discharge nozzle until the manually exerted force is released. Upon release of the manual force, the discharge nozzle is effectively closed from the measuring chamber and the measuring chamber is opened to the main body of liquid in the bottle. To obtain further discharge from the spray nozzle, the valve is again actuated by manual force as a repeated cycle. Consequently, the valve must be actuated in successive cycles to obtain successive but measured small puffs of mist from the spray nozzle. The practical effect of this is that the user does not unconsciously waste the contents of the bottle when he applies the deodorant to his person.

According to the invention, a valve arrangement is provided in which a measuring chamber having an openable and closable inlet valve and an openable and closable outlet valve is interposed between an expansion chamber and the main body of liquid in the body portion of the container, a passageway connecting the measuring chamber and the expansion chamber being provided which is openable and closable by the outlet valve of the measuring chamber. The two valves are actuated in response to movement of a manually actuatable and reciprocatable valve stem accessible for manual operation from the outside of the bottle, to discharge the contents from the main body of the bottle into the measuring chamber, thence through the expansion chamber, and finally out through the discharge orifice as individual separated puffs of mist.

Although the novel features which are believed to be characteristic of the invention will be pointed out in the annexed claims, the invention itself as to its objects and advantages and the manner in which it may be carried out may be better understood by reference to the following description taken in connection with the accompanying drawings forming a part hereof, in which:

Fig. 1 is a view in elevation and partly in section of an aerosol bottle embodying the invention;

Fig. 2 is a partial view in section and elevation to a larger scale showing the valve arrangement of the bottle shown in Fig. 1; this view showing the parts in normal position in which the valve stem is up;

Fig. 3 is a view similar to Fig. 2 showing the parts in the position they take when the valve stem is pressed down, the cover cap having been removed; and

Fig. 4 is a view on line 4—4 of Fig. 3.

Referring now to the drawings in which like reference characters indicate similar parts throughout the several views, the bottle comprises a cylindrical side wall portion **10** and a dished bottom wall **11** closing the lower end. The periphery of the bottom closure **11** is crimped to the lower end of the cylindrical portion at **12** in conventional manner. The top wall of the bottle, designated generally by reference character **13**, has a substantially horizontal annular peripheral portion **14**, an upstanding inverted cup portion **15** comprising a cylindrical side wall portion **16** and a horizontally disposed annular portion **17** from which extends upwardly a bonnet portion **18** comprising cylindrical side wall **19** having a discharge orifice **20** and a horizontally disposed top **21** having a central opening **22** through which the reciprocatable valve stem **23** extends.

The body portion of the bottle may be stamped out of metal known to be suitable for the purpose. And it will be understood by those skilled in the art that the bottle is charged with its liquid contents, after the valve is assembled and anchored in the top wall. The contents are charged through the open end of the body portion before the closure **11** is secured and sealed in place. This operation of charging the "liquefied" gas or propelling agent together with the active ingredients into the bottle is performed while the charge is in a refrigerated condition. It is done in a cold room and the contents then sealed in the bottle by crimping on the bottom closure **11** in place. When the charged bottle is then moved to a place of normal room temperature it will, as is well understood, contain the liquefied gas under pressure by reason of the vapor pressure exerted by the confined "liquefied" propellant.

Referring again to the valve arrangement itself, there

is provided in the cup portion 15 a valve housing 25 providing a measuring chamber 26. The valve housing 25 is cup-shaped, having a cylindrical side wall 27 and bottom wall 28. The bottom wall 28 has a depending centrally bored boss 29 providing passageway 30 into the measuring chamber 26. The inner surface of the bottom wall of the measuring chamber 26 is shaped as an inverted truncated cone and the upper surface surrounding the bore 30 provides an annular valve seat 31 at the inlet port 32 of the measuring chamber.

The upper end of the cylindrical side wall 27 of the valve housing has an outwardly extending annular shoulder 33 for a purpose hereinafter mentioned.

A flat ring gasket 34 between the interior annular ring 17 and the upper edge of the cylindrical side wall 27 of the housing element 25 provides an annular valve seat 35, it being noted that the diameter of the valve stem bonnet 18 is of less diameter than the valve housing side wall 27 so that the gasket 34 at the valve seat 35 has a firm surface against which to rest when the valve stem is in normal position as illustrated in Fig. 2.

The valve stem 23 has at its upper end a shank 37 of reduced diameter so that it snugly but slidably fits into aperture 22 of the top 21 of the bonnet 18. This shank carries a press fitted button 38. Surrounding the shank 37 and between the lower surface of the button 38 and the top 21 of the bonnet 18 is a tubular gasket 39, the upper end of which extends into an annular anchoring groove 40 in the button 38. This tubular gasket 39 as well as the flat ring gasket 34 is made of a soft resilient material such as rubber and preferably of the synthetic type such as "neoprene" which is more resistant to attack or corrosion by chemicals.

The valve stem is enlarged at the lower end of shank 37 to provide a valve plug 41 for the outlet port 42 from the measuring chamber 26. The valve plug 41 has an upper cylindrical portion 43 and a seating portion 44 of slightly larger diameter, this portion, when the stem is in upper position as shown in Fig. 2, resting against the rubber gasket 34 and effectively closing the outlet port 42 and sealing off measuring chamber 26 from expansion chamber 46 which is provided by the bonnet 18. The portion 43 of the valve plug 41 has a vertically disposed groove 47 in its peripheral surface which terminates short of the annular upper surface of the seating portion 44 of valve plug 41. This groove 47 provides a restricted passageway from chamber 26 to chamber 46 when the valve stem is pressed down as shown in Fig. 3, the passageway being closed from chamber 26 when the valve stem is up as shown in Fig. 2. This construction, in effect, constitutes an expansion valve between the measuring chamber 26 and the expansion chamber 46.

The lower end of valve stem 23 has a reduced diameter shank 48 depending from the valve plug 41, it being noted that there is an enlarged ring 49 just above the depending shank 48, the lower surface of which provides an annular seat which engages the upper end of a metal compression spring 50 which fits over the shank 48 and engages the inlet valve seat 31 on the bottom wall of chamber 26. Disposed between the spring 50 and shank 48 is a tubular resilient rubber gasket 51, preferably "neoprene," which fits snugly on the depending shank 48. This gasket at its upper end engages shoulder 49 and its lower end extends below the end of shank 48 and presses against seat 31 when the valve stem 23 is pressed down as shown in Fig. 2. Thus there is provided on valve stem 23 an outlet valve 41 for port 42 from the chamber 26 to chamber 46 and an inlet valve 52 for port 32 from the passageway 30 into chamber 26, the lower end of tubular gasket 51 serving as a seating portion to rest on the valve seat 31.

Valve 41 and valve 52 are so spaced on the valve stem that on pressing down of the finger button 38, valve 52 is seated on its seat slightly in advance of the opening of valve 41 and on release of the pressure on button 38 to permit the compression spring 50 to move the valve stem up, valve 41 is closed slightly in advance of the opening of valve 52.

A press fitted hollow tube 53, preferably made of resilient but firm plastic, is slipped over the hollow boss 29 with a press fit and extends to the bottom of the bottle. Thus when the bottle is charged with the liquid propellant 54 and sealed in, the vapor pressure of the gas above the liquid level forces the liquid up through tube 53 through port 32 into measuring chamber 26 when the valve stem is in normal position as shown in Fig. 1. However, the propellant cannot then pass through passageway 47 of the outlet valve because this valve is then closed. Consequently, when the stem is up there is no propellant discharged from the discharge orifice 20.

The valve housing 25 is held in proper position and relation by a roll crimp 55 in the cylindrical metal wall 16 of the metal cup 25. That is, in assembling the elements before the bottle is charged, the valve stem 23 with rubber gasket 51 press fitted on shank 48, and compression spring 50 in place, is inserted in housing 25. Then gasket 34 is put on the stem and the shank 37 is slipped through opening 22. Gasket 39 is slipped onto the protruding shank 37 and then button 38 is press fitted on the upper end of the shank. The valve elements then being so assembled and placed, the metal wall 16 is crimp rolled to press an annular crimp 55 which engages shoulder 33. Then housing 25 firmly presses against gasket 34 to provide a seal between the interior of the bottle and the expansion chamber 46.

The bottle may, if desired, be provided with a valve protecting cap or cover 60, molded from plastic. The interior of the surrounding wall 61 having a concentric cylindrical wall 62 depending from the top 63, the cylindrical wall engages the metal wall 16 with a press fit as shown in Fig. 2. This removable cap 60 being press fitted, serves, when in place, to prevent accidental or unwanted movement of the valve stem.

The valve stem 23, the button 38, and the valve housing 25 may be made of any suitable material such as metal but preferably they are made of moldable plastic of the desired resiliency or rigidity.

It is believed the operation of the valve arrangement will be understood from the foregoing but suffice it to say that the liquid in the container is under pressure generated by its vapor pressure at ordinary temperature. The valve stem is normally in the position shown in Fig. 2 since the compression spring 50 urges the stem to its uppermost position. In this position the vapor pressure above the main body of liquid in the bottle forces a small and limited quantity of liquid into measuring chamber 26, through tube 53, the valve 52 being open and valve 41 being closed. By manually pressing down on finger button 38, the valve stem moves down to the position shown in Fig. 3, closing valve 52 and opening valve 41; the valve 52 closing slightly in advance of the opening of valve 41. Then the liquid under pressure in measuring chamber 26, passes through passageway 47 (see Fig. 3) into expansion chamber 46, where it expands to gas under pressure and is discharged as a measured amount or puff of mist or spray from discharge orifice 20. No more than this measured and limited quantity is discharged until button 38 is released and the valve stem raised, to close valve 41 and open valve 52, when the measuring chamber 26 is again charged from the main body of liquid in the bottle. The cycle may then be repeated to obtain successive puffs of spray from the bottle, as desired.

The terms and expressions which have been employed herein are used as terms of description and not of limitation, and there is no intention in the use of such terms and expressions of excluding any equivalent of the features shown and described or portions thereof, but it is recognized that various codifications are possible within the scope of invention claimed.

What is claimed is:

1. An aerosol bottle adapted for the discharge of its contents in separated and successive measured puffs of mist which comprises a main body portion holding a confined main body of liquid aerosol propellant having a vapor pressure exerting sufficient force to expel the propellant from said bottle; means defining an expansion chamber having a discharge orifice; means defining a measuring chamber having an outlet port leading into said expansion chamber and an inlet port communicating with said main body portion of said bottle; said measuring chamber being disposed between said expansion chamber and said main body portion of the bottle; a conduit extending from said measuring chamber a substantial distance into the main body portion and providing passageway for liquid from said main body of liquid through said inlet port into said measuring chamber; an outlet valve having a manually reciprocatable stem for opening and closing said outlet port; a resilient inlet valve engaging said stem within said measuring chamber for opening and closing said inlet port in response to

reciprocal movement of said stem; said inlet valve being closed and said outlet valve being opened in response to inward movement of said stem and said inlet valve being opened and said outlet valve being closed in response to outward movement of said stem; said inlet valve being closed in advance of said outlet valve on said inward movement and said outlet valve being closed in advance of said inlet valve on said outward movement, the vapor pressure of said confined propellant exerted upon the surface of the liquid confined in said main body portion being sufficient to force a measured quantity of propellant from said main body through said passageway which is entrapped in said measuring chamber when said inlet valve is opened and said outlet valve is closed in response to outward movement of said stem, said liquid entrapped in said measuring chamber expanding into said expansion chamber and discharging through said discharge orifice as a puff of mist when said outlet valve is opened and said inlet valve is closed in response to inward movement of said stem, said resilient inlet valve when so closed preventing liquid propellant from passing from said main body portion into said measuring chamber.

2. An aerosol bottle having a valve arrangement adapted to discharge the aerosol liquefied gas propellant from said bottle through a discharge orifice in measured individual puffs of mist which comprises a main body portion carrying a main body of said liquid propellant under a vapor pressure sufficient to expel said propellant from said bottle, a valve housing secured in the top wall of said bottle having an outlet port and an inlet port and providing a measuring chamber, an expansion chamber connected with said measuring chamber through said outlet port, a resilient gasket between said chambers and providing a resilient valve seat, a tube extending from said inlet port into said main body portions and terminating just short of its bottom closure wall providing a passageway for liquid forced by the vapor pressure of said propellant from said main body of liquid through said inlet port into said measuring chamber, a valve stem mounted for reciprocation in said two chambers and having a shank accessible for manual operation from the outside of said bottle, an outlet valve in said housing on said stem and having a seating portion engageable with said resilient seat for opening and closing said outlet port and an inlet valve having a resilient seating portion engageable with the bottom wall of said housing for opening and closing said inlet port, a yieldable spring means engaging said stem and the interior wall of said housing and urging said stem to outward position in which position said outlet valve closes said outlet port and said inlet valve opens said inlet port, said valve stem moving said inlet valve to closed position and said outlet valve to open position upon pressing said stem inwardly, said inlet valve being moved into closed position in advance of the opening of said outlet valve when said stem is so pressed inwardly.

3. An aerosol bottle for dispensing the pressurized fluid contents in measured quantities as individual puffs of mist which comprises a body portion for holding a main body of fluid liquefied gas propellant under a vapor pressure sufficient to expel said propellant from said bottle, a measuring chamber having an inlet and an outlet port, said inlet port having an annular valve seat, an expansion chamber having an outlet orifice, said measuring chamber outlet port being interposed between said two chambers, a reciprocatable valve stem having a shank protruding thru the wall of said bottle, a spring in said measuring chamber urging said stem outwardly to a normal position, a tube extending from said measuring chamber into said main body of fluid propellant and terminating just short of the bottom wall, a passageway connecting said measuring chamber with said main body of fluid through said inlet port through which a measured quantity of liquid is forced from said main body of fluid propellant into said measuring chamber when said inlet port is open, an outlet valve on said stem for opening and closing said outlet port and an inlet valve on said stem for opening and closing said inlet port, said inlet valve opening said inlet port and said outlet valve closing said outlet port when said stem is in normal position permitting a limited quantity of fluid to flow from said body of liquid through said passageway into said measuring chamber and said inlet valve having a resilient seating portion for engaging said annular valve seat and closing said inlet port and said outlet valve opening said outlet port after said inlet port is closed by said resilient seating portion when said stem is pressed inwardly against the force of said spring permitting the fluid entrapped in said measuring chamber to flow through said outlet port and expand in said expansion chamber and discharge from said discharge orifice as a measured puff of mist, said resilient seating portion of said inlet valve preventing further discharge from said main body of liquid into said measuring chamber or from said bottle until after said stem is returned to normal position.

4. An aerosol bottle for dispensing the pressurized fluid contents in measured quantities as individual puffs of mist which comprises a body portion for holding a main body of fluid propellant under pressure, a measuring chamber having an inlet port having an annular seat and an outlet port, a resilient valve seat surrounding said outlet port, an expansion chamber having an outlet orifice, said measuring chamber outlet port being interposed between said two chambers, a reciprocatable valve stem having a shank protruding thru the wall of said bottle, a spring engaging said stem in said measuring chamber urging said stem outwardly to a normal position, a tube extending from said measuring chamber into said main body portion and terminating near the bottom end wall of said bottle and providing a passageway connecting said measuring chamber with said main body of fluid through said inlet port, an outlet valve on said stem for opening and closing said outlet port and an inlet valve having a resilient seating portion on said stem for opening and closing said inlet port, said inlet valve opening said inlet port and said outlet valve seating against said resilient seat to close said outlet port when said stem is in normal position permitting a limited quantity of pressurized fluid to flow from said body of liquid into said measuring chamber without inverting or tipping said bottle and said resilient seating portion of said inlet valve engaging said annular seat closing said inlet port when said stem is pressed inwardly against the force of said spring and said outlet valve moving away from said resilient seat and opening said outlet port when said stem is pressed inwardly against the force of said spring permitting the pressurized fluid entrapped in said measuring chamber to flow through said outlet port and expand in said expansion chamber and discharge from said discharge orifice as a measured puff of mist while preventing further discharge from said main body of liquid into said measuring chamber or from said bottle until after said stem is returned to normal position.

5. The combination comprising an aerosol propellant fluid bottle holding a body of fluid propellant, a valve housing providing a measuring chamber having an inlet and an outlet port, said inlet port having a valve seat, an expansion chamber having an outlet orifice, said measuring chamber outlet port being interposed between said two chambers, a resilient gasket between said housing and expansion chamber and providing a resilient valve seat, a reciprocatable valve stem having a shank protruding from the wall of said bottle, a spring in said measuring chamber urging said stem outwardly to a normal position, a conduit defining a passageway connecting said measuring chamber with said main body of fluid through said inlet port and terminating near the bottom of said bottle, an outlet valve on said stem having a seating portion engageable with said resilient seat for opening and closing said outlet port, said stem having a groove extending upwardly from said seating portion and providing restricted passageway from said measuring chamber to said expansion chamber when said outlet valve is open, an inlet valve having a resilient seating portion on said stem for opening and closing said inlet port, said inlet valve opening said inlet port and said outlet valve closing said outlet port when said stem is in normal position permitting a limited quantity of fluid to be forced from said body of liquid by the vapor pressure of said propellant through said conduit into said measuring chamber and said resilient seating portion of said inlet valve engaging the valve seat of said inlet port and closing said inlet port and said outlet valve opening said outlet port when said stem is pressed inwardly against the force of said spring permitting the fluid entrapped in said measuring chamber to flow through said outlet port and expand through said restricted passageway into said expansion chamber and discharge from said discharge orifice as a measured puff of mist while preventing further discharge from said

main body of liquid into said measuring chamber or from said bottle until after said stem is returned to normal position.

6. An aerosol bottle having a discharge valve mechanism for discharging the pressurized fluid contents from the bottle in measured individual puffs of mist, said valve mechanism comprising a cup-shaped valve housing providing a measuring chamber and having a hollow boss depending from its bottom wall, providing an inlet passageway into said measuring chamber, a tube having its upper end press fitted on said boss and its other end terminating near the bottom of said bottle, an inverted cup-shaped expansion chamber above said valve housing and having a discharge orifice, the upper open end of said valve housing cup and the lower open end of said inverted cup being in registry and providing an opening for reciprocation therein of a valve stem, a resilient gasket between said cup-shaped chambers sealing the peripheral edges of said cups and providing a resilient valve seat, a reciprocatable valve stem having a shank at its upper end extending through an opening in the top wall of said expansion chamber, and a valve plug having a seating portion engageable with said resilient seat, a spring supporting shank depending from said plug, a tubular gasket mounted on said depending shank providing a valve seating portion at its lower end, to open and close said inlet passageway into said measuring chamber, a compression spring mounted on said depending shank engaging said valve plug and the bottom wall of said measuring chamber and urging said valve stem upwardly to normal position in which said valve plug seating portion rests against said resilient seat, a groove in said plug providing a restricted passageway from said measuring chamber to said expansion chamber when said valve stem is pressed downwardly to unseat said valve plug from its seat, said tubular gasket sealing off said inlet passageway into said measuring chamber when said stem is so pressed downwardly.

7. An aerosol bottle holding in its body portion a main body of fluid propellant, a valve housing providing a measuring chamber having an inlet and an outlet port, an expansion chamber having a discharge orifice, said measuring chamber outlet port being interposed between said two chambers, a resilient gasket between said chambers providing a resilient valve seat, a reciprocatable valve stem having a shank protruding through an opening in

the wall of said bottle, a resilient gasket around said protruding shank, a compression spring in said housing urging said stem outwardly to a normal position, a tube extending from said housing a substantial distance into said main body of fluid propellant which provides an inlet passageway connecting said measuring chamber with said main body of fluid through said inlet port, an outlet valve on said stem for opening and closing said outlet port, said outlet valve having a seating portion engageable with said resilient seat, said stem having a groove providing a restricted passageway from said measuring chamber to said expansion chamber, an inlet valve carried on the inner end of said stem having a resilient valve seating portion engageable with the bottom wall of said housing for opening and closing said inlet port, said outlet valve opening said restricted passageway to provide communication between said two chambers when said outlet valve is unseated, by pressing said valve stem inwardly against the force of said spring and said outlet valve closing said restricted passageway when said outlet valve is seated in normal position by the force of said spring, said valves when in normal position permitting only a limited quantity of fluid to pass from said main body of fluid through said tube into said measuring chamber, said measuring quantity of fluid passing into said chamber as a result of force exerted on said fluid by its own vapor pressure and said valves when moved inwardly by pressing said stem against the force of said spring permitting only the fluid in said measuring chamber to pass into said expansion chamber for discharge as a measured puff of mist from said discharge orifice and preventing further discharge from said main body of liquid into said measuring chamber until after said stem is returned to normal position.

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