May 22, 1956 W. H. ST. GERMAIN 2,746,796

METERING VALVE AEROSOL BOTTLE

Filed Aug. 5, 1953

FIG.1.

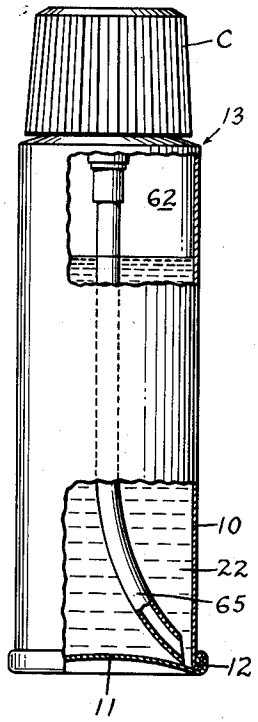


FIG.2.

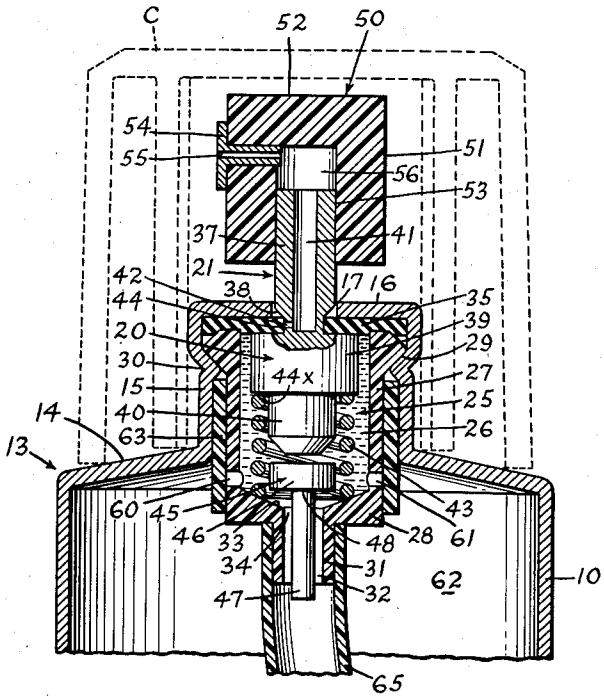


FIG.4.

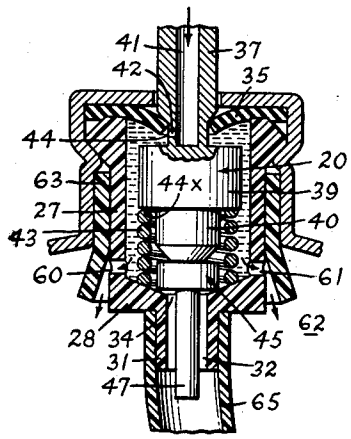


FIG.3.

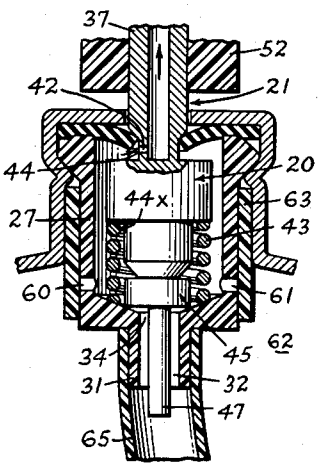
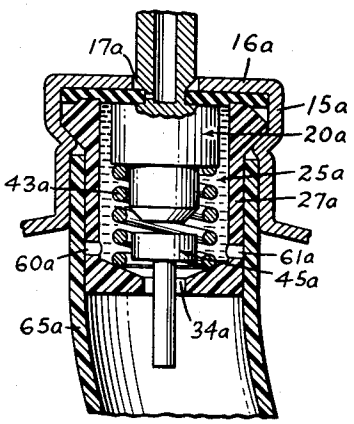


FIG.5.



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METERING VALVE AEROSOL BOTTLE

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5 Claims. (Cl. 299—95)

This invention relates to aerosol bottles and more particularly to the type which has a metering valve mechanism

The principle of dispensing liquids or active ingredients mixed with a suitable aerosol-forming liquid such as dichlorodifluoromethane and 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 propeling agent used in such bottles is preferably one that is comparatively easy to liquefy 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 on the market various propelling agents having the desired characteristics making them suitable for use in aerosol bottles, 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 anti-perspirants.

Aerosol bottles containing active deodorant ingredients mixed with a propelling agent, such as Freon, have for some time been sold on 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 anti-perspirant 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.

Valve arrangements have heretofore been designed for dispensing the liquid contents of an aerosol bottle in measured individual quantities, the liquid being discharged in individual measured puffs of mist or spray. In such valve arrangements a measuring chamber is provided which communicates through an inlet port with a tube or conduit extending into the body of pressurized liquid in the body of the bottle. The measuring chamber communicates with the ambient atmosphere through an outlet port, expansion chamber and discharge nozzle or orifice. In that type of arrangement there is an inlet valve for opening and closing the inlet port of the measuring chamber and an outlet valve for opening and closing the outlet port of the measuring chamber, the valves being operative in response to reciprocation of a valve stem which is accessible at the outside of the bottle where it may be actuated by finger pressure. The arrangement is such that if the outlet valve is opened to provide communication between the measuring chamber and ambient atmosphere, the inlet valve to the measuring chamber is necessarily closed and when it is closed communication between the body of the bottle and measuring chamber

is shut off so that communication then is shut off between the ambient atmosphere and the main body of the liquid in the bottle. By reason of the construction of aerosol bottles having the measuring or metering valve type of arrangement, it is not possible to initially charge the propelling agent (herein sometimes called "liquefied gas") into the bottle through the valves because when the outlet valve is opened to provide communication to the ambient atmosphere, the inlet valve into the measuring chamber becomes closed so that there is no passageway for the liquid to enter into the body of the bottle. Consequently the fluid must be initially charged to the bottle in some other way. For example, the fluid has been initially charged into the bottle through the bottom end before the bottom closure is attached and this has been done in a refrigerated room because of the tendency to evaporate easily if not cooled or kept under high pressure.

According to this invention, a valve arrangement is provided which permits of charging the pressurized liquid into the bottle from a source outside the bottle, through the measuring chamber, after the bottle and valve are assembled, while at the same time the inlet and outlet valves of the measuring chamber retain their usual functions. To accomplish this desirable end, there is provided in the measuring chamber another port (or ports) in addition to the usual inlet and outlet ports. The additional port (hereinafter for convenience of description called a "charging port") is provided in the wall of the measuring chamber and this charging port is provided with openable and closable means. When the charging port is opened, communication is provided between the measuring chamber and the body of the bottle, and when the charging port is closed this communication is shut off. This is particularly advantageous as it eliminates the necessity of sealing the bottom end of the bottle after the liquid is charged into it as the bottle and bottom and valve may be completely assembled prior to sealing the bottle. And furthermore it eliminates the necessity of charging the bottles in a refrigerated room.

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, partly broken away, showing an aerosol bottle embodying the invention;

Fig. 2 is a sectional view to larger scale of the valve arrangement of the bottle shown in Fig. 1, showing the parts in normal position;

Fig. 3 is a view corresponding to Fig. 2 and showing the position of the parts when the valve stem is pressed down to discharge fluid from the measuring chamber;

Fig. 4 is a view corresponding to Figs. 2 and 3 to illustrate the initial charging of the bottle; and

Fig. 5 is a view illustrating a modification.

Referring now to the drawings, in which like reference characters designate similar parts throughout the several views, the bottle comprises a cylindrical side wall **10** and a dished bottom wall **11** closing the lower end of the cylindrical portion **10** at **12** in the conventional manner. The top wall of the bottle, designated generally by reference character **13**, has a substantially horizontal annular peripheral portion **14**, an upstanding neck portion **15** which terminates in an inturned flange **16** having a central opening **17** through which may pass the shank **37** of a reciprocatable valve stem **21** of a valve arrangement later to be described, the valve arrangement being designated generally by reference character **20**. A removable cap C may also be provided.

The body portion of the bottle may be formed from metal known to be suitable for the purpose, such as aluminum, and, as described in further detail hereinafter, the bottle may be charged with the liquid contents 22 into the chamber 62 after the valve 20 is assembled and anchored in the top wall and after the bottom end of the bottle is closed and sealed by the bottom closure 11.

Referring to the valve arrangement itself, there is provided in the neck portion 15 of the bottle a valve housing 25 providing a measuring chamber 26. The valve housing is generally cup-shaped, having cylindrical side wall 27 and bottom wall 28. The side wall is provided with an annular ring 29 in its outside surface which provides means for rolling a crimp 30 in the metal neck 15 for anchoring the valve housing securely in the neck. The bottom wall 28 of the valve housing has a depending centrally bored hollow boss 31 providing a passageway 32 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 32 provides an annular seat 33 on the inlet port 34 of the measuring chamber.

A flat ring gasket 35 of a suitable resilient material such as neoprene rests upon the upper annular edge of the upper end of the valve housing and under the inturned metal flange 16 of the neck portion of the bottle. This gasket provides a leakproof seal between the bottle neck and the valve housing and also provides a valve seat as described hereinafter.

The valve stem, designated generally by reference numeral 21, has a hollow or bored shank portion 37 of reduced diameter, the shank having an annular groove 38 in its outside surface just above a plug portion 39 which has a diameter greater than the diameter of the shank portion. Depending from the plug portion is a boss 40. Extending from the outside surface of the groove 38 to the bore 41 of the shank is a passageway 42 of reduced cross-section. Mounted on the depending boss 40 is a compression spring 43 the upper end of which rests against the shoulder 44x of the plug 39 and the lower end of which rests upon the bottom wall 28 of the valve housing 25. This spring urges the valve plug 39 upwardly to its normal position (as shown in Fig. 2), and it will be noted that the circular edge of the central opening of the ring gasket 35 engages the surface of groove 38 in the shank of the valve stem and in normal position the gasket covers the passageway and closes it and thus shuts off communication between the measuring chamber 26 and the bore 41 of the valve stem. As indicated, this gasket is made of a flexible, resilient and compressible material; preferably of rubber of the synthetic type, such as "neoprene" which is resistant to attack or corrosive action by chemicals. The valve stem shank is reciprocatable through the central opening 17 of the inturned flange 16. The valve plug 39 which cooperates to open and close the outlet port provided by the passageway 42 in the shank is herein referred to, for convenience of description, as an outlet valve and the port (designated by 44) is referred to as the outlet port.

The inlet port 34 of the measuring chamber 26 is provided with an inlet valve 45 made of a resilient material, such as "neoprene." It comprises a valve plug 46 from which depends a guide shank 47 extending downwardly and reciprocatable into hollow boss 31 of the valve housing 25. Thus the valve plug 46 provides an annular shoulder 48 which may rest upon the valve seat 33 thereby to close inlet port 34 when said valve plug is forced downwardly so that the annular shoulder 48 presses against the valve seat 33. The valve plug 46 may be forced into closed position (as shown in Fig. 3) by pressing down the valve stem 21.

A hollow cup-shaped button 50 made of moldable plastic, having a side wall 51 and top wall 52, provides a bore 53 which press-fits on the hollow shank 37 of the valve 20. The valve 20 may be forced downwardly against the force of compression spring 43 by finger pressure on the button 50. Mounted in the side wall 51 is a discharge nozzle 54 having a passageway 55 which communicates between the expansion chamber 56 provided by the hollow button 50 and the ambient atmosphere.

The valve housing 25 is provided with one or more ports 60, 61. As shown, two such ports 60, 61 are provided by bores through the side wall 27 of the housing, these ports being referred to herein as charging ports. Means are provided for opening and closing the charging ports 60 and 61. The closure means for these ports are such that they normally maintain the charging ports closed but may be actuated to open the ports by fluid pressure exerted in the measuring chamber 26. When opened, the charging ports provide communication between the measuring chamber 26 of the interior chamber 62 of the body of the bottle.

As shown, the openable closure means for the charging ports 60 and 61 is a tube 63 of flexible, resilient and elastic plastic material which is of a diameter to snugly fit over and grip the side wall 27 of the valve housing. The gripping force of the tube 63 is sufficient to maintain the ports 60 and 61 closed under normal conditions. However, the material of the tube is sufficiently elastic that exertion of fluid pressure in the measuring chamber slightly greater than the pressure within the body of the bottle will force the tube wall outwardly away from the side wall 27 of the valve housing, thereby opening the ports 60 and 61 and thus provide communication between the measuring chamber 26 and the interior of the bottle (as illustrated in Fig. 4).

A hollow tube 65 is slipped over the hollow boss 31 with a press fit and extends to the bottom of the bottle. Thus when the bottle is charged with liquid propellant 22, the vapor pressure of the gas above the liquid level forces the liquid up through tube 65 through inlet port 34 into measuring chamber 26 when the valve stem is in normal position as shown in Fig. 2. However, the propellant cannot then pass through the outlet port 44 because the spring 43 urges the outlet valve to closed position. Furthermore, fluid or gas may not pass through ports 60 and 61 because the tube 63 will keep the ports 60 and 61 closed because of the force of the pressure of the gas in the interior of the bottle plus the gripping force of the elastic tube 63 which is greater than the force of the pressure within the chamber 26. Thus the tube will grip the side wall 27 of the valve housing and keep the ports 60 and 61 closed after the bottle has been initially charged with the liquid propellant.

It will be seen from the foregoing description that the charging ports 60 and 61 in the valve housing together with the tube 63 provide in effect a third or additional port in the valve housing having an openable and closable valve means which valve is normally urged to closed position but which will permit of initially charging liquid propellant to the bottle through the valve arrangement of the bottle after it is assembled and sealed in place, and it is not necessary to charge the bottle through the bottom prior to sealing the bottom end; nor is it necessary to charge the bottle in a refrigerated room.

This may be done as follows: Before placing the button cap 50 on the hollow stem, a conduit connected with a source of liquid propellant under pressure is connected to the hollow shank 37 of the valve. Then by forcing the valve stem in a downward or inward direction, outlet port 44 is opened and inlet valve 45 closes the inlet port 34 (see Fig. 4). Then as fluid pressure is exerted through valve shank 37 from the source of liquid propellant under pressure, it will overcome the gripping force of tube 63 and force it away from ports 60 and 61 to open them and provide passageway to the interior of the bottle, the fluid passing into the interior of the bottle in the direction indicated by the arrows in Fig. 4. When sufficient liquid propellant is charged to the bottle, the valve stem 37 is permitted to be urged to upward normal position,

as shown in Fig. 2, by spring 43 which closes outlet port 44. Then the tube 63 will grip wall 27 of the housing 25 and close the ports 60 and 61. The charging conduit is disconnected from the shank 37 and the cap button 52 is press-fitted on the stem. The bottle is now charged and may be operated to discharge the contents in individual puffs of mist.

When the button is pressed downwardly, this opens outlet port 44 and closes inlet port 34 (see Fig. 3) and that amount of liquid which was entrapped in the measuring chamber 26 is discharged through the passageways 42, 41 of the stem into expansion chamber 56 through the discharge nozzle 54 to the ambient atmosphere as an aerosol. Upon release of the finger pressure on the button 50, valve stem 37 is urged upwardly by spring 43 to close outlet port 44 and the internal pressure opens inlet port 34 to permit another measured charge of fluid to be forced by the vapor pressure in the bottle up through the tube 65 into the measuring chamber 26; whereupon the cycle may be repeated.

The modification illustrated in Fig. 5 is substantially like the construction above described except that instead of using a separate tube to open and close the charging ports 60 and 61 and a separate conduit tube 65 as shown in Figs. 2, 3 and 4, a single tube 65*a* (see Fig. 5) is used to serve as a means to open and close the charging ports 60*a* and 61*a* and also to serve as a conduit tube which extends into the body of the liquid 22 and terminates near the bottom of the bottle to provide a passageway for liquid to the inlet port 34*a*.

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 modifications are possible within the scope of invention claimed.

What is claimed is:

1. An aerosol bottle which comprises a main body portion for holding a liquid aerosol propellant, means defining an expansion chamber having a discharge orifice; a housing including a wall defining a measuring chamber having an inlet port and an outlet port interposed between the interior of said main body portion of the bottle and said expansion chamber; an outlet valve, having a manually reciprocatable stem, for opening and closing said outlet port, an inlet valve for opening and closing said inlet port, said inlet port being closed and said outlet port being opened in response to inward movement of said stem and said inlet port being opened and said outlet port being closed in response to outward movement of said stem, a tube extending from said measuring chamber into said body portion of the bottle and terminating near the bottom of said body portion, and an openable and closable third port in said housing providing communication between said measuring chamber and the interior of said body portion of the bottle, said third port providing means through which liquid propellant may be charged from an outside source into the body portion of said bottle.

2. In an aerosol bottle which has a main body portion for holding a pressurized liquid propellant and a metering valve mechanism for discharging the liquid propellant as individual puffs of mist in response to reciprocation of a valve stem and in which the metering valve mechanism comprises a valve housing having walls defining a measuring chamber having an inlet port which is closed when said outlet port is opened in response to movement of said stem, a charging port in said measuring chamber providing communication between said measuring chamber and said body portion, providing a passageway through which liquid propellant may be charged from an outside source through said measuring chamber into said body portion when said inlet valve is closed and closure means normally closing said charging port, said closure means being actuatable to open said charging port by exerting fluid pressure in said measuring chamber greater than the vapor pressure exerted by the liquid propellant within the body portion of said bottle.

3. An aerosol bottle which comprises a main body portion for holding a liquid propellant, a valve housing mounted in said bottle and having walls defining a measuring chamber, an inlet port and an outlet port in said housing, a tube connected with said inlet port and extending into said main body portion of said bottle, an outlet valve for opening and closing said outlet port and having a reciprocatable stem extending to the outside of said bottle, an inlet valve for opening and closing said inlet port, 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, resilient spring means urging said outlet valve closed, means defining a discharge orifice, means providing passageway for fluid propellant from said outlet port to said discharge orifice, means defining a charging port in said housing providing a passageway through which to pass liquid propellant from said measuring chamber into said main body portion of the bottle when said inlet valve is closed and said charging port is opened, closure means for said charging port normally urged to closed position and when in closed position closing said charging port, said closure means being actuatable to open position by fluid pressure exerted in said measuring chamber greater than the vapor pressure within said body portion and said closure means acting to close said charging port when the vapor pressure within said measuring chamber is less than the vapor pressure within said body portion.

4. An aerosol bottle according to claim 3 wherein the closure means for the charging port is a tube of resilient elastic material surrounding and gripping the outside surface of said valve housing and overlying said port.

5. An aerosol bottle according to claim 4 wherein said tube of elastic material surrounding said housing extends downwardly from said housing into the body of said bottle and provides passageway for fluid in the body portion of the bottle to the inlet port of said measuring chamber.

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