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AEROSOL BOMB FILLING AND DISPENSING VALVE

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Fig. 3.

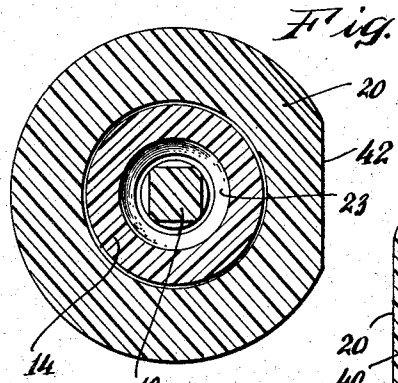


Fig. 2.

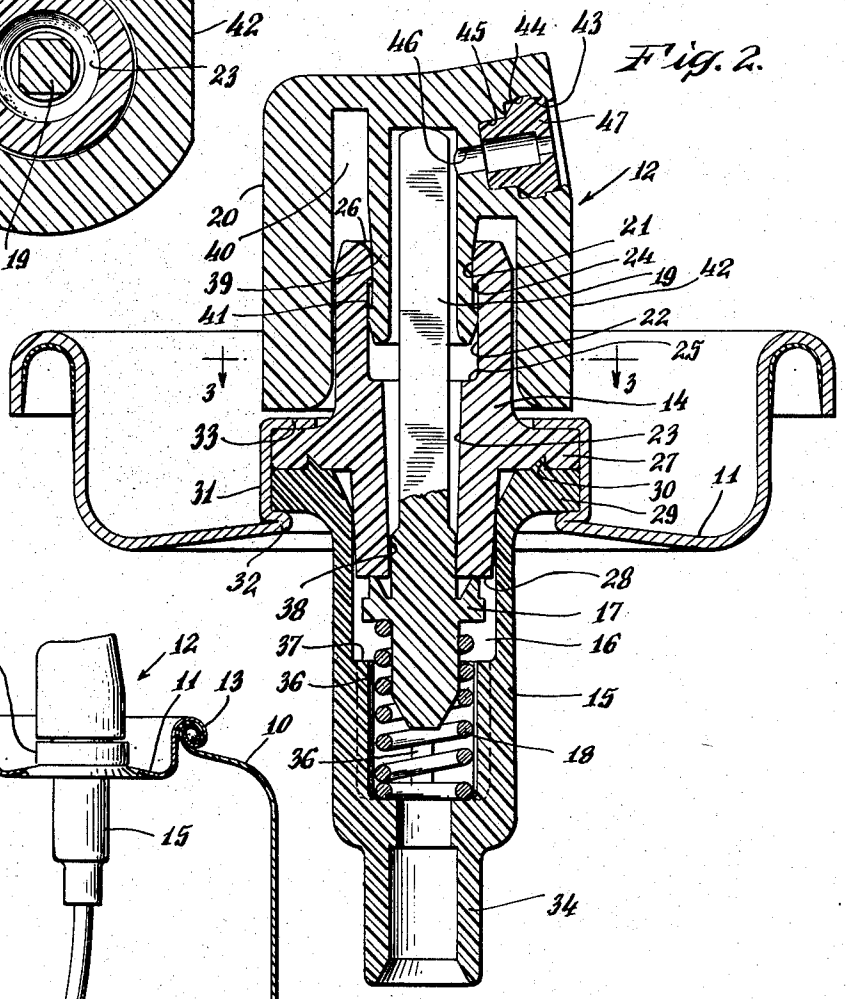
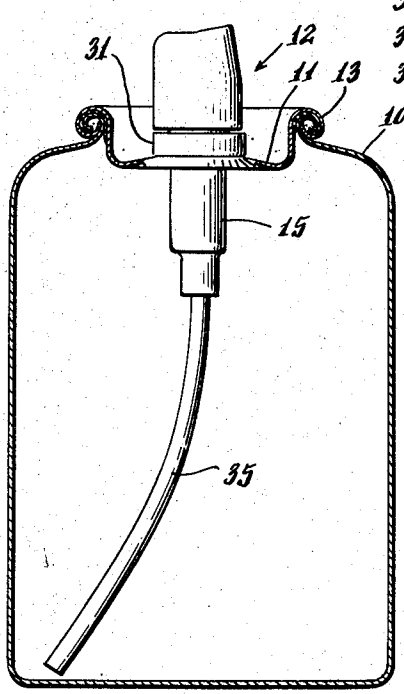


Fig. 1.



INVENTORS.
Richard E. Treharne, Jr.
BY Adolph J. Wegmann

Churchill, Rich, Weymouth & Engel.
ATTORNEYS.

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AEROSOL BOMB FILLING AND DISPENSING VALVE

Richard E. Treharne, Jr., Lindenhurst, and Adolph J. Wegmann, Glen Cove, N. Y., assignors to Scovill Manufacturing Company, Waterbury, Conn., a corporation of Connecticut

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3 Claims. (Cl. 299—95)

The present invention relates to aerosol bombs and the like and more particularly to a filling and dispensing valve assembly for such bombs.

So-called aerosol bombs are now extensively used to discharge in the form of an aerosol spray, insecticides, fungicides, deodorants and the like, and also to discharge in the form of a viscous foam, shaving cream and the like. Present day aerosol bombs usually consist of a non-refillable container having therein a solution or a suspension of the substance to be discharged together with a propellant, which is gaseous at room temperature, and a valve assembly for controlling the discharge of the substance with the propellant from the container.

Filling of the containers through the dispensing valve has heretofore been found to be too slow and costly, wherefore the conventional practice is to fill the container with both the substance to be discharged and the propellant before the closure provided with the control valve is secured on the container. To do this, refrigeration is employed to transform the propellant from its normally gaseous state to the liquid state and the container is filled with the desired substance and the propellant through the open top of the container, after which the closure and valve assembly is secured to the container. The operations of filling the container and securing the closure and valve assembly is carried out in a refrigerated atmosphere and, although said operations are rapidly performed, they present several drawbacks, to wit:

(*a*) The required refrigeration machinery is costly and expensive to operate;

(*b*) Condensed moisture may get into the container and render the dispenser inoperative because of ice formation at the valve;

(*c*) The filled containers, with the valve assembly secured thereto, must be tested at 130° F. for leakage, which means that the previously chilled and filled containers must be heated on a hot water bath or its equivalent; and

(*d*) Foam products cannot be handled by this method.

The primary object of the present invention is to overcome the drawbacks aforementioned.

A further object is to provide a filling and dispensing valve which will enable aerosol bombs to be rapidly charged with both the active substance and the propellant without recourse to refrigeration.

A still further object of the invention is to provide a relatively simple valve assembly for aerosol bombs which is made substantially of thermoplastic material.

The foregoing and other objects of the invention, not specifically enumerated, are accomplished by providing a novel filling and dispensing valve assembly through which the flow rate of fluid in the filling direction is much faster than the flow rate in the discharge direction, and charging the propellant into the container under sufficient super-atmospheric pressure to maintain the propellant in the liquid state. The invention and the novel construction and arrangement of parts will be readily

understood from the detailed description which follows, when considered in connection with the accompanying drawings, wherein:

Figure 1 shows an embodiment of the invention, wherein the container is shown in diametrical section and the valve assembly in elevation; the combination of the container and the valve assembly being hereinafter referred to as a bomb.

Fig. 2 shows a diametrical sectional view of the valve assembly.

Fig. 3 shows a sectional view taken along the line 3—3 of Fig. 2.

Referring first to Fig 1 of the drawings, the aerosol bomb may be said to consist of a container **10**, the open top of which is closed by a closure member **11** having mounted therein a valve assembly **12**. The container **10** may be of any preferred construction and is adapted to contain a solution or a suspension of the substance to be discharged, which substance, independently of the propellant, may be introduced into the container either prior to or subsequent to the closure member **11** being bead-seamed to the container, as shown at **13**.

The valve assembly **12**, as shown in detail in Fig. 2, consists essentially of a two-part tubular casing **14**, **15**, suitably held in assembled relation by the closure member **11** as hereinafter described, said casing having a valve chamber **16** within which is mounted a check valve **17** adapted to be held against a valve seat by a helical coil-spring **18**, the check valve having a valve stem **19** and the casing being intended to have telescopically mounted thereon a cap member **20**.

The upper member **14** of the two-part casing is of tubular form, the bore therethrough being formed with different diameters **21**, **22** and **23**, the diameter **21** being slightly smaller than the diameter **22** and forming therewith an overhanging shoulder **24**, the bore **22** being larger than the bore **23** and forming therewith a shoulder **25** and the bore **23** tapering axially inwardly from the shoulder **25** to its lower end. The upper end of the tubular casing part **14** is chamfered or relieved, as shown at **26**, and said casing part intermediate its ends is formed with an outwardly extending radial flange **27**. The casing part **14** is preferably formed of deformable elastic material such as polyethylene and the inner end surface **28** of said member serves as the valve seat for the check valve **17**.

The second or lower part **15** of the two-part casing at its upper end is formed with an outwardly-extending radial flange **29** seating against the flange **27** and the seating face of the flange **29** is formed with an annular, sharp, axially-extending tooth or rib **30** biting into and providing a fluid-tight seal between the casing parts **14** and **15**. The flanges **27** and **29** are held in assembled fluid-tight contacting relation by a central tubular portion **31** on the closure **11**, said portion **31** being formed by a reentrant flange **32** and a clamping flange **33**. The casing part **15** at its lower end is formed with a tubular extension **34** adapted to frictionally receive and hold a tube **35** which extends to the bottom of the container. Formed in the valve chamber **16** are a plurality of circumferentially spaced, axially-extending, ribs **36**, the tops **37** of said ribs providing a stop shoulder for limiting the inward movement of the valve **17** while not impairing the passage of fluid through the valve chamber during the filling or charging of the container with a propellant. The casing part **15** is formed of harder and more rigid material than the casing part **14** and is preferably formed of nylon.

The valve stem **19**, as herein shown, is of generally chamfered rectangular form in transverse cross-section and of a cross-sectional area to loosely move within the bore **23** in the valve casing member **14**, and adjacent the

check valve 17 whereat the stem is enlarged, as shown at 38, the stem is of cylindrical form, and of an axial length to extend into the bore 23 with a relatively small amount of clearance. The length of the cylindrical enlargement 38 is such that when the check valve 17 is unseated to rest upon the tops 37 of the ribs 36, the enlargement will have been moved below the valve seat 28 and the valve will be fully opened. When the valve is closed, the valve stem 19 will protrude through the top of the upper part of the casing 14 a substantial amount. The check valve 17 and valve stem 19 is formed of harder and more rigid material than the casing part 14 and its valve seat 28 and is preferably formed of nylon.

The closure cap member 20 which is adapted to telescopically engage over the upper portion of the two-part valve casing is formed with a central, inwardly-extending, hollow projection 39 providing an annular groove 40. The exterior wall of the projection 39 is formed with a normal diameter slightly larger than the diameter of the bore 22 in the casing part 14, and rearwardly adjacent its face end is slightly cut back or reduced in diameter to provide a shoulder 41. The closure cap 20 is of a length such that when the valve stem 19 engages the base of the socket in the central projection 39, the lower end of the cap will be spaced from the flange 33 an axial distance which is substantially less than the axial length of the cylindrical enlargement 38 on the valve stem so that, when the cap is pressed downwardly to unseat the valve 17, the enlargement 38 will still remain within the bore 23 and thus limit the area of clearance between the enlargement 38 and the bore 23 and hence the outflow of fluid through the valve assembly. A portion of the outer wall of the closure cap is flattened, as shown at 42, and, extending inwardly from said flattened portion near its top, is formed with an opening having different diameters 43, 44, 45 and 46, communicating with the opening in the central projection 39. Force-fitted into the bores 43, 44 and 45 is a nozzle 47 having a bore therethrough communicating with the bore portion 46. The closure cap 20 is also preferably formed of deformable elastic material such as polyethylene, as is also the nozzle 47.

The valve assembly 12 minus the closure cap 20, is assembled by disposing the valve 17 and spring 18 within the casing part 15, after which the casing part 14 is inserted into the casing 15 to bring the flanges 27 and 29 into overlying relation; the assembly then mounted within the central tubular portion 31 of the closure member 11 to seat the flange 29 on the flange 32, whereupon the flange 33 is swaged over the flange 27 to cause the annular tooth 30 to bite into the flange 27 and provide a leak-tight seal therewith. The container 10 may be then charged the desirable quantity of solution or suspension of the substance to be discharged from the bomb when completed or said substance may be charged into the container after the valve assembly has been mounted in the container. The valve assembly, together with the closure member 11, are mounted in the container and the closure member bead-seamed to the container, as shown at 13. A desirable propellant such as Freon under sufficient superatmospheric pressure to maintain it in the liquid state is then charged into the container through the valve assembly, a suitable chuck being employed which will form a fluid-tight seal with the exterior of the valve casing and preferably unseat the valve to its maximum extent. The valve when thus unseated will have the enlargement 38 of the valve stem located wholly within the valve chamber 16 and will thus not impair the rate of flow through the valve in the filling direction. When the desired amount of propellant has been charged into the container, the chuck is withdrawn, whereupon the valve will seat owing to the combined force of the closure spring 18 and the pressure of the propellant within the container. The closure cap member 20 is then applied by forcing the central projection 39 through the bore 21, which action will be readily accomplished because of the deformability of the central projection and the casing member. After the hooked end 41 on the central projection has passed beyond the shoulder 24, the inner end of said projection will seek to assume its normal diameter and provide a frictional, leak-tight sliding seal with the bore portions 21 and 22. The bomb thus provided may be discharged by pressing downwardly upon the cap member 20, which movement will be limited by engagement of the lower end of the cap with the flange 33 and will also restrict the opening through the bore 23 to the difference in diameters between the cylindrical portion 38 on the valve stem and the diameter of the bore at the valve seat 28. In the act of discharging the bomb contents, the aerosol, after passing through the restricted passage, will expand upon reaching the bore 23 and bore 22, then will be again restricted by the passage around the valve stem within the central projection 39 and again expand in passing through the nozzle 47, thus providing a very effective atomized spray of the aerosol. The flattened surface 42 on the cap will serve, by the sense of feeling, to apprise the user as to the location of the nozzle and the point of discharge of the spray.

It will thus be seen that the invention provides an aerosol bomb which eliminates the necessity for the use of refrigeration machinery and for the filling of the bomb under refrigeration, and the further testing of the bomb by re-heating, and thereby provide a substantial saving in the cost of filling aerosol bombs.

While there has been shown and described a preferred embodiment of the invention, it is to be understood that the invention is to be construed in the light of the appended claims, wherefore changes in details of construction may be resorted to without departing from the spirit of the invention.

What we claim is:

1. A valve assembly comprising a tubular casing having therein, a valve chamber, a tubular valve seat defining one end of the valve chamber and a check valve in said chamber movable into and out of engagement with said valve seat, said valve having a valve stem extending through said valve seat and having an enlargement adjacent the check valve adapted to substantially fill the end of the passage in the valve seat adjacent the check valve when the valve is seated and to provide a restricted opening through the valve seat when the valve is moved away from said seat a predetermined distance, and to substantially enlarge said passage in the valve seat when the valve is moved away from said seat an axial distance greater than the axial dimension of the enlargement on the valve stem, a cap member telescopically mounted on the casing adapted to engage the valve stem to unseat the valve to the predetermined distance throughout which limit of movement the enlargement on the valve stem will provide the restricted opening through the valve seat and cooperating parts on the cap and casing for providing a fluid-tight seal between said casing and said cap and for limiting the telescopic movement of the cap.

2. A valve assembly comprising a tubular casing formed of two tubular parts, each having an axial bore therethrough and a peripheral flange, with the flanges disposed in abutting facial contact and the bores in axial alignment, one of the tubular casing parts being formed of elastomeric, readily deformable, material which provides the valve seat, the other tubular casing part being formed of tough, dimensionally stable, material having an axially extending rib on the abutting face of the flange, a carrier having a central tubular part the end portions of which are flanged over the peripheral portions of the flanges on the tubular casing parts for holding said tubular casing parts in fluid-tight engagement with the annular rib in biting engagement with the flange on the other tubular part, said tubular casing parts providing the casing with a valve seat and a valve chamber, and a check valve mounted in the valve chamber for engaging the valve seat.

3. In an aerosol bomb consisting of a container having a valve assembly mounted in one end thereof and a cap closure for said valve assembly, a valve assembly comprising a casing formed of two tubular parts each having an axial bore therethrough and a peripheral flange with the flanges disposed and held in abutting facial fluidtight contact and with the bores in axial alinement, one of said tubular parts extending outwardly of the container and being formed of elastomeric deformable material, a check valve within said casing having a valve stem extending through the elastomeric tubular part, a cap member formed of elastomeric deformable material telescopically mounted on the elastomeric tubular part adapted to engage the valve stem to unseat the check valve, a discharge opening in the valve cap and cooperating parts on the valve cap and the elastomeric tubular part providing a fluidtight seal between said cap and tubular part as the cap is telescopically moved relatively to said tubular part and for limiting the telescopic movement of the cap.

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