June 30, 1953 J. B. RESWICK 2,643,914

VALVE MEANS FOR AEROSOL SPRAY DISPENSERS

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Fig. 1.

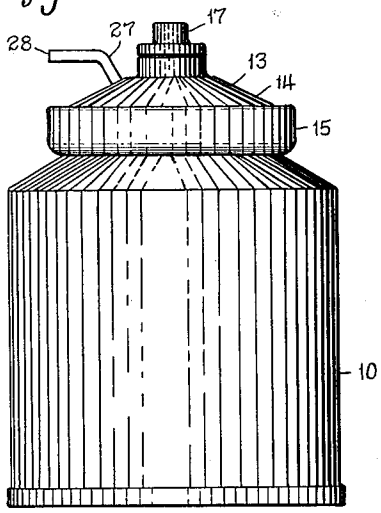


Fig. 6.

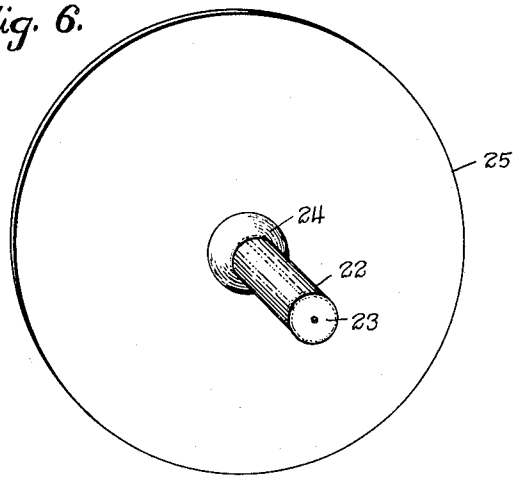
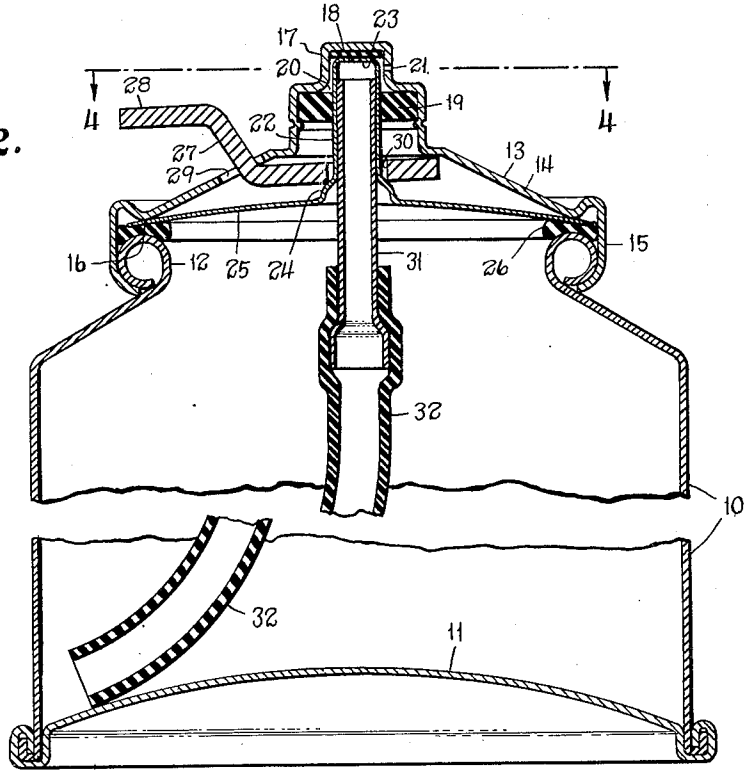


Fig. 2.



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Fig. 3.

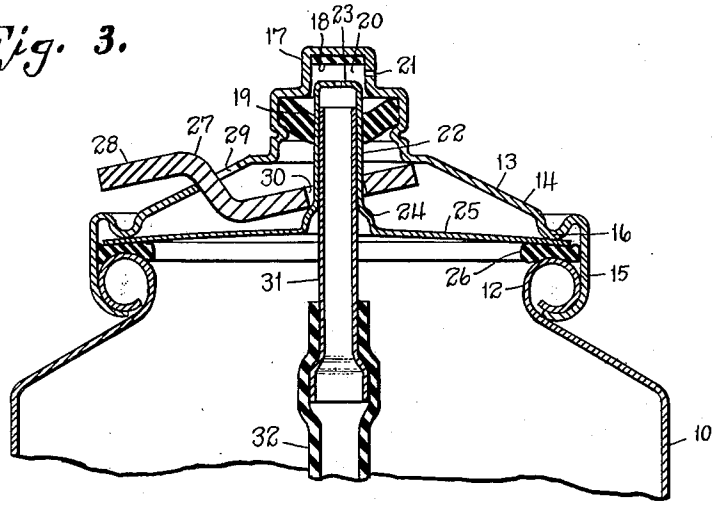


Fig. 4.

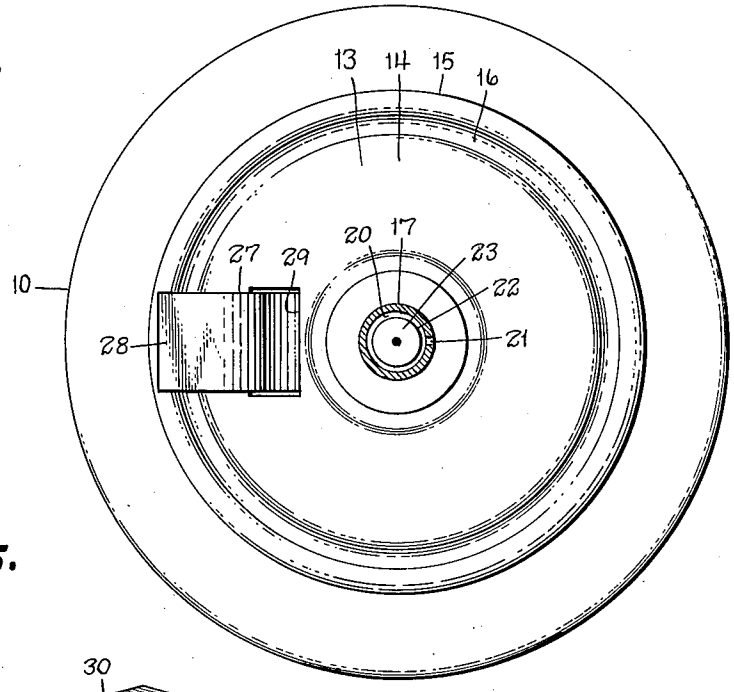
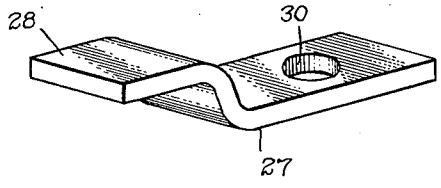


Fig. 5.



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VALVE MEANS FOR AEROSOL SPRAY DISPENSERS

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9 Claims. (Cl. 299—95)

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The present invention relates in general to dispensers and more especially to a dispenser of the type which utilizes fluid pressure for expelling a liquid medium into the atmosphere in the form of a fine mist or aerosol spray, the invention pertaining in particular to improved valve means for effecting the emission of the aerosol spray from the dispenser.

An object of the invention is to provide a superior valve means for a liquid-spray dispenser.

A further object of the invention is to provide a liquid-spray dispenser with superior valve means of durable, economical and dependable construction.

A still further object of the invention is to provide a liquid-spray dispenser with improved valve means which serves to effect both the release of a liquid medium from the dispenser and a diminution in the size of the particles of the liquid so as to form an aerosol spray.

Other objects and advantages will appear to those skilled in the art from the following, considered in conjunction with the accompanying drawings.

In the accompanying drawings, in which certain modes of carrying out the present invention are shown for illustrative purposes:

Fig. 1 is a side elevation of a dispenser embodying the improved valve means of this invention;

Fig. 2 is an enlarged broken side elevation in section of the dispenser of Fig. 1 with the valve in its closed position;

Fig. 3 is an enlarged fragmentary side elevation of the dispenser similar to Fig. 2 but showing the valve in its open position;

Fig. 4 is a transverse section of the dispenser on line 4—4 of Fig. 2;

Fig. 5 is a perspective view of the manually-operated lever for actuating the valve; and

Fig. 6 is a perspective view of the composite valve and valve spring of the valve means of the dispenser.

For the purpose of illustrating the improved aerosol valve means, the latter is embodied in a dispenser which, as shown in Figs. 1 and 2, comprises a container or can indicated generally at 10, provided at its lower end with a concave bottom 11 and at its upper open end with a rolled rim 12 to which the end-closure or cap 13 of the dispenser is permanently secured by a rolled crimped joint. Containers of this type are generally known to the trade as the Crown-Can type of container and while this type of container is shown herein to illustrate an exemplary embodiment of the improved valve means of this

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invention, it will be understood that the valve means may be used with other types of containers and with end-closures or caps secured to the open end of a container by a fluid-tight fastening means other than the rolled crimped joint which characterizes the container shown herein.

The improved valve means for effecting the dispersion of an aerosol spray is shown assembled in the aforesaid container cap 13 which comprises a substantially conical-shaped base portion 14 provided at its outer edge with an annular depending flange 15 for supporting the cap on the rolled rim 12 of the can, the junction between the periphery of the base portion 14 of the cap and the upper edge of the flange 15 comprising an annular indenture in the outer face of the cap. Opposite to the annular indenture and formed thereby on the underside of the base portion 14 of the cap is an annular bead 16.

Formed integrally with the narrow upper end of the conical base portion 14 of the cap is a hollow neck portion 17 of reduced diameter having an imperforate top wall, to the underside of which is secured a valve seat 18 which, in the present embodiment of the invention, comprises a relatively thin resilient disk formed of rubber or a rubber-like material. Fixedly secured by means of an internal annular bead or equivalent means on the inside of the neck portion 17 of the cap below the valve seat 18 and in a horizontal plane substantially parallel thereto, is an apertured gasket 19 which is formed of rubber or a rubber-like material and provides an expansion chamber 20 in the upper end of the neck portion of the cap, between the gasket 19 and the valve seat 18. A radial aperture 21 is provided in the wall of the neck portion of the cap forming the expansion chamber 20 and serves as the nozzle or discharge opening of the dispenser.

The valve of the dispenser is adapted to function both as a closure member for closing off the interior of the container from the aforesaid expansion chamber 20 of the cap; and as an outlet passage for conducting the volatile solution within the container to the expansion chamber. As shown especially well in Figs. 2, 3 and 6, the valve is a composite member comprising a substantially tubular valve nose 22 provided at its upper end with an apertured end wall 23 and at its opposite lower end with an integral circumferential enlargement or skirt 24; and a resilient dish-shaped diaphragm 25 which is preferably formed integrally with the skirt 24 of the valve nose and concentric thereto, the diaphragm 25 being biased normally to hold the valve nose 22

in its normal valve closing position, wherein its upper apertured end wall 23 is engaged against the aforesaid valve seat 18. The valve nose 22 is adapted to project up through the central aperture of the gasket 19, wherein the size of the aperture and the nature of the gasket material are such that the gasket adheres to the valve nose and forms a fluid-tight seal therewith.

In the embodiment shown, the aforesaid diaphragm is a thin sheet of resilient metal such as, for example, aluminum bronze or an equivalent metal alloy, from the center of which the tubular valve nose is drawn as an integral part thereof, the over-all diameter of the diaphragm being such that its outer peripheral edge is adapted to be engaged between the aforesaid annular bead 16 of the cap and the rolled rim of the container. Seated on the upper edge of the annular rolled rim 12 of the container beneath the underside of the peripheral edge of the diaphragm is a sealing gasket 26, which, in the embodiment shown, comprises a resilient annulus formed of rubber or a rubber-like material. By so assembling the diaphragm and its sealing gasket on the rolled rim of the can, and thereafter crimping the flange 15 of the cap 13 thereover to permanently secure the cap thereto, the peripheral edge of the resilient diaphragm and the sealing gasket 26 are tightly pinched between the annular bead 16 of the cap and the rolled rim of the container.

With the resilient diaphragm 25 supported thus within the cap 13, the diaphragm serves as the valve spring for normally urging the apertured end wall of the valve nose against the valve seat in the neck portion of the cap; and for returning the valve to its valve seat after the valve has been unseated therefrom in the manner hereinafter described. In addition to the inherent resiliency of the diaphragm, the pressure of the gas within the can may act on the underside of the diaphragm to urge the apertured end wall of the valve nose against the valve seat; and to return the valve nose to its valve seat after the valve has been unseated. Although the resilient metal diaphragm has been described as biased so as to hold the valve nose against the valve seat, it is within the purview of the invention to bias the diaphragm so that it holds the valve nose away from the valve seat and to rely on the internal gas pressure alone to hold the valve nose against the valve seat, thereby reducing the force exerted by the valve nose against the valve seat. Although a resilient metal diaphragm is a preferred form of valve spring, it is also within the purview of the invention to form the diaphragm of other suitable materials such as, for example, rubber or a rubber-like material, and to join the rubber diaphragm to the skirt of the valve nose by any suitable fastening means.

As pointed out above, the valve nose 22 and more particularly its apertured end wall is adapted normally to be held by the resilient force of its diaphragm 25 in engagement with the valve seat 18. In order to unseat the valve nose from its valve seat, a manually-operated lever arm 27 is employed which, as shown especially well in Fig. 5, comprises substantially flat metal stock, the outer end of which is offset with respect to its inner end to provide a finger grip 28 which is adapted to project substantially radially through an aperture 29 (see Fig. 4), in the base portion of the cap. Adjacent the opposite or inner free end of the valve-actuating lever is an aperture 30, the diameter of which is greater than the diameter of the valve nose 22 so that the lever may engage freely thereover. However, as noted especially well in Fig. 2, the aperture 30 of the valve-actuating lever arm is sufficiently smaller than the circumferential skirt 24 at the base of the valve nose 22 so that the lower edge of the aperture 30 of the lever arm rests freely on the shoulder of the circumferential skirt at the lower end of the valve nose. In this manner, the inner free end of the lever arm is held normally against the underside of the base portion 14 of the cap at the juncture of its neck portion, the valve-actuating lever arm being thus a lever of the second class, wherein by pressing down on its outwardly extending finger grip 28, the lever will fulcrum about its inner free end against the underside of the cap to deflect the resilient diaphragm and displace the valve nose 22 downwardly, thereby to unseat its apertured end wall from its valve seat. On releasing the finger grip of the lever arm, the combined forces of the deflected diaphragm and the internal gas pressure (or the force of the internal gas pressure alone, providing no diaphragm force or spring is used) will return the latter to its normal position and thereby move the valve nose upwardly to re-engage its valve seat, the valve-actuating lever arm being simultaneously swung upwardly into its normal position. Since the gasket 19 is formed of a rubber or rubber-like material which is adapted to adhere to and form a fluid tight seal with the valve nose 22, the center portion of the gasket will be moved-in-shear or deflected in response to the movement of the valve nose to and from its valve seat. For brevity, the term "valve means" as used herein shall denote the composite valve, the valve seat, the valve-operating lever and the cap having the discharge opening therein.

As pointed out above, the composite valve is adapted to serve as an outlet passage for conducting a fluid medium within the container to the expansion chamber from whence the fluid medium escapes by way of the nozzle into the atmosphere. To this end, the tubular valve nose 22 is provided with a feed pipe 31 comprising, preferably, a rigid metal tube fixedly secured at its upper end within the valve nose and provided at its lower end with a circumferential enlargement over which the upper end of a flexible rubber feed tube 32 is stretched and thereby supported by the valve within the interior of the container, the lower end of the flexible feed tube 32 being arranged to extend downwardly to the bottom of the container to a point adjacent the outer edge thereof.

To use the dispenser of the type shown herein and described above, the container 10 is charged in any suitable manner with a quantity of liquified gas such as, for example, Freon, or a material which is highly volatile at atmospheric pressures, the Freon or equivalent fluid being preferably in solution with the liquid medium to be dispersed. By way of example, the liquid medium in solution may be an oil, wax, insecticide, deodorant, or the like. In charging the container with the highly volatile solution, the container is not entirely filled, a space being left above the surface of the solution for the development of vapor pressure. In the case of a solution embodying the liquified gas Freon, the vapor pressure developed in the container will be of the order of 35 to 45 pounds per square inch.

Thus, upon depressing the finger grip of the valve-actuating lever, the nose 22 of the valve will be moved downwardly off of its seat, thereby uncovering the aperture in the end wall of the valve nose so as to open the outlet passage of the valve to atmospheric pressure. Immediately, the vapor pressure within the container forces the liquid therein up through the flexible feed tube into the outlet passage of the valve and from thence through the aperture in the upper end wall thereof into the expansion chamber and from thence through the aperture or discharge opening to the atmosphere. Inasmuch as the liquid solution passes from the outlet passage into an expansion chamber by way of a relatively small aperture and from the expansion chamber through a relatively small aperture to the atmosphere, the liquid solution is broken up into extremely small particles by the combined mechanical dispersion of the liquid effected by its passage through the small apertures, and by the explosive action of the highly volatile solution escaping into the atmosphere. As a result, the liquid solution is dispersed from the nozzle of the dispenser in the form of highly divided particles or aerosol spray.

The valve means of the dispenser is thus characterized by its relatively simple, economical and durable construction embodying the combined functions of a valve, and liquid-dispersion means for controlling both the release of the liquid solution, and the diminution of the liquid particles, to provide an aerosol spray.

The invention may be carried out in other specific ways than those herein set forth without departing from the spirit and essential characteristics of the invention, and the present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive, and all changes coming within the meaning and equivalency range of the appended claims are intended to be embraced therein.

I claim:

1. In a dispenser having an end-closure and a nozzle, the combination including: a valve-seat in said end-closure; an apertured resilient gasket secured in said end-closure and spaced vertically below said valve-seat to form an expansion-chamber opposite said nozzle; a valve comprising a valve-nose having a passage therethrough, an apertured wall at one end thereof and an integral resilient diaphragm at its opposite end, said resilient diaphragm being arranged to support said valve in said dispenser and normally to hold the apertured end wall of said valve-nose on said valve-seat; feed-means arranged to connect the passage of said valve-nose with the interior of said dispenser for delivering a liquid solution under pressure into the passage of said valve-nose; and means arranged to actuate said valve to move the apertured end wall of said valve-nose off of said valve-seat so as to release the solution under pressure within the passage of said valve-nose for dispersion into the atmosphere through the nozzle of said end-closure.

2. In a dispenser having an end-closure and a nozzle, the combination including: a valve-seat in said end-closure adjacent said nozzle; an apertured resilient gasket secured in said end-closure and spaced vertically below said valve-seat to form an expansion-chamber in said end-closure; a valve comprising a tubular valve-nose having an apertured end wall at its upper end and an integral resilient diaphragm at its opposite lower end arranged to support said valve in said dispenser and normally to hold the upper apertured end wall of said valve-nose on said valve-seat with said valve-nose projecting through the apertured resilient gasket and forming a fluid-tight seal therewith; a tube arranged to connect the lower end of said tubular valve-nose with the interior of said dispenser for delivering a liquid solution under pressure into said tubular valve-nose; and a valve-actuating lever constructed and arranged to be supported intermediate its opposite ends on said valve, one end of said lever being fulcrumed on the underside of said end closure and the opposite end of said lever being arranged to project outwardly through an aperture of said end-closure for manual manipulation thereby to move the apertured end wall of said tubular valve-nose off of said valve-seat, so as to release the solution under pressure within said tubular valve-nose into said expansion-chamber for dispersion therefrom into the atmosphere through the nozzle of said end-closure.

3. In a dispenser for fluid under pressure, the combination including a container having an end-closure fixed thereto, said end-closure having a discharge opening therein, a valve-seat in said end-closure adjacent said discharge opening, a valve mounted within said end-closure for movement relative thereto and having a passage which opens at one end adjacent said valve-seat and at the other end into the interior of said container for delivering fluid in said container to said discharge opening, resilient means disposed between said container and said valve to support the latter and normally to hold it with said one end of the valve passage against said seat to close off said passage, and valve-actuating means arranged to move said valve away from said valve-seat against the pressure of said resilient means so as to release said fluid from said container for dispersion through said discharge opening.

4. A dispenser as defined in claim 3, wherein said valve comprises a tube and said resilient means comprises a diaphragm secured adjacent its periphery to said container and engaging said tube so as to urge one end thereof against said valve-seat.

5. A dispenser as defined in claim 4, wherein said diaphragm is in integral engagement with said tube.

6. A dispenser as defined in claim 3, wherein said valve-actuating means comprises a lever supported intermediate its opposite ends by said valve, one end of said lever being fulcrummed on said end-closure and the opposite end of said lever being arranged to project outwardly through an aperture in said end-closure for manual manipulation.

7. In a dispenser for fluid under pressure, the combination including a container having an end-closure fixed thereto, said end-closure having a discharge opening therein, a valve-seat in said end-closure, an apertured resilient gasket secured in said end-closure and spaced from said valve-seat to form an expansion chamber adjacent said discharge opening, a valve mounted within said apertured gasket for movement relative to said end-closure and forming a gas and fluid tight seal with said gasket, said valve having a passage which opens at one end adjacent said valve-seat and at the other end into the interior of said container for delivering fluid in said container to said discharge opening, resilient means disposed between said container and said valve to support

the latter and normally to hold it with said one end of the valve passage against said seat to close off said passage, and valve-actuating means arranged to move said valve away from said valve-seat against the pressure of said resilient means so as to release said fluid from said container for dispersion through said discharge opening.

8. In a dispenser for fluid under pressure, the combination including a container having an end-closure fixed thereto, said end-closure having a discharge opening therein, a valve-seat in said end-closure adjacent said discharge opening, a tubular valve mounted within said end-closure for movement relative thereto and having one end thereof adjacent said valve-seat, resilient diaphragm means disposed between said container and said tubular valve to support the latter, said diaphragm means being subjected to the pressure within said container to urge said end of said tubular valve against said valve-seat, and valve-actuating means arranged to move said

tubular valve away from said valve-seat against the pressure of said resilient diaphragm so as to release said fluid from said container for dispersion through said discharge opening.

9. A dispenser as defined in claim 8, wherein said resilient diaphragm is integral with said tubular valve and is secured adjacent its periphery to said container, said diaphragm being biased to assist the pressure in said container in urging said valve against said valve-seat.

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