

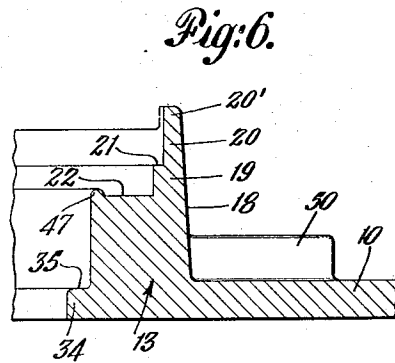
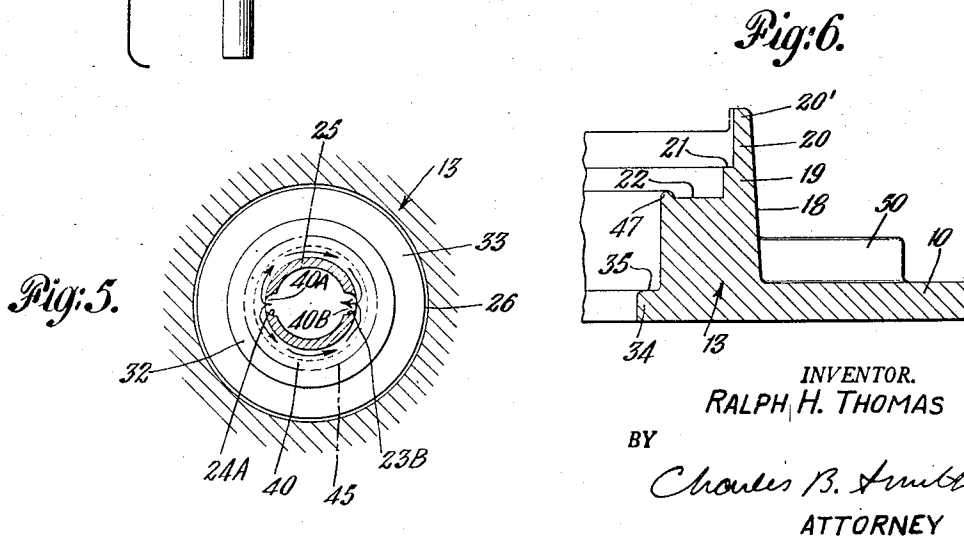
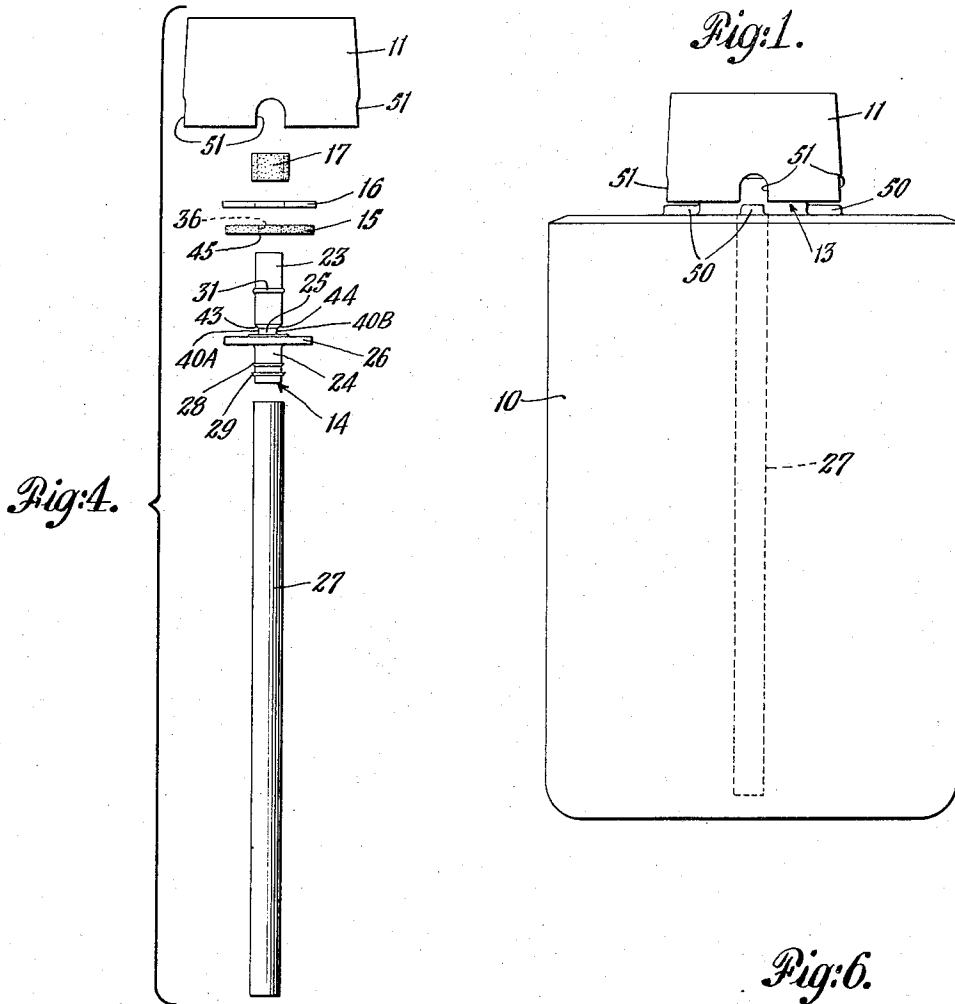
Aug. 7, 1956

R. H. THOMAS
DISPENSER

2,757,826

Filed Nov. 19, 1952

2 Sheets-Sheet 1



INVENTOR.
RALPH H. THOMAS
BY
Charles B. Smith
ATTORNEY

Aug. 7, 1956

R. H. THOMAS
DISPENSER

2,757,826

Filed Nov. 19, 1952

2 Sheets-Sheet 2

Fig. 2.

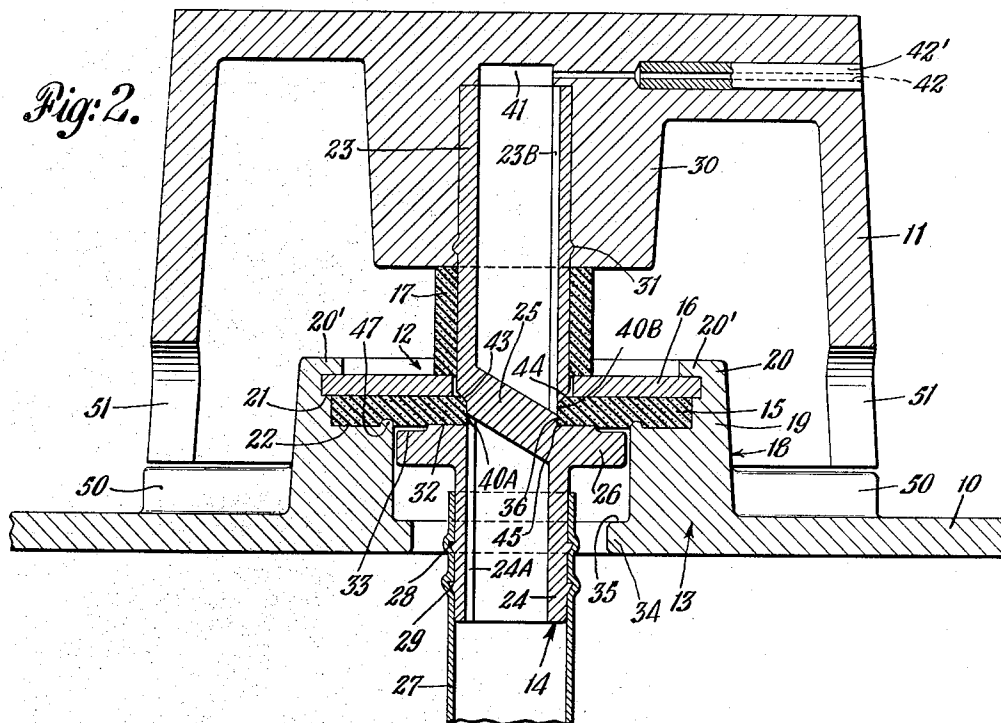
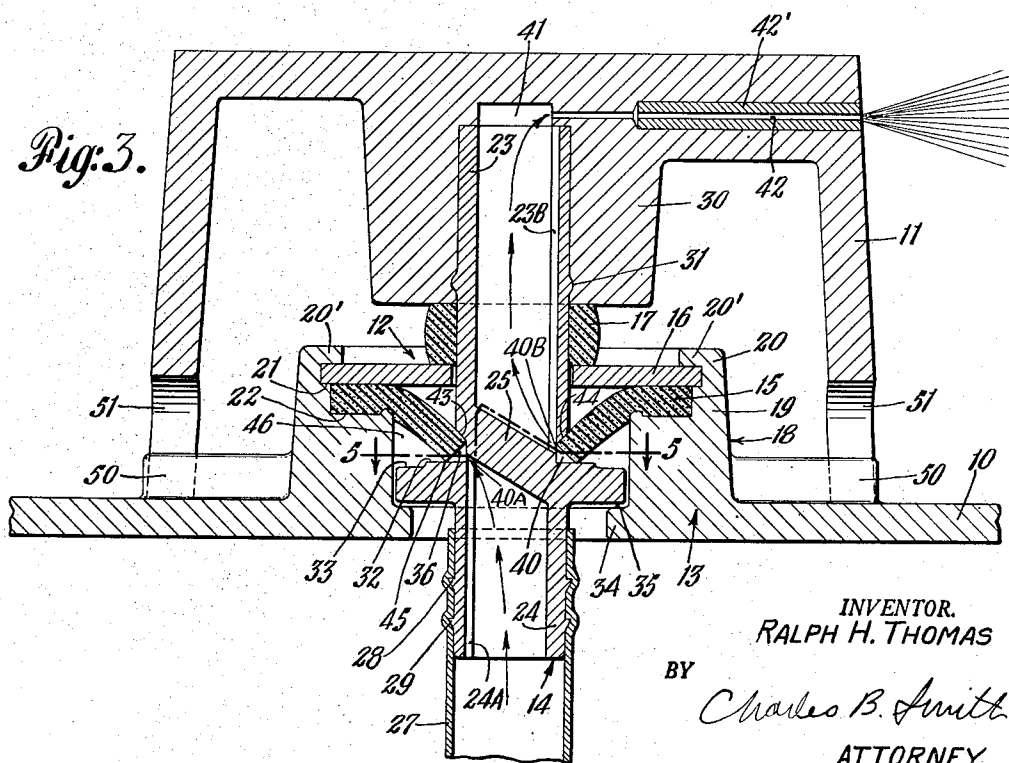


Fig. 3.



INVENTOR.
RALPH H. THOMAS

BY

Charles B. Smith
ATTORNEY

1

2,757,826

DISPENSER

Ralph Henry Thomas, Rahway, N. J., assignor to Bristol-Myers Company, New York, N. Y., a corporation of Delaware.

Application November 19, 1952, Serial No. 321,377

12 Claims. (Cl. 222—394)

The present invention relates to containers of the type employed in the packaging and dispensing of various liquids in vapor or droplet form and more particularly to a novel and improved valve unit for controlling the discharge from such a container.

In the dispensing of preparations of the character indicated, the active substance is ordinarily intermixed with a suitable propellant in a closed container. At room temperature, the mixture is maintained under a suitable pressure within a container and is adapted to be released in the form of a spray upon the operation of a valve. Thus a desired amount of an appropriate deodorant, antiperspirant or other liquid may be discharged by the propellant upon the manual operation of a valve. Difficulties have been encountered in the operation of devices of this character because of the problem of providing an effective seal along the various surfaces of the device through which the liquid may be discharged. Aerosol bombs or containers of the character indicated are often maintained under an internal pressure of from 10 to 35 pounds, or more, per square inch at room temperature. A serious problem has been presented in maintaining the unit in tightly sealed condition when stored or otherwise out of operation and in enabling the unit to be simply and effectively operated when it is desired to discharge a portion of the contents in the form of a fine spray. Another serious problem has been encountered in preventing the leakage of gas, which is above the liquid level of the container, into the valve when the valve is open.

An important object of the present invention has been to provide a simple but reliable arrangement for controlling the discharge of a desired amount of the contents of an aerosol container at will and effectively sealing the container against undesired loss of its contents and pressure at all times. Toward this end, one aspect of the invention involves the provision of an improved valve unit, which may be applied to a container formed of metal or other suitable material, that may be easily operated to cause the discharge of a portion of the contents in the form of a spray and will effectively seal the container whenever the valve operating means is released. Furthermore, the valve unit is so constructed as to prevent escape from the container of gas above the liquid level.

A further object of the invention has been to provide a valve unit of the character indicated which is simple and inexpensive to construct and which is suitable for manufacture by mass production methods.

It is desirable that an aerosol container of the character indicated be provided with means to prevent the accidental discharge of the contents during shipment. Such protective means is also preferably adaptable to prevent accidental discharge of the container contents after the container has been first used as, for example, while being carried in a suitcase or the like.

Accordingly, it is a further object of the invention to provide an aerosol container having protective means for

2

preventing the accidental discharge of the container contents.

Other and further objects, features and advantages of the invention will appear from the following description.

In accordance with the invention, a container is provided with a valve unit adapted to be seated in an opening in the container, the valve unit comprising a movable plunger provided with a port communicating with the inside of the container through a first discharge path and communicating with the outside of the container through a second discharge path and a resilient deformable washer adapted in a closed position thereof to seal the port thereby preventing communication between the discharge paths, the washer being adapted in an open deformed position thereof to permit communication between the discharge paths and simultaneously to form a sealing contact of the washer with the plunger below the port and remote from the first discharge path thereby to prevent communication between the port and the contents of the container except through the first discharge path. In accordance with further features of the invention, means are provided for maintaining the washer in a normally non-deformed condition and for preventing accidental deformation of the washer due to careless or rough handling of the container.

The invention will now be described in greater detail with reference to the appended drawings wherein:

Fig. 1 is an elevational view of an aerosol dispenser constructed in accordance with the invention;

Fig. 2 is an enlarged sectional view of the container neck and valve unit of Fig. 1, the valve unit being shown in closed position;

Fig. 3 is a view similar to Fig. 2 but with the valve unit shown in open position;

Fig. 4 is an exploded view of the valve unit and cap;

Fig. 5 is a sectional view taken along the line 5—5 of Fig. 3; and

Fig. 6 is a detail view of a portion of the container neck and top.

Referring now to the drawings and more particularly to Figs. 1 and 2, the container illustrated comprises a reservoir or body portion 10, a cap 11 and a valve unit generally designated by the reference numeral 12.

The materials selected for the various parts of the dispenser may be chosen to suit the particular application desired. The various materials suggested hereinafter are intended solely for purposes of illustration and are not to be considered as limiting the invention. For example, the reservoir or body portion 10 may conveniently be formed of impact extruded aluminum, while the cap 11 might be formed of polystyrene. If the liquid to be dispensed tends to react with aluminum, another metal or other suitable material should be employed for the reservoir 10 or a suitable internal coating should be provided thereon.

The reservoir 10 is provided with an outwardly extending reduced diameter neck portion 13 adjacent one end thereof. It will be observed that the construction of the reservoir 10 and the neck 13 is such as to facilitate formation thereof by impact extrusion processes. Within the neck portion 13 is mounted the valve unit 12 which comprises a plunger 14, a washer 15, a washer 16 and a collar 17. The neck 13 is provided with an upwardly extending flange portion 18. The wall thickness of the lower portion 19 of the flange 18 is greater than that of the upper portion 20 thereof, thus providing an inwardly extending shoulder 21. The annular disc or washer 16 is supported adjacent the periphery thereof on the shoulder 21. The disc 16, which may conveniently be formed of brass or the like, fits within the upper portion 20 and rests on the shoulder 21. The top of the portion 20 is provided with tabs 20' which are bent over inwardly

firmly to hold the washer 16 in place on the shoulder 21. A tab 20' is shown in Fig. 6 in its vertical position, i. e., before being bent over. The upper surface of the main portion of the neck 13 is formed as an inwardly extending shoulder 22 which is adapted to support the outer or stationary portion of the washer 15.

In the valve closed position of Fig. 2 the washer 15, which is preferably formed of Buna-N rubber or other similar resilient material, should completely fill the space bounded by the shoulder 22, the lower surface of the washer 16 and the inner surface of the portion 19, thus providing the desired sealing effect along these surfaces.

The plunger 14, which may conveniently be formed of nylon or the like, is generally cylindrical in shape and comprises an upper hollow portion 23, a lower hollow portion 24, a reduced diameter solid portion 25 separating the portions 23 and 24, and an outwardly extending solid flange portion 26 formed adjacent the solid portion 25. A draft tube 27, which may be formed of polyethylene or other suitable material, is affixed to the lower portion 24 and extends into the reservoir 10 to a suitable depth, preferably adjacent the bottom of the reservoir 10 as shown in Fig. 1. Outwardly extending projections or lugs 28 and 29 may be provided on the walls of the portion 24 to firmly retain the draft tube 27 in position thereon.

The cap 11 is formed with a central downwardly extending annular housing portion 30 adapted to encompass and firmly engage the portion 23 of the plunger 14 adjacent the upper end thereof. To assist the firm engagement of the housing 30 and the portion 23, a circular projection or lug 31 may be provided in the outer surface of the portion 23 and adapted to mate with a complementary recess provided in the inner surface of the housing 30.

The collar 17, which is preferably formed of Buna-N rubber or other suitable resilient material, encompasses the portion 23 between the lower end of the housing 30 and the upper surface of the disc or washer 16. The collar 17 and the portion 23 preferably have a sliding fit to permit relative motion therebetween.

The inner portion 32 of the upper surface of the flange 26 is adapted to support the adjacent bottom surface of the washer 15 in the closed valve position shown in Fig. 2. The upward force exerted by the collar 17 on the housing 30, and hence on the plunger 14, is preferably sufficient to provide a pressure tight seal between the inner portion 32 of the upper surface of the flange 26 and the adjacent bottom surface of the washer 15. The outer portion 33 of the upper surface of the flange 26 is preferably spaced from the washer 15 to permit moist vapor from the reservoir 10 to contact the portion 33 of the washer 15 to prevent the same from drying out or stiffening over extended periods of idleness.

To permit easy sliding of the plunger 14 within the open neck of the container, a slight clearance between the outer surface of the flange 26 and the adjacent inner surface of the neck 13 is preferably provided. Upward movement of the plunger 14, under influence of the resilient collar 17, is limited by the hard washer 16, which is held in place between the shoulder 21 and the bent over tabs 20'. Downward movement of the plunger 14, which occurs when the cap 11 is forced downward against the action of the collar 17, is limited by an inwardly extending flange 34 of the neck 13. The flange 34 provides a shoulder 35 adapted to engage the lower surface of the flange 26 and thus limit the downward travel thereof.

The valve unit 12 is shown in its closed position in Fig. 2. It will be observed that fluid from the reservoir 10 will enter the draft tube 27 and fill the lower portion 24 of the plunger 14. However, the sealing action of the inner surface 36 of the resilient washer 15, which presses against the adjacent surface of the reduced diameter portion 25, prevents the pressure within the reservoir 10 from forcing the fluid into the upper portion 23 of the plunger 14. Washer 15 also provides sealing action

at the surface 32 of flange 26 and at the surface 22 of the neck 13 to prevent the pressure within the reservoir 10 from forcing fluid out of the container along these surfaces. Thus, with the valve unit 12 in the closed position thereof, the container is effectively sealed against leakage or loss of pressure.

When it is desired to discharge a portion of the contents of the container, the cap 11 is depressed by the user, causing the valve unit to assume a position as shown in Fig. 3. Referring now particularly to Fig. 3, it will be observed that the collar 17 has been compressed, permitting downward movement of the plunger 14 under the force exerted on the cap 11 by the user. Fluid from the reservoir 10 may now be discharged from the container through the path indicated by the arrows in Figs. 3 and 5. The pressure within the reservoir 10 forces fluid up the draft tube 27, up the hollow portion 24 of the plunger 14, and through a hole or orifice 40A into a chamber 40 formed between the surface 36 of the washer 15, the adjacent outer surface of the reduced diameter portion 25 and the innermost portion of the surface 32 of the flange 26. The chamber 40 extends around the periphery of the portion 25, as best shown in Fig. 5. The solid portion 25 of plunger 14 is disposed diagonally as shown so that fluid may enter the chamber 40 adjacent the lower surface of the portion 25 but will be discharged therefrom through a hole orifice 40B into the hollow portion 23 adjacent the upper surface of the portion 25. As shown at the right hand side of the portion 25 in Figs. 3 and 5, the hole 40B is provided in the wall of the plunger 14 to permit fluid to enter the hollow portion 23 from the chamber 40 at one side thereof. The holes 40A and 40B are formed by the conjunction of grooves 24A and 23B, respectively, provided in the inner walls of the portions 24 and 23, respectively, with the reduced diameter portion 25 of the plunger 14. These grooves may be relatively inexpensively formed during an extrusion process and do not require drilling. The hollow portion 23 communicates at the upper end thereof with a chamber 41 provided in the upper wall of the cap 11. The chamber 41 communicates with the outside of the container through a passageway 42 provided in the upper wall of the cap 11. The outer portion of the passageway 42 may be formed as the hollow portion of a tube 42' to facilitate extrusion of the cap 11.

The chamber 40 is formed by deformation of the washer 15 when the cap 11 is depressed. For this purpose, the lower surface of the portion 25 adjacent one side thereof is tapered, as shown at 43, to contact the adjacent inner upper surface of the washer 15 and to carry the same downward. The bottom surface of the portion 23 is tapered as shown at 44 to engage the inner upper surface of the washer 15 at the other side thereof and to assist in carrying the same downward. Actually, the surfaces denominated 43 and 44 are a continuous surface formed on the plunger 14. The washer 15 seals the plunger 14 along the surfaces 43 and 44 to prevent leakage and loss of pressure along these surfaces.

The lower inner corner 45 of the washer 15 is urged firmly against the surface 32 of the flange 26 when the valve unit 12 is in the open position thereof, thus providing a seal at the outer edge of the chamber 40 and preventing gas which collects in the upper end of the reservoir 10 from entering the chamber 40 and escaping from the container. This gas enters the neck 13 on the outside of draft tube 27 and passes along the bottom and outer surfaces of the flange 26 into a chamber 46 formed beneath the washer 15. This gas and whatever fluid may be carried with it into the chamber 46 is prevented from entering the chamber 40 by engagement of the corner 45 and the surface 32. Engagement of washer 15 with shoulder 22 prevents loss of pressure along this shoulder.

An upward projection 47 may be provided on the shoulder 22 adjacent the inner edge and extending around the periphery thereof. The projection 47, which is pref-

5

erably semicircular in cross section, facilitates bending of the washer 15 and prevents lateral displacement thereof. The washer 15 may be considered as divided into two annular portions. The outer portion extends outwardly from the projection 47 and is stationary. The inner portion extends inwardly from the projection 47 and is movable or deformable. The outer or stationary portion provides sealing action along the shoulder 22 at all times. The inner or movable portion seals the discharge path when the valve unit 12 is in its closed position (Fig. 2). When the valve unit 12 is in the open position thereof, (Fig. 3) the movable portion forms the chamber 40 and seals the same except for the desired discharge path about the portion 25 and through the hole 40B into the portion 23.

While a container constructed in accordance with the invention may be made any convenient size, it will generally be considerably smaller than shown in Figs. 2 and 3 of the drawings. Hence it will be evident that a relatively small inward displacement of the cap 11 will shift the valve unit 12 into the open position thereof. To protect the container against accidental discharge while in shipment or while being carried in a suitcase or the like, the cap 11 and the upper surface of the reservoir 10 are constructed in such a way as to minimize the possibility of accidental discharge. For this purpose, two or more lugs or projections 50 may be provided on the upper surface of the reservoir 10. These lugs are arranged to cooperate with the sides of the cap 11 to prevent depression of the cap and consequent opening of the valve unit 12. To permit discharge of the container contents, the sides of the cap 50 are provided with slots 51 adapted to register with and encompass the lugs 50. When the cap 11 is rotated so that the slots 51 and the lugs 50 register, the cap 11 may be depressed to open the valve unit 12. The depth of the slots 51 is preferably equal to or greater than the maximum travel of the plunger 14.

It should be understood that the terms "inward" and "outward" and similar expressions used in the specification and claims herein have been used solely to indicate radial or lateral directions or locations. Similarly, the terms "upward," "downward," "top" and "bottom" and like expressions have been used solely to indicate relative longitudinal directions or location.

While the invention has been described in connection with a specific embodiment thereof and in a specific use, it should be understood that various modifications thereof will occur to those skilled in the art without departing from the spirit and scope of the invention as set forth in the appended claims. For example, it will be readily apparent that the resilient collar 17 can be replaced with other resilient members such as a spring or diaphragm. As another alternative, the upward force on the plunger 14 could be provided by the gas pressure within the reservoir acting on the flange 26. It will also be apparent that the port and discharge path arrangement can be varied to meet varying needs.

What is claimed is:

1. A fluid dispenser, comprising a container having an opening in one end thereof, a valve unit having an open position and a closed position and being adapted to fit within and to seal said opening, and means for manually operating said valve unit from said closed position to said open position thereof to permit discharge of a portion of the contents of said container, said valve unit comprising a movable member having a hollow section communicating with said container, a discharge path communicating with the hollow section of said movable member and with the outside of said dispenser, a resilient member having a stationary portion engaging said container adjacent said opening therein to seal the same and a movable portion which, in an unmoved position thereof, engages said movable member to close said discharge path and prevent communication between said hollow section and said discharge path, operation of said manual means caus-

6

ing said movable portion of said resilient member to move in a direction permitting communication between said discharge path and said hollow section, said movable portion of said resilient member being arranged, in the moved position thereof, to contact said movable member between said discharge path and the inside of said container to seal said discharge path from communication with said container except through said hollow section.

2. An aerosol dispenser, comprising a container having an opening in one end thereof; a valve unit having an open position and a closed position and being adapted to fit within and to seal said opening; and means for manually operating said valve unit from said closed position to said open position thereof to permit discharge of a portion of the contents of said container; said valve unit comprising a movable plunger having a first hollow section communicating with said container, a second hollow section communicating with the outside of said dispenser and an intermediate section separating said hollow sections and having ports communicating, respectively, with said hollow sections, and a resilient member having a stationary portion engaging said container adjacent said opening therein to seal the same and a movable portion which, in the closed position of said valve unit, contacts said movable member adjacent said intermediate section to thereby prevent communication between said hollow sections; operation of said manually operable means causing said movable portion of said resilient member to move in a direction permitting communication between said hollow sections through a channel formed by sealing contact of the movable portion of said resilient member with said plunger above and below said ports, said sealing contact below said ports preventing communication between said second hollow section and said container except through said first hollow section.

3. A valve adapted to be seated in an opening in a container, comprising a movable plunger provided with a first port communicating with the inside of said container and a second port communicating with the outside of said container and a resilient deformable washer having a face which in a substantially non-deformed position of said washer, seals said ports thereby preventing communication therebetween, said face of said washer, in a deformed position of said washer, forming a channel for communication between said ports by sealing contact of said face of said washer with said plunger above and below said ports.

4. A valve unit adapted to be seated in an opening in a container, comprising a movable plunger provided with a first port communicating with the inside of said container and a second port communicating with the outside of said container and a resilient annular washer having a stationary outer portion sealing said valve unit in the opening in said container and having a deformable inner portion which, in a substantially non-deformed position thereof, seals said ports thereby preventing communication therebetween, said inner portion of said washer, in a deformed position thereof, forming a channel by sealing contact of said inner portion of said washer with said plunger above and below said ports, said channel permitting communication between said ports.

5. A valve unit adapted to be seated in an opening in a container, comprising a movable plunger provided with a first port communicating with the inside of said container and a second port communicating with the outside of said container, a resilient annular washer having a stationary outer portion sealing said valve unit in the opening in said container and having a deformable inner portion which in a substantially non-deformed position thereof seals said ports thereby preventing communication therebetween, the inner portion of said washer, in a deformed position thereof permitting communication between said ports through a channel formed by

sealing contact of said washer with said plunger above and below said ports, resilient means for normally retaining the inner portion of said washer in said substantially non-deformed position thereof, and manually operable means for causing said inner portion of said washer to assume said deformed position thereof thereby to permit discharge of a portion of the contents of said container.

6. A valve unit adapted to be seated in an opening in a container; comprising a movable plunger provided with a first port communicating with the inside of said container, a second port communicating with the outside of said container, a reduced diameter section interconnecting said ports, and a resilient deformable washer which, in a substantially non-deformed position thereof, engages said plunger adjacent said ports and seals said ports thereby preventing communication therebetween, said washer, in a deformed position thereof, forming a communicating channel between said ports by effecting a sealing contact of said washer with said plunger above and below said ports; and manually operable means for moving said plunger whereby said washer is caused to assume said deformed position thereof thereby to permit discharge of a portion of the contents of said container.

7. A container, comprising a valve unit adapted to be seated in an opening in the container, said valve unit comprising a movable plunger provided with a first port communicating with the inside of said container and a second port communicating with the outside of said container, and a resilient deformable washer adapted in a substantially non-deformed position thereof to seal said ports thereby preventing communication therebetween, said washer being adapted in a deformed position for communication between said ports through a channel formed by sealing contact of said washer with said plunger above and below said ports, a cap member mounted on said plunger and adapted for movement therewith whereby said washer is caused to assume said deformed position thereof for discharge of a portion of the contents of said container, and projecting means provided on the outer surface of said container adjacent said opening therein, said projecting means being arranged to cooperate with said cap member to prevent said movement of the latter, said cap member being provided with a recessed portion adapted to be manually registered with said projecting means to permit said movement of said cap member and said plunger.

8. A valve adapted to be seated in an opening in a container, comprising a movable plunger provided with a first port communicating with the inside of said container and a second port communicating with the outside of said container and a resilient deformable washer which in a closed position thereof seals said ports thereby preventing communication therebetween, said washer, in an open deformed position thereof, effecting sealing contacts with said plunger above and below said ports to form a communication channel between said ports.

9. An aerosol dispenser; comprising a container having an opening in one end thereof; a valve unit having an open position and a closed position and being adapted to fit within and to seal said opening; means for manually operating said valve unit from said closed position to said open position thereof for discharge of a portion of the contents of said container; and resilient means tending to retain said valve unit normally in said closed position thereof; said valve unit comprising a movable plunger having a first hollow section communicating with said container, a second hollow section communicating with the outside of said dispenser, a reduced diameter section separating said hollow sections and having ports communicating, respectively, with said hollow sections and a radially extending flange section disposed below said ports, and a resilient member having a stationary portion adapted to engage said container adjacent said opening therein to seal the same and a movable portion adapted in the closed position of said valve

unit to contact said reduced diameter section to thereby prevent communication between said hollow sections, operation of said manually operable means causing said movable portion of said resilient member to move in a direction permitting communication between said hollow sections through a channel formed by sealing contact of the movable portion of said resilient member with said plunger above said ports and with said flange section below said ports, said sealing contact with said flange section preventing communication between said second hollow section and said container except through said first hollow section.

10. An aerosol dispenser, comprising a container having an opening in one end thereof; a valve unit having an open position and a closed position and being adapted to fit within and to seal said opening; said valve unit comprising a movable plunger having a first hollow section communicating with said container, a second hollow section communicating with the outside of said dispenser and a reduced diameter section separating said hollow sections and having ports communicating, respectively, with said hollow sections, and a resilient member having a stationary portion adapted to engage said container adjacent said opening therein to seal the same and a movable portion adapted in the closed position of said valve unit to contact said movable member adjacent said reduced diameter section to thereby prevent communication between said hollow sections, means comprising a cap member mounted on said plunger for movement therewith for manually operating said valve unit from said closed position to said open position thereof for discharge of a portion of the contents of said container; operation of said manually operable means causing said movable portion of said resilient member to move in a direction permitting communication between said hollow sections through a channel formed by sealing contact of the movable portion of said resilient member with said plunger above and below said ports, said sealing contact below said ports preventing communication between said second hollow section and said container except through said first hollow section; projecting means provided on the outer surface of said container adjacent said opening therein, said projecting means being adapted to cooperate with said cap member to normally prevent operation of said manually operable means; said cap member being provided with slots adapted to be manually registered with said projecting means to permit operation of said manually operable means.

11. A fluid dispenser, comprising a container having an opening in one end thereof, a valve unit having an open position and a closed position and being adapted to fit within and to seal said opening, a cap member operatively connected to said valve unit for manual operation thereof, and a plurality of projecting elements provided on the outer surface of said container adjacent said opening therein, said projecting elements being adapted to engage said cap member in a normal position thereof to prevent manual operation of said valve unit, said cap member having a plurality of recesses therein and being adapted to be rotated to a second position in which said recesses register with said projecting elements for manual operation of said valve unit.

12. A valve adapted to be sealed in an opening in a container, comprising a movable hollow plunger mounted partially within said opening and having a reduced diameter portion, a solid portion separating said plunger into an upper hollow section communicating with the exterior of the container and a lower hollow section communicating with the interior of the container, a first port extending through said reduced diameter portion adjacent a lower surface of said solid portion and communicating with said lower hollow section, and a second port extending through said reduced diameter portion adjacent an upper surface of said solid portion and com-

9

municating with said upper hollow section; a resilient deformable washer secured by an outer portion thereof to said container adjacent the opening therein and about said reduced diameter portion of said plunger and in frictional contact therewith, an inner portion of said washer having an unsupported surface thereof adjacent the container; resilient means to retain said plunger in a raised position within said opening and to retain said washer in a normally undeformed position, and manually operable means to depress said plunger whereby said washer is deformed in the direction of said unsupported

10

surface into sealing contact with said plunger above and below said ports thereby forming a channel between said plunger and said washer for communication between said ports and for fluid discharge from the interior to the exterior of said container.

References Cited in the file of this patent

UNITED STATES PATENTS

2,577,242	Tuttle et al. -----	Dec. 4, 1951
2,667,991	Boyer -----	Feb. 2, 1954