Nov. 10, 1959 B. EDWARDS 2,912,173

AEROSOL VALVE, VALVE ACTUATOR THEREFOR AND AEROSOL DISPENSING NOZZLE

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Fig. 1

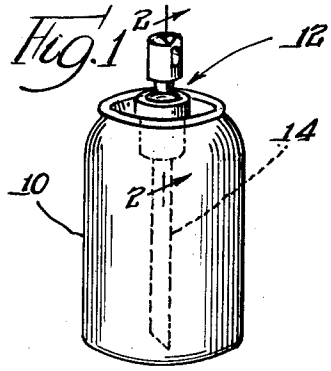


Fig. 2

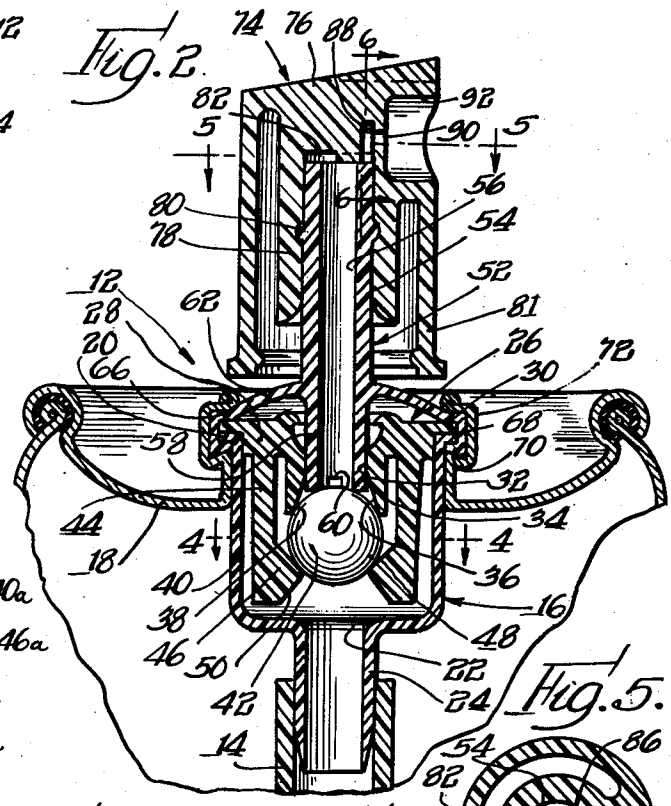


Fig. 7.

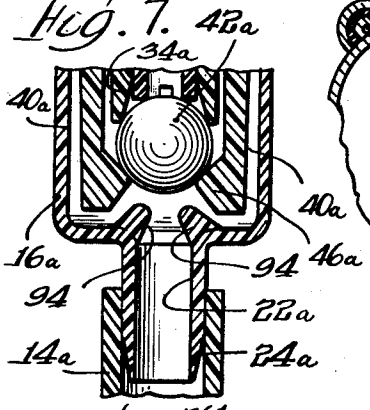


Fig. 8.

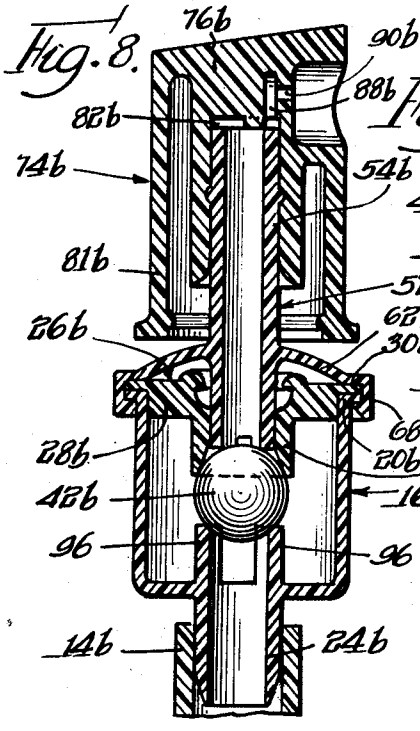


Fig. 3.

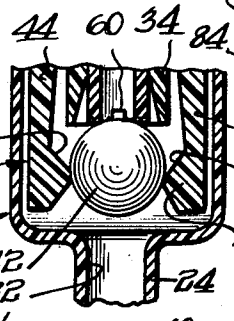


Fig. 4.

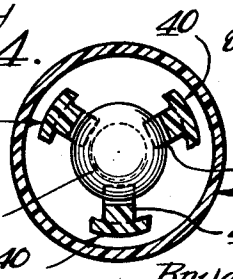


Fig. 5.

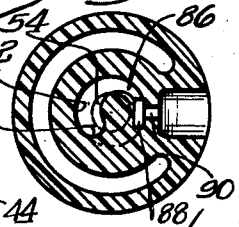
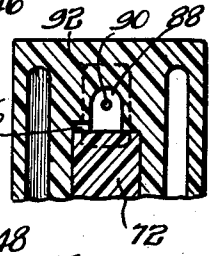


Fig. 6.



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AEROSOL VALVE, VALVE ACTUATOR THEREFOR AND AEROSOL DISPENSING NOZZLE

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7 Claims. (Cl. 239—471)

The present invention relates to a novel dispensing valve, and more particularly to a novel dispensing valve structure adapted to be used in a pressurized dispensing container.

An important object of the present invention is to provide a novel dispensing valve of the type contemplated herein which is of simple and economical construction while being adapted to insure proper atomization of a product being dispensed.

A further object of the present invention is to provide a novel dispensing valve structure comprising a plurality of parts which may be economically produced and readily assembled with each other and which are constructed so as to insure the prevention of improper leakage through the valve structure.

A more specific object of the present invention is to provide a novel dispensing valve structure including a plurality of parts which may be readily molded from a suitable resilient plastic material and which are constructed so as to include various integral resilient elements which serve normally to maintain the valve in a closed condition.

Other objects and advantages of the present invention will become apparent from the following description and the accompanying drawings wherein:

Fig. 1 is a perspective view showing a pressure dispensing container of the type contemplated herein;

Fig. 2 is an enlarged fragmentary sectional view taken along line 2—2 in Fig. 1 and shows a dispensing valve structure incorporating the features of the present invention;

Fig. 3 is a fragmentary sectional view similar to Fig. 2 but shows the manner in which the parts may be shifted to open the valve;

Fig. 4 is a cross sectional view taken along line 4—4 in Fig. 2;

Fig. 5 is a cross sectional view taken along line 5—5 in Fig. 2;

Fig. 6 is a fragmentary sectional view taken along line 6—6 in Fig. 2;

Fig. 7 is a fragmentary sectional view similar to Fig. 2 but showing a slightly modified form of the present invention; and

Fig. 8 is a sectional view similar to Fig. 2 but showing another embodiment of the present invention.

Referring now more specifically to the drawings wherein like parts are designated by the same numerals throughout the various figures, a pressurized dispensing container 10 is shown in Fig. 1, which container includes a dispensing valve structure 12 incorporating features of the present invention. A tube 14 is connected to and depends from the dispensing valve structure so that when the valve structure is open in the manner described below, the contents of the container will be forced upwardly through the tube and then through the discharge valve by the pressure within the container as will be understood.

Referring particularly to Figs. 2 and 3, it is seen that

the dispensing valve structure 12 comprises a cup-shaped member 16 adapted to be mounted in an aperture in a top section 18 of the container. The upper margin of the cup-shaped member 16 terminates in a radially outwardly projecting flange 20 which is provided for the purpose described below. The bottom of the cup-shaped member is provided with a central aperture or passageway 22 therethrough and is integrally joined to a short tube section 24. The tube section 24 is adapted to be joined as with a force fit to the depending tube 14. A member 26 is disposed within the cup-shaped member and is provided with an annular transversely disposed body portion 28 having a peripheral flange 30 overlying the flange 20 and having a central passageway 32 therethrough. A central sleeve portion 34 is integral with and depends from the body portion 28 and is formed with a downwardly and outwardly flaring internal wall 36 so as to provide a valve seat 38 adjacent its lower free end. A plurality of resilient finger elements 40 is provided for yieldably retaining a ball valve member 42 against the valve seat 38. Each of the finger elements 40 comprises an axially extending shank portion 44 extending downwardly from the body portion 28 along and radially outwardly from the sleeve portion 34 and beyond the lower end of the sleeve portion. Adjacent the lower end of each of the shank portions 44 there is provided a laterally inwardly projecting ball valve retaining portion 46 having a generally upwardly facing and inwardly and downwardly inclined cam surface 48. When the ball valve is manually depressed in the manner described below, it acts against the cam surfaces 48 of the finger elements so that the finger elements are caused to flex outwardly to permit the ball to be shifted downwardly from the valve seat as shown in Fig. 3. It will be appreciated that when the manual pressure is removed, the resilient finger elements return toward their normal positions and force the ball member against the valve seat. Each of the projecting portions 46 of the finger elements also has a generally downwardly facing and upwardly and inwardly inclined cam surface 50. These cam surfaces facilitate spreading of the finger elements during initial assembly of the ball valve, which assembly is accomplished by placing the ball valve against the surfaces 50 and pressing the ball valve until it is snapped through the restricted throat provided by the generally opposing tips of the laterally projecting portions 46.

A valve actuating and sealing member 52 is provided with a tubular portion 54 having a central axially extending passageway 56 therethrough, which tubular portion has a lower end section 58 adapted to extend through the passageway 32 in the member 26 and to engage the ball valve member 42. A notch 60 is formed in the lower edge of the tubular section 58 to permit the flow of fluid into the passageway 56 when the valve member is opened. The member 52 is also provided with a resilient diaphragm portion 62 integrally joined to an intermediate area of the tubular portion 54. The diaphragm portion has a substantially flat annular marginal portion 66 adapted to seat against the flange portion 30 of the member 26. A cylindrical flange section 68 extends axially from the section 66 and terminates in an annular inwardly projecting shoulder 70 which is adapted to be snapped beneath the flange 20 of the cup-shaped member. Thus, it is seen that the flanges 20 and 30 are clamped between the sections 66 and 70 of the diaphragm portion so that the various members are retained in assembled relationship and so that a seal is provided between the diaphragm portion and the flanges 20 and 30. This assembly of the valve structure may be readily interconnected with the top section 18 of the container by forming an annular portion 72 of the container top 18 beneath and above the flange means provided by the

flanges 20, 30, 66, 68 and 70 in the manner shown in Fig. 2.

The valve structure is completed by a dispensing cap member 74 which is assembled on an upwardly extending section of the tubular portion 54 of the actuating member. The cap member has a solid upper end or head portion 76 and a central sleeve portion 78 which receives the upper end of the tubular portion 54 with a fit such that there is a fluid tight seal between the parts. This may be accomplished by providing a force fit between the parts throughout the portions thereof which are in engagement, and/or by forming an annular rib 80 on the tubular portion 54, which rib will embed itself in the sleeve portion 78 when the parts are assembled as shown in Fig. 2. An annular skirt portion 81 depends from the head portion 76, the lower margin of which provides a stop for engaging the diaphragm portion and limiting downward movement of the actuating member so as to minimize any possibility of the ball valve being depressed too far and snapped beneath the projecting portions 46 of the finger portions 40.

It is important to note that the dispensing cap member is provided with swirl chamber means for causing fluid being dispensed to swirl in a manner which promotes the discharge of a liquid spray wherein the size of the liquid particles is quite small. For example, the valve structure may be constructed for creating a spray wherein the particle size is on the order of 20 microns or less, such a spray being commonly known as a space spray. The device may also be adapted for providing coarser sprays, if desired. As shown in Figs. 2, 5 and 6, the swirl chamber means comprises an arcuate recess or passageway 82 in the end wall of the cap member head portion 76 which abuts the upper end of the tubular actuating member portion 54. The recess or passageway 82 is relatively narrow in a direction extending axially of the axis of the tubular portion 54, and the recess extends generally horizontally or at right angles to said axis. As shown in Fig. 5, the horizontal cross section of the recess progressively decreases from an end 84 of the recess to an opposite end 86, and the upper end of the tubular portion 54 closes a considerable portion of one side of the recess so that fluid will enter the recess 82 adjacent its end 84 and flow in an arcuate path toward the end 86. The end 86 of the recess opens into an upstanding chamber 88 which is sufficiently narrow so that its lower end is closed by the tubular portion 54. Fluid is finally discharged from the chamber 88 through a laterally extending small discharge orifice 90. As shown in Figs. 2 and 6, the narrow end of the recess 82 opens into the recess or chamber 88 adjacent its lower end and in the direction of the major width of the chamber 88 so that a swirling motion is applied to the fluid flowing through the chamber or recess 82 and further swirling motion is imparted to the fluid as it enters the bottom end of the chamber 88 and flows upwardly and is directed by the curved upper end of this chamber. Preferably, the discharge orifice 90 opens into an enlarged recess 92 in the side of the cap member, which recess serves as a shield to prevent the spray from contacting the operator.

Fig. 7 shows a slightly modified form of the present invention which is similar to the above described structure as indicated by the application of identical reference numerals with the suffix *a* added to corresponding elements. This embodiment differs in that the cup-shaped member 16*a* is provided with a plurality of integral upwardly extending projections 94 around the passageway 22*a*. These projections extend beneath the finger portions 40*a* and are adapted to limit positively downward movement of the ball valve member so as to insure retention of the ball valve in operative relationship with the resilient fingers.

Fig. 8 shows another embodiment of the present invention which is similar to the structures described above as indicated by the application of identical reference numerals with the suffix *b* added to corresponding elements. This embodiment differs in that the resilient fingers for retaining the ball valve member are omitted from the member 26*b* and are replaced by finger elements 96 provided by a split tubular section integral with and extending upwardly from the bottom of the cup-shaped member 16*b*. The diameter of this tubular section is similar to that of the depending tubular section 24*b* and is smaller than the diameter of the ball valve member so that the valve member is normally retained against the valve seat.

It will be appreciated that the various members of all of the embodiments described above are formed so that they may be readily and economically molded from a suitable plastic material such as nylon, which is inherently resilient so as to provide the above mentioned finger elements and diaphragms with sufficient resiliency for urging the ball valve members against the valve seats. The ball valve member may be formed from various suitable materials such as plastic, metal, rubber and the like. It will be further appreciated that while the preferred embodiments of the present invention have been shown and described herein, various structural changes may be made without departing from the spirit and scope of the appended claims. For example, the flanges 20, 30 and 66 of the members 16, 26 and 52 could be adhesively secured together so that the depending flange 68 could be eliminated, if desired, and it is understood that the other embodiments might be similarly modified.

The invention is claimed as follows:

1. A dispensing valve for pressure containers and the like comprising a one-piece resilient plastic cup-shaped member having an opening therethrough and including an outwardly extending peripheral flange, a one-piece resilient plastic body member traversing an upper end of said cup-shaped member and having a central passageway therethrough and including a peripheral flange overlying said first mentioned flange, integral axially depending thin wall resilient tube means on said body member providing a downwardly facing resilient valve seat encircling the central passageway, a valve element shiftably disposed against said valve seat, a plurality of resilient finger means integral with and extending generally axially from one of said members and engaging said valve element and yieldably retaining the valve element against said valve seat, a tubular actuating member extending through said central passageway and depressible for shifting said valve element from said valve seat, a resilient diaphragm joined to said actuating member and having a peripheral flange overlying said first mentioned flange, and means interconnecting said flanges, said diaphragm normally maintaining said actuating member in a raised position.

2. A dispensing valve structure, as defined in claim 1, wherein said finger means are integral with and depend from said body member and include lateral projections engaging beneath said valve element, and wherein said cup-shaped member includes projection means extending upwardly from a bottom thereof for limiting downward movement of the valve element when the actuating member is depressed.

3. A dispensing valve, as defined in claim 1, wherein said finger means are integral with and extend upwardly from a bottom of said cup-shaped member for engaging beneath said valve element.

4. A dispensing valve structure for pressure containers and the like comprising plastic body means adapted to be connected to a container and having an axially extending passageway opening at an outer end thereof, said body means including an integral relatively thin wall resilient axially extending tubular section defining a portion of said passageway, said tubular section including a downwardly and outwardly flaring internal surface at its lower

end providing a valve seat having different maximum and minimum diameters, a valve member having an annular portion with a diameter between said maximum and minimum diameters shiftably disposed against said seat, an actuating member extending into said passageway and being depressible for shifting said valve member from said valve seat, said actuating member having an axially extending discharge passageway therethrough communicating with said first mentioned passageway, and a flexible plastic diaphragm joined to said actuating member and to a peripheral portion of said outer end for preventing leakage around said actuating member and for resiliently urging the actuating member to a raised position.

5. A dispensing valve structure for pressure containers and the like comprising means adapted to be connected to a container top and including a generally cup-shaped plastic member having a bottom with opening defining means for connection with depending conduit means, a plastic body member having an axially extending passageway therethrough opening at an outer end thereof, said body member being disposed within said cup-shaped member, said body member including an axially depending resilient tubular section defining a portion of said passageway and providing a generally downwardly facing yieldable valve seat, a valve element shiftably disposed against said valve seat, one of said members including integral resilient spring elements retaining said valve element for engagement with said valve seat, a plastic actuating member extending into said passageway and depressible for shifting said valve element from said valve seat, said actuating member having an axially extending bore therethrough communicating with said passageway, and a resilient plastic diaphragm integrally joined to said actuating member and connected to a peripheral portion of said outer end for preventing leakage around said actuating member and for resiliently biasing said actuating member outwardly after it has been depressed for shifting the valve member.

6. A dispensing valve structure, as defined in claim 5, which includes a one-piece plastic cap member mounted and sealed on an outer end of said actuating member, said cap member including a central bore receiving said actuating member and partially defined by a transverse end wall abutting an outer terminal end of the actuating member, said cap member including means defining an internal swirl chamber which is relatively narrow in one direction and relatively wide in another direction and which has one end intersecting said wall and closed by said terminal end of the actuating member, said cap

member including means defining a restricted discharge orifice communicating with said swirl chamber at a location substantially offset from said wall, and said cap member including arcuate recess means in said wall, which arcuate recess means has a relatively wide end partially communicating with said bore through said actuating member and a relatively narrow end covered by the terminal end of the actuating member and communicating with a narrower side of said swirl chamber.

7. A dispensing valve structure for pressure containers and the like comprising valve means adapted to be connected to a container and including an actuating member having a discharge bore therethrough and adapted to be manipulated for opening the valve means and permitting material to discharge from the container through said bore, and a cap member secured on an outer end portion of said actuating member and including a second bore snugly receiving said actuating member and partially defined by a transverse end wall, an outer terminal end of said actuating member abutting said wall, said cap member including means defining a swirl chamber which has an end intersecting said wall and closed by said terminal end of the actuating member and which is relatively narrow in one direction and relatively wide in another direction and elongated in another direction extending perpendicularly to said wall, said cap member including means defining a restricted discharge orifice communicating with said swirl chamber at a location offset from said wall along said last mentioned direction, and said cap member including means defining an elongated and arcuate recess in said wall and extending generally parallel to said terminal end of the actuating member, said arcuate recess having a relatively wide end only partially communicating with said bore in the actuating member and an opposite relatively narrow end covered by said terminal end of the actuating member and communicating with a narrow side of said swirl chamber.

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