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F. VENUS, JR
COMBINED ACTUATOR BUTTON AND SPRAY NOZZLE
DEVICES FOR AEROSOL VALVES
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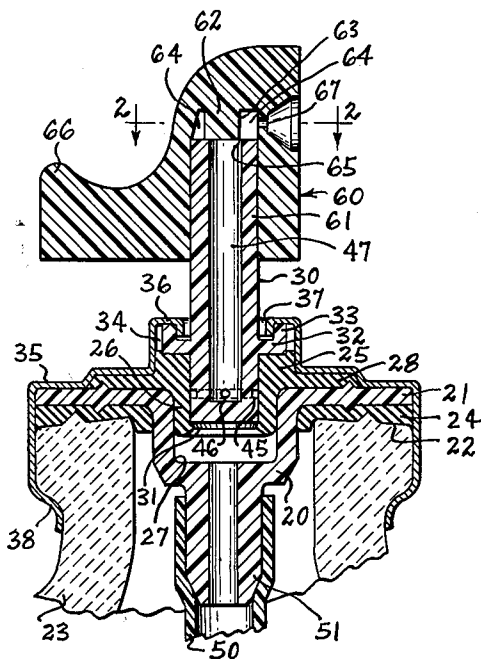


Fig. 1

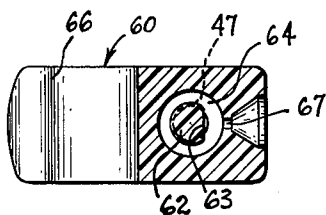


Fig. 2

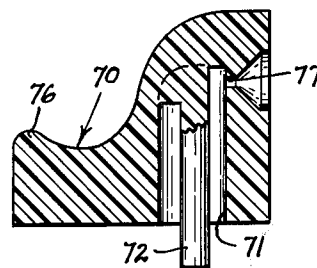


Fig. 4

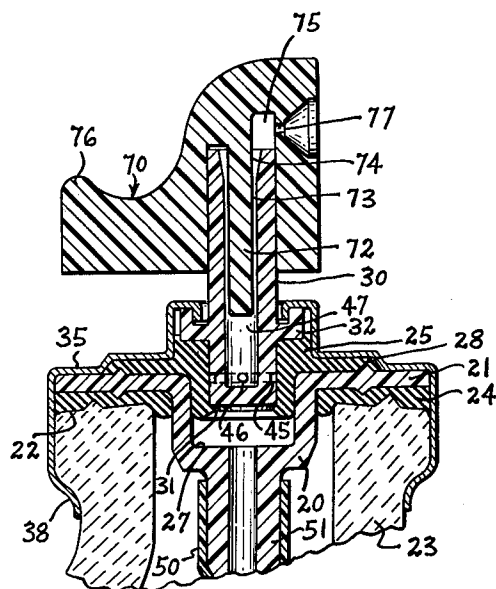


Fig. 3

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**COMBINED ACTUATOR BUTTON AND SPRAY
NOZZLE DEVICES FOR AEROSOL VALVES**

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845,477

6 Claims. (Cl. 239—573)

This invention relates to fluid dispensing means, and more particularly to a combined actuator button and spray nozzle for the dispensing of aerosols from self-contained pressure packages.

It is an object of the invention to provide an inexpensive actuator button for cooperation with a tubular valve stem of conventional type used in aerosol valves, wherein the valve stem is moved manually, either by tilting or by axial reciprocation, to operate the valve mechanism. Such actuation of the valve allows fluid to be released from a container in which it is packaged under pressure, and to be delivered through the tubular valve stem to a nozzle for discharge to atmosphere in the form of an aerosol or spray.

It is a particular object of this invention to provide, in association with the type of valve just discussed, an improved nozzle assembly which helps to break up fluid particles to aerosol size even when the fluid is delivered from the container at relatively low pressures.

In general, the novel valve actuator and nozzle means of the invention comprise a molded plastic body member having a socket closed at one end within which the free end of the tubular valve stem is adapted to be received in peripheral sealing engagement. The body member is provided with an aperture formed through one of its walls and communicating with the interior of the socket to form a discharge orifice from which the fluid is dispensed in the form of a fine cone of spray when the valve is actuated by manual depression or tilting of the stem through finger pressure applied to a face of the actuator. The aforesaid body member is also provided with an integral peg extending axially from the closed end of the socket, in circumferentially spaced relation to the side wall of the socket. This peg cooperates with the tubular valve stem to form a fixed restriction in the path of fluid flow to the discharge orifice, whereby more effective vaporization and atomization of the fluid passing from the stem to the discharge orifice is accomplished.

One form of the improved nozzle assembly comprises an actuator button containing a depending peg, the lower surface of which is coplanar with the upper end of the valve stem received in the socket of the button. The lower face of the peg is designed to cover all but a small part of the aperture in the end of the hollow valve stem. At the same time, the cross-sectional area of the peg is less than that of the interior of the actuator housing, whereby to provide an annular secondary expansion chamber surrounding the peg above the end of the valve stem. For example, the peg may be slightly larger in diameter than the diameter of the valve stem aperture, and the peg flattened on one side to provide a segmental orifice feeding from the primary expansion chamber in the interior of the valve stem to the secondary expansion chamber. A terminal orifice leads from the secondary expansion chamber to the atmosphere. It has been found that by providing the secondary expansion chamber, in association with the segmental orifice leading from the first to the second expansion chamber, the aerosol dispenser can be operated successfully at pressures as low as 6 to 8 p.s.i. (gauge) to produce a fine aerosol-type spray.

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Another specific form of improved nozzle assembly comprises an actuator button like that just described, but in this case the depending peg is slightly smaller in diameter than the diameter of the valve stem interior, which peg extends for some distance into the valve stem to form a constricted passage between the peg and the walls of the valve stem, whereby to impart turbulence to the fluid passing therethrough. Fluid from this constricted passage passes to a secondary expansion chamber and thence through a terminal orifice to the atmosphere.

The invention is illustrated by the specific embodiments shown in the accompanying drawings and described more fully hereinafter. In the drawings,

FIG. 1 is a vertical cross-sectional view showing a portion of a conventional dispensing container, and aerosol valve means to which a combined actuator button and dispensing nozzle of the invention has been attached;

FIG. 2 is a plan view, partly in section, taken on line 2—2 of FIG. 1;

FIG. 3 is a view similar to that of FIG. 1 but showing a modified form of actuator button; and

FIG. 4 is a vertical cross-section of the actuator button of FIG. 3.

Referring now to FIG. 1, in assembling the new valve, a rigid valve cup 20, preferably formed of plastic or other suitable material, is so placed that its flange 21 contacts the lip 22 of the container 23, which may have been previously filled with the substance which it is desired to dispense together with a propellant fluid such as one of the Freons, or methylene chloride, or, alternatively, the container may be filled through the valve after assembly has been completed. In order to insure that the valve when assembled will tightly seal the container, gasket 24 may be interposed between flange 21 and the container 23. The valve closing member or valve seat 25, constructed of resilient material, such as rubber, is then placed so that its body portion 26 is contained within the central cavity 27 of valve cup 20. The flange 28 of seat 25 will contact the upper surface of the valve cup flange 21. Valve stem 30, which is slightly greater in diameter than the seat passage 31, is then inserted into the passage 31 of valve seat 25 and forced downward until valve stem flange 32, which is provided with an upstanding rim 33 about its periphery, contacts valve seat 25. When valve stem 30 is inserted in seat passage 31, it will force the material of seat 25 outwardly to insure a tight fit of the body portion 26 with the wall of cavity 27.

An apertured sealing cover 35 is then fitted over the valve cup 20, valve seat 25, and valve stem flange 32, so that the stem 30 projects outwardly through the aperture in the cover member. The latter is formed to provide an upwardly recessed socket 36 surrounding the aperture, which socket conforms generally to the contours of flange 32 and valve seat 25. Surrounding the aperture in socket 36 there is a downwardly or inwardly directed rim 37 which terminates within the periphery of the upstanding rim 33 of valve stem flange 32. The cover skirt 38 is then pressed and deformed against the body of the container 23 so as to insure a tight fit therewith, the sealing cover 35 and valve cup 20 then cooperating to form a valve housing exteriorly confining and positioning the resilient valve closing member or seat 25. Actuator 60 is then fitted on the open end of valve stem 30 to complete the assembly.

It will be noted that valve stem 30 is provided with an annular depression 45 and with ports 46 communicating between the hollow interior 47 of the valve stem 30 and the annular depression 45, which is normally sealed by the valve seat 25. When it is desired to dispense fluid from the container, force is applied to flange 66 of ac-

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tuator 60 which will force the valve stem 30 to pivot about a definite pivot point formed by engagement of rim 33 with flange 36 of the housing. The opposite side of valve stem flange 32 will press against the upper portion of valve seat 25, deforming the material thereof, and causing an upward force to be applied to flange 32 by seat 25. Simultaneously, stem 30 will be angularly displaced so that its lower end will press against and deform one side of the body portion 26 of seat 25, while removing a portion of the annular depression 45, from sealing contact with valve seat 25. In this position fluid may pass through eductor tube 50, which is secured to valve cup 20 as by frictional engagement with dependent nipple 51, through the stem interior 47, and through orifice 67 to the atmosphere. When pressure on the flange 66 is released, the valve stem 30 will immediately snap back into the position shown in FIG. 1 under the urging of the deformed material of the valve seat 25, a lateral force being exerted against the valve stem 30 by the rubber forming the body portion 26 of the valve seat 25, while an upward force is exerted against the valve stem flange 32 by the deformed material of the valve seat 25 at the upper edge thereof. Provision is made to compensate for the swelling of the material of valve seat 25 by solvent action or otherwise by providing ample space in the central cavity 27 for the flow of seat material and by providing an annular space 34 adjacent the valve stem flange 32. Pressure of the cup body against the body portion of the seat will maintain effective contact between the seat and the annular depression even during conditions of extreme swelling.

In order to prevent binding of the upper inner edge of rim 33 against the down-turned flange 37 when the valve stem is canted, that edge of the rim is beveled off, as can be seen in FIG. 1 for example. This further insures against lateral displacement of the valve stem in the sealing cover when actuated to effect dispensing of the container contents.

Turning now to a detailed discussion of one form of the novel nozzle assembly of the present invention, it will be observed that actuator 60 is provided with a bore 61 of a diameter such that valve stem 30 may be fitted therein and be held by frictional contact. At the closed end of bore 61 is a peg 62, which is flattened on one side to form a vertical peg face 63. When the nozzle is fitted into place on valve stem 30, it will be found that, since peg 62 is slightly greater in cross-sectional area than stem interior 47, it covers all but a narrow opening of the aperture in the valve stem, thus providing an orifice to an annular secondary expansion chamber 64 from the primary expansion chamber, i.e. the passage 47 of the valve stem. This secondary expansion chamber is formed by the wall of peg 62, the wall and end of bore 61, and the end of valve stem. Communication between stem interior 47 and expansion chamber 64 is had via segmental orifice 65, defined by the upper edge of valve stem 30 and the lower edge of peg face 63.

When the valve is operated by depressing actuator flange 66, whereby to effect an angular displacement of valve stem 30 so as to break contact between valve seat 25 and the annular depression 45, material will flow, under the force exerted by the propellant, through eductor tube 50 and ports 46, wherein the spray material is broken up into droplets, through stem interior 47, forming a first expansion chamber, then through segmental orifice 65, effecting a further breakdown of the droplets, through expansion chamber 64, in which a swirling motion is given to the stream, and finally to the atmosphere through terminal orifice 67, whereby to effect a still further breakdown of particle size. In this connection, the shape of orifice 65 is important, since due to its very narrow width, it is effective to break droplets down to very small size, while the area of the orifice is still sufficient to pass the desired quantity of spray material even when the pressure in container 23 is very low, say in the order of 4 to 8 p.s.i.

Turning now to FIGS. 3 and 4, in which a somewhat

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different form of nozzle assembly is shown, it will be seen that actuator 70 is again provided with a bore 71, of a diameter such that valve stem 30 may be fitted therein and be held by frictional contact therewith. At the closed end of bore 71 will be found a peg 72, of a cross-sectional area slightly less than that of stem interior 47, and which extends down into valve stem 30 for a considerable portion of its length, as illustrated in FIG. 3, forming an annular constricted flow passage 73 between the peg 72 and the interior wall of valve stem 30. The upper end of valve stem 30 is countersunk to a slight degree, providing a flow path 74 of gradually increasing cross-sectional area leading into secondary expansion chamber 75.

When the valve is operated by pressing down on actuator flange 76, to effect an angular displacement of valve stem 30 to break contact between valve seat 25 and the annular depression 45, fluid will flow through eductor tube 50 and ports 46, wherein the liquid is broken up into droplets, through stem interior 47, which forms a first expansion chamber, then through flow passage 73, where sufficient turbulence is imparted to the fluid to cause a further breakdown in particle size, thence through expansion chamber 75, and to the atmosphere via terminal orifice 77.

As may be seen from the foregoing description, the valve in combination with the novel nozzle assembly provides a series of three orifices, with intervening expansion chambers, to insure breakdown of spray material to aerosol size even when low pressures are employed to force the spray material through the orifices and associated expansion chambers to the atmosphere. At the same time, the construction is such as to be capable of production at extremely low cost.

Various specific changes are possible, within the scope of the invention, from the constructions specifically illustrated and described hereinabove. Such modifications will be apparent to those skilled in the art and the invention is accordingly not limited to the specific illustrations herein.

This application is a division of application Ser. No. 438,543, filed June 22, 1954, and now abandoned.

What is claimed is:

1. In a combined actuator button and dispensing nozzle for an aerosol dispensing valve having a movable tubular valve stem providing a passage through which fluid is delivered when the valve is opened by actuation of said stem, said actuator button comprising a molded plastic body member having a socket closed at one end within which the valve stem is adapted to be received in peripheral sealing engagement, said body member having an aperture formed through one of its walls to communicate with the interior of said socket adjacent its closed end to provide a discharge orifice, an integral peg extending axially from the closed end of said socket in circumferentially spaced relation to the side wall thereof, said peg having an end face disposed to partially block said valve stem passage to form an orifice so sized as to break down the fluid droplets being dispensed to a very small size while still passing a desired quantity of the fluid at low pressures.

2. A combined aerosol actuator button and dispensing nozzle as defined in claim 1, wherein said peg is of slightly greater cross-sectional area than that of the tubular stem passage, said peg limiting the insertion of said stem into said socket by engagement of its end wall with the end of the valve stem, said peg having a flattened portion defining an edge at the projecting end of said peg, which edge intersects the open upper end of the valve stem passage to define said second-mentioned orifice.

3. A combined aerosol button and dispensing nozzle as defined in claim 1, wherein said actuator peg is of slightly smaller cross-sectional area than the passage in the tubular stem, said peg being of a length sufficient to extend into the passage of the valve stem in closely spaced

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relation when assembled therewith to form a constricted passage that serves as said second-mentioned orifice.

4. Dispensing valve means comprising a resilient annular valve closing member, a tubular valve stem having an axial passage closed at its inner end, said closed end being resiliently gripped completely around its periphery by said annular member in the normal position of said stem, a rigid valve housing enclosing said member and the inner end of said stem and supporting them to permit manual tilting of said stem relative to said housing, said housing including means for confining said valve closing member laterally to cause it to grip the inner end of said stem, a stiff flange encircling said stem intermediate the ends thereof, said flange being disposed between and engaging said valve housing and resilient member, respectively, and having a peripheral portion which bears against said housing when said stem is manually tilted to provide a positive pivot point for tilting movement of said stem, and an inlet passage through the wall of said stem communicating with the interior thereof at a location adjacent its closed end, said passage being sealed off by said member in the normal position of said valve stem but opened upon tilting of the latter, and an actuator for said valve means forming a spray nozzle at the outer end of said stem, said actuator comprising a body member having a socket closed at one end within which said tubular valve stem is received in peripheral sealing engagement with the wall thereof, said body member having an aperture formed through a wall thereof and communicating with the interior of said socket to provide a discharge

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orifice, said body member having a peg extending axially from the closed end of said socket into closely spaced relation with the passage in said valve stem, said peg having a cross-sectional area different from that of said stem passage whereby said peg and valve stem define between them a restricted flow passage leading from the interior of said valve stem to said discharge orifice.

5. Dispensing means as defined in claim 4, wherein said actuator peg is of slightly greater cross-sectional area than that of said tubular stem passage and said peg contacts the end of the valve stem, whereby to form an annular expansion chamber defined by the peg wall, the wall and closed end of the actuator socket and the end of the valve stem, said peg having a flattened section to form a peg face, and said restricted flow passage comprising a segmentally shaped orifice defined by the edge of the peg face and a portion of the upper edge of the valve stem.

6. Dispensing means as defined in claim 4, wherein said actuator peg is of slightly lesser cross-sectional area than that of said tubular stem passage and extends into the passage of said valve stem, said peg and the interior wall of said valve stem passage forming said restricted flow passage leading from the interior of said valve stem to said discharge orifice in said actuator.

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