

April 16, 1957

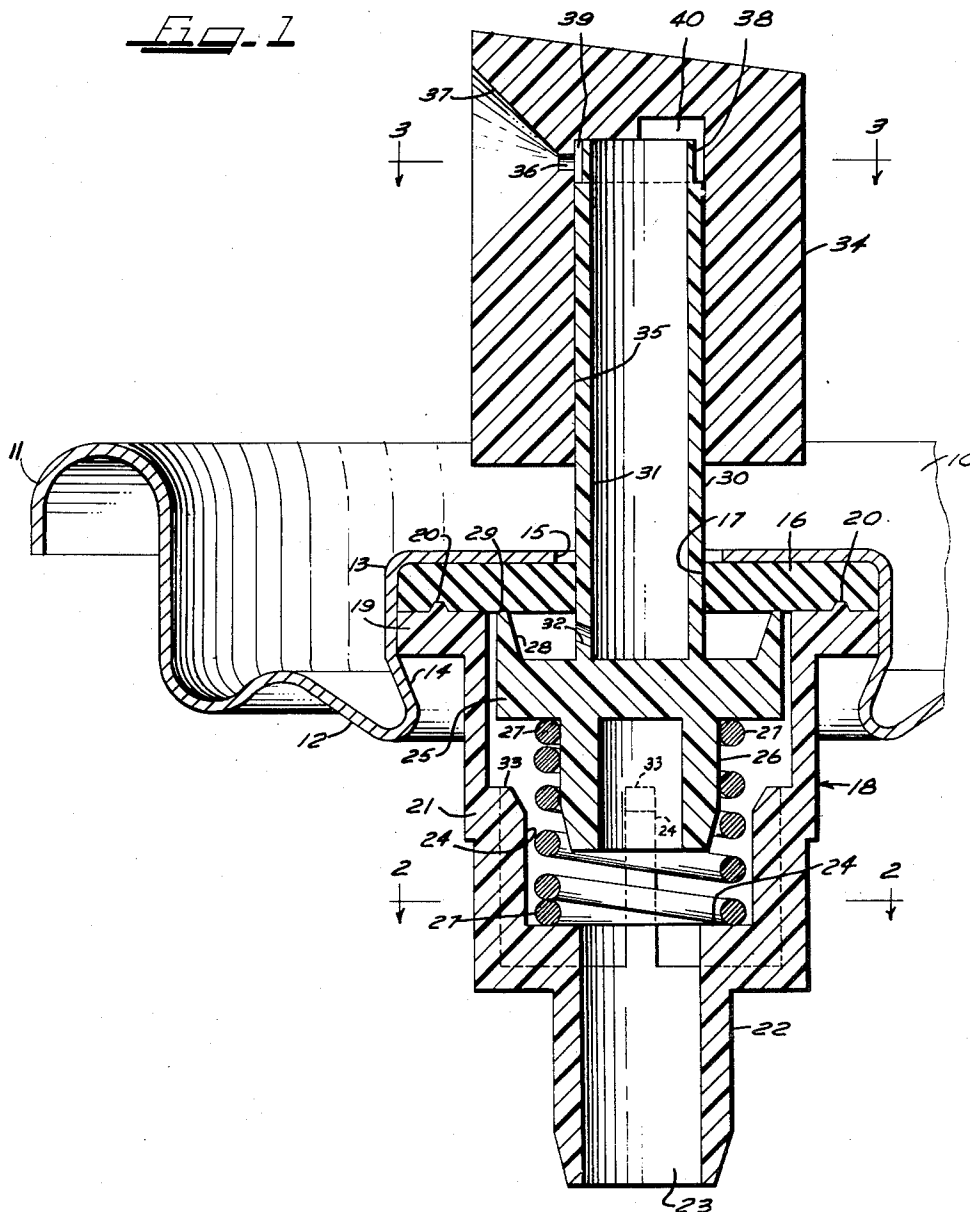
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2,789,012

VALVE MECHANISM FOR DISPENSING APPARATUS

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2 Sheets-Sheet 1



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VALVE MECHANISM FOR DISPENSING APPARATUS

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2 Sheets-Sheet 2

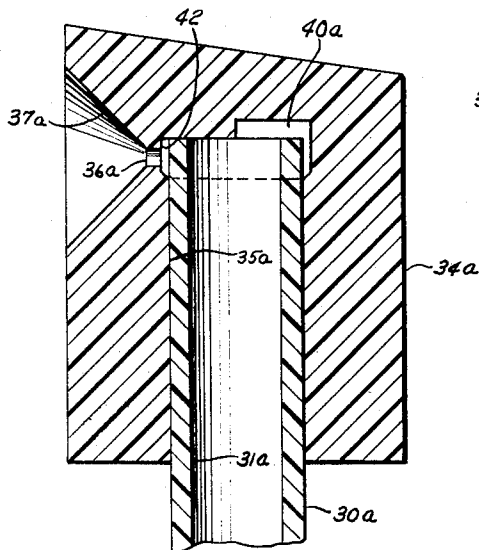


Fig-4

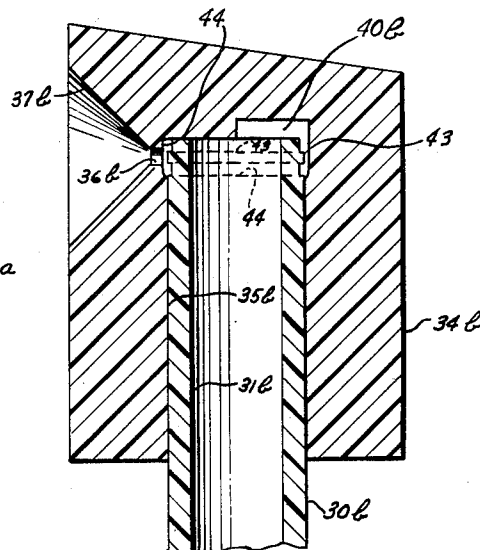


Fig-5

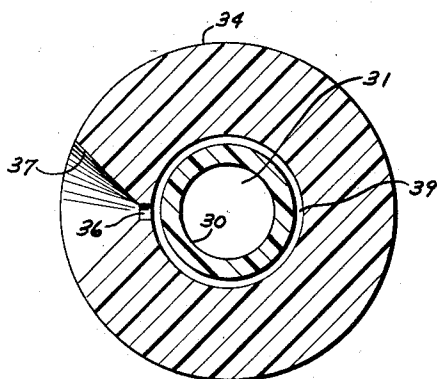


Fig-3

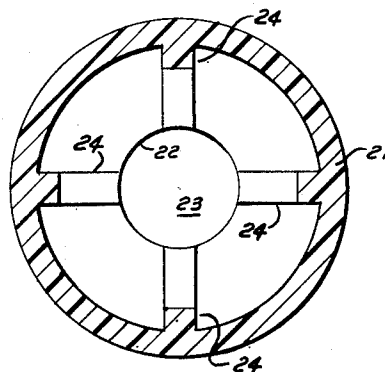


Fig-2

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1

2,789,012

VALVE MECHANISM FOR DISPENSING APPARATUS

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6 Claims. (Cl. 299—95)

This invention relates to valve mechanisms and more particularly to an improved valve for dispensing, in spray or aerosol form, materials contained under pressure. The valve mechanism herein is of the type set forth in my co-pending application Serial No. 457,769, filed September 22, 1954, of which this application is a continuation-in-

part. The valve of the present invention is especially adapted for use with aerosol containers. Generally, the construction provides a valve element movable relative to a gasket for opening and sealing the interior of a container to the atmosphere. A hollow stem, extending outwardly of the container from the valve element, is actuated by a removable spray tip or press button. The button is arranged to embrace the end of the valve stem.

Adjacent surfaces of the button and stem, at or near the end of the stem, are shaped to provide a mixing and expansion chamber or passageway connecting the hollow valve stem with an orifice through which contained materials are sprayed into the atmosphere. The present valve construction provides several such arrangements designed to effect a more thorough mixing of materials and an ejection thereof in a finely divided spray form.

In the usual dispensing valve construction for aerosol containers there is provided but one flow passageway system connecting the interior of the container with the atmosphere. This one system is used both for filling and emptying the container. Generally, such a construction is not satisfactory. One or more orifices of relatively small cross-section are desirable in the ejection passageway system to insure the proper mixture and to effect a fine spray. But the restriction of the orifices makes it impossible to rapidly fill the container. As a result, the filling of containers through such valves does not lend itself to assembly line operations.

To overcome this objectionable feature, the present valve is provided with an additional flow passageway system for filling operations. The passageways in this additional system are relatively large. As both passageway systems are available during filling operations, there is thus insured the quick and economical filling of a container.

As important object, then, is the provision in a dispensing valve mechanism of different flow passageway systems for the filling of a container and the ejection of the contents.

Another object of the invention is the provision in a dispensing valve mechanism of larger flow passageways for the filling of an applied container than for the dispensing of the contents.

Still another object of the invention is the provision in a dispensing valve mechanism of a system of flow orifices and passageways of such size and relative position as to enhance the aerosol vaporization and atomization of a contained fluid during ejection or discharge of the containers.

Another and further object of the invention is the provision in a dispensing valve mechanism of a hollow stem

2

and embracing press button having adjacent portions, at or near the end of the stem, of such shape and size as to provide chambers or passageways for more thoroughly mixing the materials being discharged during flow between the stem and an atmospheric discharge orifice in the button.

Another and still further object of the invention is the provision of a dispensing valve mechanism so constructed as to readily lend itself to economical mass production without the use of soldering, welding, brazing or threading.

Still another and further object of the invention is the provision of a dispensing valve mechanism which is extremely simple in construction, efficient in operation, and of a type which lends itself to being formed of plastic materials.

Other objects and advantages of the invention will become more apparent from the following detailed description taken in connection with the accompanying drawings, in which:

Figure 1 is a fragmental vertical cross-sectional view of the valve device of this invention, shown as being mounted in a container;

Figure 2 is a horizontal cross-sectional view, taken along a plane indicated by the line 2—2 of Figure 1, showing details of interior rib construction of the valve body;

Figure 3 is a horizontal cross-sectional view, taken along a plane indicated by the line 3—3 of Figure 1, showing the dispensing channel arrangement of the valve stem and spray tip;

Figure 4 is a fragmental vertical cross-sectional view, similar to Figure 1, illustrating a modified form of construction of valve stem and spray tip; and,

Figure 5 is a fragmental vertical cross-sectional view, similar to Figures 1 and 2, showing another modified form of construction of valve stem and spray tip.

Referring now to Figure 1 of the drawings, the reference numeral 10 designates a cup-shaped mounting cap for a container designed for holding aerosol material under pressure. At its upper edge, the top wall of the container cap is formed into an outwardly and downwardly extending bead 11. The container proper (not shown) may be assembled to the container cap in any desired fashion. One arrangement could be the forming of a wall bead in the container to be complementarily embraced in crimped engagement by the bead 11 of the cap. A central portion of the bottom 12 of the cap is shaped as an inverted cup 13 to provide an inwardly sloping shoulder 14 for a purpose to be described in detail later herein. A central opening 15 is provided in the top wall of the cup 13.

The container and mounting cap may be made of any suitable material which will withstand internal pressures exerted by the particular dispersant utilized as the propellant in the spray or aerosol composition to be contained. Usually, the material is metal.

A disc type gasket 16, formed of a suitable material such as natural or synthetic rubber, or the like, is seated within the inverted cup 13 against the top wall thereof. A central opening 17 in the gasket is smaller than and concentric with the opening 15 in the retaining cap. A valve housing 18, preferably of metal or a non-resilient plastic, has an outwardly extending flange 19 sized to seat in the container cap against the gasket 16. The sloping shoulder 14, formed after the gasket and housing are assembled in place and serves to maintain the housing flange in pressure engagement with the gasket. The gasket 16 is thereby retained within and squeezed into tight peripheral sealing engagement with adjacent walls of the container cap. An annular rib or sealing ring 20, on the upper surface

of the housing flange 19, is impressed by pressure of the crimp into the disc gasket thereby effecting a face sealing of the assembled parts.

The valve housing 18 has a tubular body 21 depending from the flange and terminating at its lower end in a tubular section 22 having a flow opening 23 therein. The tubular section is adapted to receive one end of a flexible dip tube (not shown) designed to extend sufficiently into the container whereby contents are always ejected through the valve from or near the bottom of the container.

As best shown in Figures 1 and 2, the tubular housing body 21 has a plurality of circumferentially spaced interior lugs or ribs 24, 24 extending along the bottom wall and partially along the vertical sidewall thereof.

A cup-shaped valve body 25, is sized to fit loosely within the housing body 21 between the lugs 24, 24 and the gasket 16. A boss 26, on the lower side of the valve body, is embraced by one end of a coiled spring 27 the other end of which seats on the horizontal portions of the ribs 24, 24. The inside of the cup-shaped valve body is tapered as at 28 to provide a narrow seal rim 29. The coiled spring 27 normally urges the valve body into rim engagement with the gasket 16 to seal the interiors of both the valve and the container. A tubular valve stem 30 extends from the cup portion of the valve body through the gasket 16 and the container cap opening 15. A central channel 31 in the stem is connected to the interior of the cup of the valve body by means of one or more openings 32 in the sidewall of the stem adjacent its base.

The valve body is arranged for movement from its uppermost position in rim engagement, as shown in Figure 1, to seated position on the top edges 33, 33 of the lugs 24, 24. This distance of movement is less than the length of the boss 26. Consequently, the interiors of the tubular body 21 and the depending tubular section 22 are always in flow communication. The flow area therebetween is enhanced by the spaces between adjacent lugs 24, 24.

A spray tip or press button 34 has an axial bore 35 extending partially along its length to receive therein the free end of the tubular valve stem 30. A terminal orifice 36, located adjacent the end of the axial bore 35, connects the axial bore with a nozzle outlet 37. In order to connect the orifice 36 in flow communication with the central channel 31 of the stem, the free end 38 of the stem is reduced in diameter to provide a peripheral channel 39. Also, the axial bore 35 of the spray tip is partially extended within the button to provide an expansion chamber 40. By this arrangement, fluid flowing from the tubular stem passes through the expansion chamber 40, around the peripheral channel 39, and into the orifice 36 and the nozzle outlet 37 to the atmosphere.

The valve member, with its spring boss and stem, and the housing may both be constructed of any suitable material but it is preferred that they be of rigid plastic. The press button is also a molded plastic, preferably of a resilient type such as polyethylene. The particular material used should have the properties of rigidity with sufficient resilience to permit easy engagement and disengagement of the button relative to the stem but with sufficient friction therebetween to eliminate any inadvertent disengagement.

Operation of the valve mechanism will not be described.

The valve mechanism as shown in Figure 1 is mounted on the container with the press button removed. Mechanism for filling the container is then applied around the valve stem and the aerosol material and propellant are injected under pressure. The material being injected may flow either through the valve stem and the connecting channel 32 or directly through the container opening 15 between the gasket 16 and the stem 30. This latter channel is provided by a flexing of the gasket 16 away from the stem when filling pressure is exerted. Normally, the internal pressure of the propellant serves to hold the

gasket in sealing engagement with the container cap and the valve stem. The filling pressure overcomes the opposed pressure exerted by the coiled spring 27 thereby effecting a movement of the valve body away from the gasket 16. Flow of the filling material and propellant is then directed into the valve housing, through the channel 23 and the dip tube, and into the container. When the container is filled, a release of the filling pressure effects a sealing of the valve housing by the rim engagement of the valve body and gasket through pressure exerted by the coiled spring.

As the filling channels have two paths, one of which provides passageways which are relatively large, the container is quickly and easily filled.

The press button 34 is then applied to the valve stem 30 in seated engagement therewith. The pressure required to snap the press button on the valve stem, preferably, should not overcome the compression of the coiled spring 27 and the internal pressure exerted by the contained aerosol mixture acting on the valve body to help maintain it in sealed engagement with the gasket. It is desired, however, that the press fit of the button on the valve stem provide sufficient friction therebetween to eliminate the possibility of inadvertent removal.

The valve mechanism is now ready for operation to eject the aerosol mixture. When the press button is manually depressed to break the rim engagement of the valve body and the gasket, the flow channel through the valve from the container to the atmosphere is opened to flow. The pressurized aerosol mixture flows through the channel 23, into the interior of the valve housing 21, into the cup of the valve body, and successively through the orifice 32, the interior of the stem 30, the expansion chamber 40, the peripheral channel 39, the orifice 36, and the nozzle outlet 37 into the atmosphere. The provision in a flow channel of a plurality of restricted orifices, particularly immediately preceding ejection into the atmosphere, aid in obtaining a finer vaporization or atomization. A release of manual pressure on the button serves to effect an automatic closing of the valve by the coiled spring, the parts assuming positions shown in Figure 1.

Figures 4 and 5 illustrate modified forms of construction of the valve stem and the press button or spray tip.

In Figure 4 is shown a valve stem 30a of uniform outside diameter along its entire length and having a central channel 31a therethrough. The cooperating press button 34a has an axial bore 35a which is partially extended to provide an expansion chamber 40a. It will be noted that the expansion chamber is extended in directions both longitudinally and laterally of the axial bore 35a for a purpose to be more apparent hereafter. As in the press button of Figure 1, the modified button 34a has a terminal orifice 36a and a nozzle outlet 37a. A peripheral groove 42 is formed at the end of the axial bore 35a in alignment with the terminal orifice 36a and connected with the expansion chamber 40a. There is thus provided a flow channel connecting the central channel 31a of the stem and the terminal orifice 36a in the press button.

In Figure 5 there is illustrated another modified form of construction of the press button and valve stem. In this form of construction the free end of the valve stem 30b has spaced grooves defining a circumferentially extending rib 43. This rib is so positioned as to be in alignment with the terminal orifice 36b of the press button 34b. The press button has an axial bore 35b which, as in Figure 4, is partially extended to provide an expansion chamber 40b. A peripheral groove 44, at the end of the axial bore 35b, provides a flow space around the end of the stem connecting the interior channel 31b of the stem and the terminal orifice 36b of the button through the expansion chamber 40b. As material under pressure is ejected to the atmosphere through the nozzle outlet 37b, the flow around the groove 44 is di-

5

rected in separate streams on opposite sides of the rib 43 which combine for entry into the terminal orifice 36. This direction of effluent streams against each other effects a finer vaporization and atomization of the aerosol material just prior to ejection into the atmosphere.

Except for the changes indicated, the stems and press buttons of Figures 4 and 5 are constructed and operate in a manner similar to like parts shown in Figure 1.

Although the invention has been described herein more or less precisely as to details, it is to be understood that the invention is not to be limited thereby, as changes may be made in the arrangement and proportion of parts, and equivalents may be substituted without departing from the spirit and scope of the invention.

I claim as my invention:

1. A valve mechanism comprising a resilient seal having an opening therethrough, a cup-shaped valve element movable into and out of rim engagement with said seal around the opening, a tubular stem extending from said valve element through and tightly embraced by the seal and arranged in flow communication with the cup of the valve element, and an axially bored button embracing said stem and having a flow channel to the exterior thereof, the end of the button bore being partially extended beyond the end of the stem to define an expansion chamber in communication with the stem, and a peripheral chamber surrounding the stem and connecting the expansion chamber with the channel to the exterior of the button.

2. A valve mechanism for a container having a valve mounting opening, comprising a resilient gasket having an opening in alignment with the container mounting opening, a valve housing mounted in the container in sealed engagement with said gasket and having an inlet opening therein, a cup-shaped valve body movable into and out of rim engagement with said gasket around the opening thereof, a coiled spring between said valve body and housing for normally maintaining the body in engagement with the gasket, a tubular stem extending from said valve body through the gasket and container openings and tightly embraced by said gasket, said stem having a flow channel connecting the interiors of the stem and valve body cup and also a diametrically reduced end portion, a longitudinally bored actuating button removably embracing said stem and having a flow channel to the exterior thereof in alignment with the reduced end of the stem, the bore of said actuating button being partially extended beyond the end of the stem to define an expansion chamber connecting the space around the reduced end of the stem and the interior thereof, and means defining a flow channel from the housing inlet around and along the valve body.

3. A valve mechanism for a container having a valve mounting opening comprising a resilient gasket having an opening in alignment with the valve mounting opening, a valve housing mounted in the container in sealed engagement with said gasket and having an inlet opening therein, a cup-shaped valve body movable into and out of rim engagement with said gasket around the opening thereof, means normally maintaining the body in engagement with the gasket, a tubular stem extending from said valve body through the gasket and valve openings and snugly embraced by said gasket, said stem having a flow channel at one end connecting the interiors of the stem and valve body cup, a diametrically reduced portion at the other end of said stem, a longitudinally bored actuating button embracing said stem and having a flow channel to the exterior thereof in communication with the peripheral chamber defined by the reduced end of the stem and said bore, the bore of said actuating button being partially extended beyond the end of the

6

stem to define an expansion chamber connecting the peripheral chamber with the interior of the stem, and means defining a flow channel from the housing inlet around and along the valve body.

4. A valve mechanism for a container having a valve mounting opening comprising a resilient gasket having an opening in alignment with the valve mounting opening, a valve housing mounted in sealed engagement with said gasket and having an inlet opening therein, a cup-shaped valve body within said housing movable into and out of rim engagement with said gasket around the opening therein, means normally maintaining the body in engagement with the gasket, a tubular stem extending from said valve body through the gasket and valve openings and snugly embraced by said gasket, said stem being open at its free end and having a flow channel near its other end connecting the interiors of the stem and valve body cup, a diametrically reduced end portion on the free end of said stem, a longitudinally bored actuating button removably embracing said stem and having a flow channel to the exterior thereof in communication with the peripheral chamber defined by the reduced end of the stem and said bore, and means connecting the interior of the stem with said peripheral chamber in an area remote from the flow channel to the exterior.

5. A valve mechanism for a container having a valve mounting opening comprising a resilient gasket having an opening in alignment with the valve mounting opening, a cup-shaped valve body movable into and out of rim engagement with said gasket around the opening therein, a spring between said valve body and housing for normally maintaining the body in engagement with the gasket, a tubular stem extending from said valve body through the gasket and valve openings and snugly embraced by said gasket, said stem having a flow channel at one end connecting the interiors of the stem and valve body cup, a diametrically reduced portion at the other end of said stem, a longitudinally bored actuating button embracing said stem and having a flow channel to the exterior thereof in communication with the peripheral chamber defined by the reduced end of the stem and said bore, and the bore of said actuating button in an area remote from the flow channel being extended beyond the end of the stem to define an expansion chamber connecting the peripheral chamber with the interior of the stem.

6. A valve mechanism for a container having a valve mounting opening comprising a resiliently yieldable gasket having an opening in alignment with the valve mounting opening, a cup-shaped valve body movable into and out of sealing engagement with said gasket around the opening therein, means normally maintaining the body in engagement with the gasket, a tubular stem extending from said valve body through the gasket and valve openings and snugly embraced by said gasket, said stem being open at its free end and having a flow channel near its other end connecting the interiors of the stem and valve body cup, a diametrically reduced end portion on the free end of said stem, a longitudinally bored actuating button removably embracing said stem and having a flow channel to the exterior thereof in communication with the peripheral chamber defined by the reduced end of the stem, and said bore, and means connecting the interior of the stem with said peripheral chamber in an area remote from the flow channel to the exterior.

References Cited in the file of this patent

UNITED STATES PATENTS

2,667,991	Boyer	Feb. 2, 1954
2,709,111	Green	May 24, 1955