

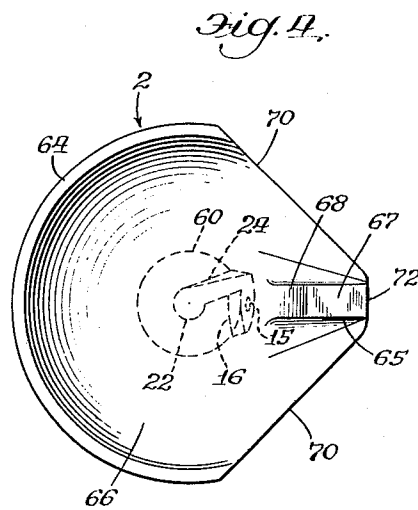
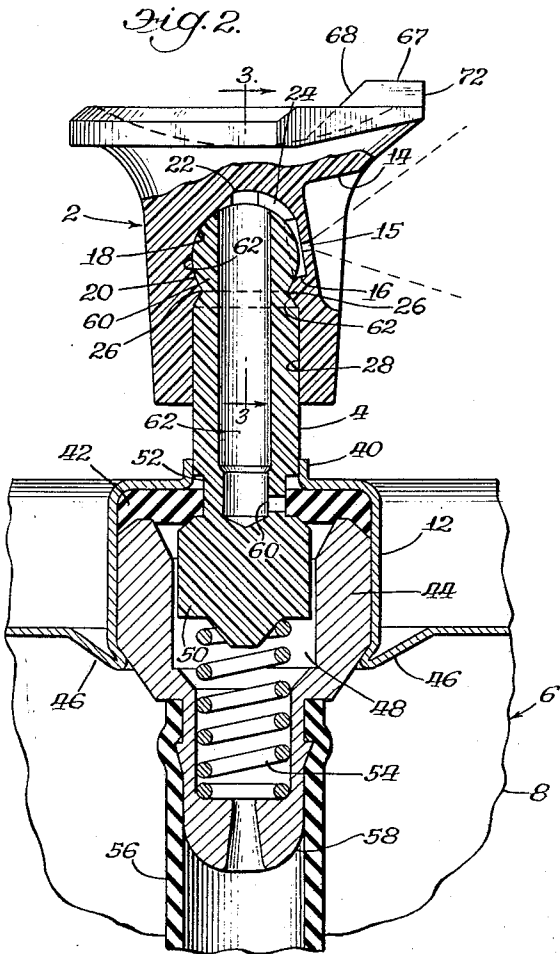
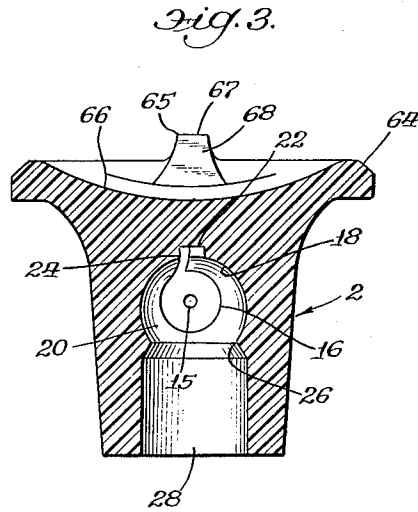
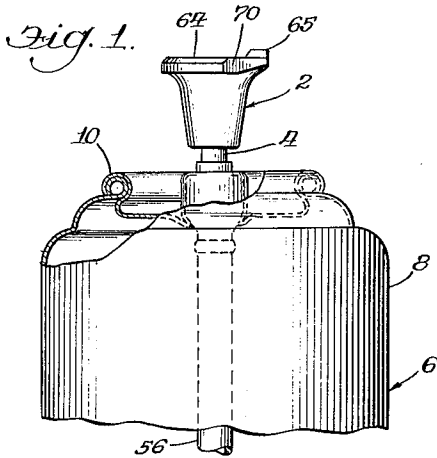
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AEROSOL DISPENSER

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AEROSOL DISPENSER

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This invention relates to dispensers of the type generally designated as aerosol dispensers wherein a sealed container is provided with normally closed manually opening valve means for releasing from the container a dispensable fluid under superatmospheric pressure within the container.

Many prior art aerosol dispensers are known wherein the dispensed fluid is a liquid having a high solubility for a propellant gas whereby as the dispensed liquid enters the atmosphere the propellant gas expanding rapidly atomizes the dispensed liquid in a fine spray.

In another type of aerosol dispenser the dispensed liquid has low solubility for the propellant gas, thus requiring mechanical means for atomizing the dispensed liquid as it is discharged from the dispenser into the atmosphere. Such prior art devices have used a spiral passage or groove with the discharge or dispensing port connected to the passage or groove at the small end of the spiral for the purpose of accelerating flow of the dispensed liquid from the large end of the spiral to the small end thereof with the objective of achieving such velocity of flow that the liquid becomes atomized as it passes into the atmosphere from the discharge port of the dispenser.

Mechanical break-up devices such as those heretofore described have been inefficient in operation, expensive to manufacture, and excessively complicated in assembly.

Accordingly, a primary object of this invention is to devise an aerosol dispenser having a mechanical break-up device which is unusually efficient and effective, which is simple and economical in construction, which is easily assembled, and which is durable in service.

A more specific object of the invention is to provide a novel vortex chamber, the radially inner or small end of which is connected to the discharge port, the radially outer or large end of the chamber receiving flow of the dispensed liquid in a path tangential to the circular perimeter of the chamber.

Another object of the invention is to provide on the valve stem which controls flow of the dispensed liquid a parti-spherical head which is complementary to and received within a parti-spherical cavity or socket of a manually operated button for actuating the valve stem, said cavity having an annular recess which defines a vortex chamber with a spherical segment of the parti-spherical head, and said button having a discharge port coaxial with the chamber on an axis which approximately intersects the center of the head.

Still another object of the invention is to form the valve stem head and/or the button of material such as nylon which is sufficiently elastic to permit the head to be press-fitted into the cavity of the button, thereby eliminating the necessity for assembling the head and button in any particular angular relationship in order to define a vortex chamber.

Yet another object of the invention is to devise a vortex chamber which is self cleaning and will thus not permit the gradual deposit of dispensed material to interfere with the vortex action of the chamber.

A further object of the invention is to utilize a one piece button having an internal surface which is economical to produce by molding and which can be easily assembled with the stem to form a vortex chamber connected to the discharge passage of the stem.

A different object of the invention is to provide a novel

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contour on top of the button to indicate the direction of spray by feel of the operator's finger and to afford a comfortable and distinctly defined area for the exertion of pressure by the finger.

The foregoing and other objects and advantages of the invention will become apparent from a consideration of the following specification and the accompanying drawings, wherein:

FIGURE 1 is a general assembly view of an aerosol dispenser embodying a preferred form of the invention, portions of the structure being broken away to clarify the construction;

FIGURE 2 is an enlarged side elevational view, partly in vertical cross-section, of the novel mechanical break-up button and related valve parts of the dispenser shown in FIGURE 1;

FIGURE 3 is a sectional view on line 3-3 of FIGURE 2, with the valve stem removed to disclose the novel internal construction of the button; and

FIGURE 4 is a top plan view of the button.

Describing the invention in detail and referring first to FIGURE 1, it will be seen that the novel mechanical break-up button 2 is illustrated as applied to a valve stem 4 of a conventional aerosol dispenser 6 comprising a steel container 8 having a spun connection as at 10 to a steel mounting cup 12.

The container 8 is adapted to contain a liquid to be dispensed and a propellant gas under superatmospheric pressure, which gas boils at atmospheric pressure and at room temperature, such as for example, Freon.

The gas in the container is at a minimum pressure of the order of 25 pounds per square inch absolute at 70° F. Generally 85 pounds per square inch absolute is considered to be a safe maximum pressure.

In prior art aerosol dispensers, the propellant gas has generally been freely soluble in the dispensed liquid, whereby upon release of the dispensed liquid to the atmosphere the dissolved gas rapidly expands breaking up the dispensed liquid into fine particles of a mist-like spray without any need for a specially shaped discharge port.

According to the present invention, however, the novel break-up button 2 is particularly provided with novel mechanical break-up means hereinafter described which break up or atomize the discharged stream of dispensed liquid into such a spray even when the propellant gas is non-soluble in the dispensed liquid.

The novel break-up button 2 comprises an outer recess 14 (FIG. 2) terminating at its bottom in a discharge port 15 which is coaxial with a circular inner recess 16 of the button 2 interrupting a parti-spherical surface 18 defining a parti-spherical cavity or socket 20 (FIG. 3) within the button.

The top of the socket 20 is interrupted by a circular recess 22 communicating tangentially at one side of its axis with a groove 24, as best seen in FIGURE 3. The groove 24 also intersects the recess 16 and is arranged tangentially thereto, as best seen in FIGURE 3, for a purpose hereinafter described.

The lower end of the socket 20 partly defines an annular V-section ring 26 which partly defines an axially extending passage 28 for the reception of the valve stem 4, which guidably engages an annular flange 40 of the mounting cup 12 which contains a sealing gasket 42 compressed within the mounting cup 12 by a valve body 44 held in position by crimped portions 46 of the mounting cup 12.

The valve body 44 has a chamber 48 which receives a head 50 connected by a neck 52 to the stem 4. The chamber also contains a compression spring 54 which biases the neck 52 to closed position shown in FIGURE 2, thereby cutting off flow of liquid from the container 8.

A discharge or delivery tube 56 is tightly fitted onto a boss or projection 58 on the bottom of the valve body 44, and said tube 56 extends to a point (not shown) slightly spaced above the bottom of the container 8 to ensure delivery of substantially all of the liquid contained therein.

The neck 52 has a port 60 which, when the stem 4 is urged downwardly to open position, accommodates flow of fluid from the delivery tube through the valve chamber 48 and port 60 into the axial discharge passage 62 of the stem 4 and thence upwardly through recess 22, groove 24, recess 16 and port 15 to the atmosphere.

The stem 4 has a head 60 with a parti-spherical surface 62 complementary to and seated against surface 18 within the socket 20. The head 60 defines with the stem 4 an annular recess 62 complementary to and receiving the ring 26.

The surfaces 18 and 62 form a vortex chamber within the recess 16, and the dispensed liquid enters this chamber at its largest or radially outermost portion tangentially to the circular cross-section of the chamber, as best seen in FIGURE 3. Thus the dispensed liquid causes a rotating or whirling flow of the liquid in the recess 16 as said liquid flows toward discharge port 15 which is a low pressure area at or near the rotational axis of rotational fluid flow. The reduced pressure and increased flow velocity of the liquid in the area of the discharge port 15 causes an immediate expansion or separation of the fluid particles. Separation is further exaggerated by the high velocity whirling liquid particles escaping tangentially from the port 15 creating an unusually effective circular spray pattern.

It may be noted that the stem 4 and/or button 2 are preferably formed of an elastic material such as polypropylene or nylon, so that the parts may be conveniently molded to the form illustrated whereupon the head 60 may be forced into the socket 20 until the ring 26 snaps into groove 62 whereupon the surfaces 18 and 62 are tightly interengaged to form the vortex chamber in the recess 16. It has been discovered in actual practice of the invention that polypropylene is greatly superior to other materials for this method of assembly.

This feature greatly simplifies formation of the vortex chamber, because the passage 28 and socket 20 of the button 2, being of substantially the same size and diameter of the valve stem 4, accommodate a massive core pin construction for molding the button 2, thereby eliminating the necessity for delicate blades and fragile mold parts as in the formation of prior art vortex chambers. This feature alone is of enormous advantage over the prior art in accommodating economical mass production.

However, it will be understood that if desired, the button 2 and stem 4 may be formed of other materials such as brass and may be assembled in less economical manner without detracting from the greater efficiency and other advantages of the novel vortex chamber over prior art vortex chambers which are less efficient and of short service life as heretofore described.

Another feature of the invention resides in the contour of the top of the button 2. As seen in the drawings, this surface comprises a single, small raised arc or ridge 64 which is parti-annular as seen in FIGURES 4 and 5 and which bounds a parti-spherical depressed surface 66 engageable with the user's forefinger. The surface 66 at a portion thereof remote from the ridge 64 is interrupted by an upstanding lug 65 having a top surface 67 which merges with a finger-engaging surface 68 sloping downwardly at an acute angle with respect to the longitudinal axis of the stem 4 to merge with the surface 66.

The surface 66 is also bounded by surfaces 70 converging toward the lug 65 to afford visual indication that the discharge port 15 is beneath the lug 65.

In using the novel device, the operator holds the dis-

penser 6 with the thumb and three fingers gripping the container 8 and with the forefinger resting on the surface 66, the extreme tip of the forefinger engaging surface 68. The forward edge 72 of the lug 65 is pointed at the object to which the dispensed liquid is applied. Downward pressure of the forefinger against surface 66 then releases the dispensed liquid to the vortex chamber within recess 16 from which the liquid passes to the port 15 emerging therefrom in a fine mist or spray as heretofore described.

Thus it will be understood that the novel aerosol dispenser is not only more economical in construction but is capable of longer life in service and is more efficient than prior art dispensers embodying mechanical break-up devices for atomizing the dispensed liquid.

What is claimed is:

1. In an aerosol dispenser comprising a container which contains liquid to be dispensed and a charge of gas at superatmospheric pressure to force the liquid from the container; the combination of a stem member having an elongated, substantially cylindrical portion and a head joined thereto, said head being in the form of a sphere, except where joined to said portion, said portion tapering toward its juncture with said head to define an annular groove around the stem at the juncture of said head and said portion, said stem having an internal longitudinal passage extending along the longitudinal axis of the stem, said passage extending entirely through the head and extending into said portion lengthwise thereof, an inlet port through said portion at a point within the container, said inlet port being connected to the passage, means in the container for releasably sealing said port, a button member having a parti-spherical socket within which the head is received in tight complementary spherical face engagement with the button member, said button member having a ring defining the outer edge of the socket, said ring being tightly fitted in said groove, a substantially circular recess in the button member interrupting said socket, a discharge port through the button member at substantially the center of said recess and connecting the socket to the atmosphere, said head extending into said recess to a point closely adjacent but spaced from the discharge port and defining with said button member a substantially frusto-conical vortex chamber in said recess tapering toward said discharge port, another recess in said button member interrupting said socket and communicating with said passage, and a fluid flow groove in said button member interrupting said socket, said flow groove being connected to said other recess and being connected to said circular recess substantially in tangential relationship to a surface of said button member defining the radially outer perimeter of said circular recess, whereby said liquid, when discharged from said passage through said other recess and flow groove, flows therefrom in a circular path around said perimeter and in a vortex path through said vortex chamber and outwardly through the discharge port, at least one of said members being resilient to accommodate a snap fit of the head in the socket and of the ring in the first-mentioned groove with the button member and stem member in any relative rotational position about said longitudinal axis, and means on said button member to accommodate manipulation of the button member and the stem member for releasing said inlet port from said sealing means, whereby the pressure gas in the container forces said liquid through the inlet port into said passage.

2. In combination, an elongated valve stem having an internal passage and an inlet port connected to said passage, said stem having a head formed as part of a sphere, and said stem tapering toward said head to define therewith an annular groove, a button having an annular ring, complementary to and received within said groove and having a parti-spherical socket inwardly of said ring, said head being tightly fitted in said socket, said button hav-

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ing a recess interrupting said socket and communicating with one end of said passage, said button having another recess interrupting said socket, said other recess being substantially circular in cross-section and being connected at its center to a discharge port through the button, said head extending into said other recess and being spaced from said discharge port, whereby the head and said other recess define a substantially frusto-conical vortex chamber tapering toward said discharge port, and a groove in said button interrupting said socket and extending into the first-mentioned recess at one end of said groove, the opposite end of said groove extending into said other recess substantially tangentially with respect thereto, whereby liquid flowing under pressure from said passage into the first-mentioned recess flows through the groove into the chamber and flows in a rotational direction through the chamber into the discharge port, at least one of said head and button being resilient so that the ring may be snap-fitted in the groove as the head is fitted into the socket.

3. In combination, an elongated valve stem having on one end thereof a substantially spherical head, a passage extending linearly through the stem and head along the longitudinal axis of the stem, a button comprising a parti-spherical cavity having an opening receiving the stem, said button having a substantially circular recess interrupting the cavity and defining with the head a vortex chamber which is substantially circular in cross-section, a discharge port through the button connected to a por-

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tion of the chamber which is smallest in cross-section, and a passage through the button connected tangentially to the chamber at a portion thereof which is greatest in cross-section, said passages being interconnected, said vortex chamber tapering in cross-section continuously from said last-mentioned portion to said port, said stem being closer to said discharge port than to said button at the greatest cross-section of said chamber.

4. An aerosol valve button comprising a substantially parti-spherical concave top surface having a lug upstanding therefrom, said lug having a finger contacting surface sloping upwardly toward the perimeter of said concave surface, said concave surface being bounded by a pair of faces converging toward said lug.

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