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MECHANICAL BREAK-UP SPRAY BUTTON

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2 Sheets-Sheet 2

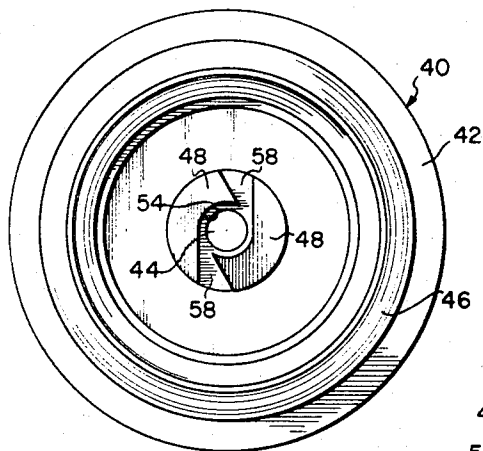


FIG. 3

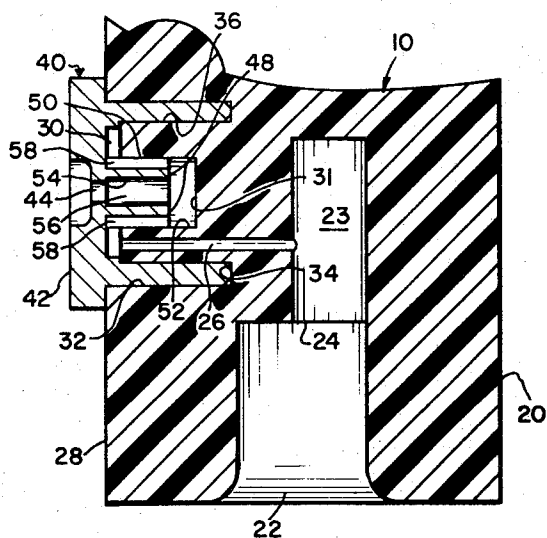


FIG. 4

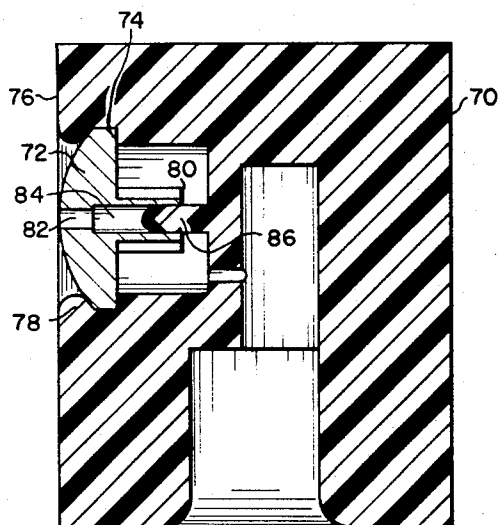


FIG. 5

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**MECHANICAL BREAK-UP SPRAY BUTTON**  
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## ABSTRACT OF THE DISCLOSURE

A mechanical break-up spray button for aerosol or similar fluid product dispensers comprising a main body member and a separate nozzle insert, wherein the nozzle insert has an annular wall surrounding a discharge orifice on the upstream side and forming a chamber about said orifice, the wall having tangentially oriented slots there-through for feeding fluid into the chamber to induce swirling motion prior to discharge through the orifice.

This invention relates generally to aerosol dispensers, and more particularly to spray heads for such dispensers. The spray heads are especially adapted to facilitate finger actuation of a valve in the dispenser and to effect mechanical atomization of fluid held under pressure therein.

Spray heads or buttons of this type are used extensively in consumer packaging of fluid products in self-pressurized units commonly referred to as aerosol dispensers. The spray heads serve the dual function of providing a member convenient for finger actuation of the valve of the container for release of product therefrom, and also for directing the discharge of such product in a desired direction and in a suitably atomized form. Where the spray heads incorporate internal labyrinth passages which impart a rotary or swirling motion to the fluid prior to discharging it through a terminal orifice, they are known as mechanical break-up buttons, and the spray heads of this invention are of this type. They are particularly useful where low pressure propellants are employed and/or where the propellant and active ingredient are not mutually soluble, in which case it is desirable to provide mechanical means for supplementing the expansion of the gaseous propellant in effecting adequate dispersion or atomization of the product or active ingredient.

Mechanical break-up actuators or spray heads are well known for this purpose, an example of one that has been used extensively on a commercial scale is shown in my prior Patent No. 2,767,023. While that spray head has served effectively, it is a primary purpose of the present invention to provide a spray head which has greater ease of assembly in the manufacture thereof, and is less critical to assemble properly than the spray head just mentioned. It is also desired to provide a spray head affording simple means in the manufacture thereof for producing spray patterns of different selected configurations, as may be best suited for a particular product. It is also a purpose of the present invention to provide a spray head that is less susceptible to clogging when used with such high solid content products as starch and antiperspirants. Since the spray heads are expendable along with the rest of the aerosol package, in that they are not normally reused after the container is once exhausted, cost of the spray heads is a vital factor in the practical use of them. It is therefore another purpose of the present invention to provide a spray head of such design that the parts thereof can be automatically molded of polymer resin materials in high production capacity molding equipment and automatically assembled. This automation can be effected as a practical matter only if the spray head consistently produces a predetermined spray rate and spray pattern so that the results in the hands of the user of the aerosol package are

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uniform and consistent with repeated uses of the device. It is in this consistency or repeatability of a desired spray pattern from one spray head to the next that most difficulty has been encountered heretofore, and it is accordingly a still further object of the invention to provide a device which affords substantial improvements in this respect.

In a copending application, Ser. No. 562,142, filed by me on July 1, 1966, now abandoned, there is disclosed a type of spray head having a flexible diaphragm member employed to effect automatic sealing of the discharge orifice, and in connection therewith a disclosure was made of a spray head incorporating a mechanical break-up feature in combination with the flexible diaphragm. It is a still further purpose of the present invention to provide an arrangement incorporating that mechanical break-up concept but omitting the flexible diaphragm.

In general, the spray head of the invention comprises a two-piece molded plastic button adapted to be seated on the usual tubular stem of a typical aerosol valve. Internal passages in the body of the button direct fluid released from the valve when the button is manually depressed or tilted to a terminal orifice usually located on one side of the button. The two-piece button of the invention comprises a main body member into which is fitted an orifice plate or cup, and the two members are so formed interiorly as to induce a swirling motion of the fluid to be dispensed about the axis of the discharge orifice immediately upstream of that orifice.

The invention is illustrated and described in conjunction with certain preferred embodiments which are shown in the accompanying drawings.

In the drawings,

FIG. 1 is a partial view in front elevation of the valve end of a typical aerosol dispenser incorporating the spray head of this invention, looking along the axis of the discharge orifice in the spray head;

FIG. 2 is a partial view in side elevation on line 2—2 in FIG. 1, parts being shown in cross section and on an enlarged scale;

FIG. 3 is a plan view of the rear face of the orifice member insert of the spray head of FIGS. 1 and 2;

FIG. 4 is a view in cross section in side elevation of a modified form of spray head; and

FIG. 5 is a view similar to that of FIG. 4 but showing a further modification of the spray button.

A general view of the spray button in normal position on an aerosol dispensing container is shown in FIG. 1. Button 10 is mounted on the hollow stem 12 of a valve assembly 14 secured in one end of a cylindrical container 16. The container is adapted to hold fluid product for dispensing through spray button 10 which, when depressed or tilted by the finger of the user, actuates a valve in assembly 14 by means of stem 12, and the fluid contents of the container, being under the pressure of a propellant gas contained therein, is released through stem 12 to the orifice of the spray button 10.

Button 10 consists of a main body member 20 (see FIG. 2) preferably formed of molded plastic and having formed in one of its faces a socket 22 for the reception therein of the upper end of the tubular valve stem 12 of the valve assembly 14. Socket 22 is formed to provide an interference fit with the stem to obtain a fluid tight seal with the body member 20 when the stem is inserted. Socket 22 is preferably stepped to provide a shoulder or stop 24 against which the upper end of the stem 12 comes into engagement to limit insertion and to provide an extension 23 inwardly of body 20 beyond shoulder 24 for communication with an internal feed passage 26. The front face 28, that is the face of the spray button from which the fluid product is discharged, is formed with a generally circular well 30 let into the body 20, and feed passage 26 opens into this well eccentrically thereof.

The open face of well 30 is closed by a separate nozzle insert 40, again this preferably being formed of molded plastic. Insert 40 comprises a generally circular face or orifice disc 42 having a central orifice 44 which passes through the disc into communication with well 30. Nozzle insert 40 is suitably secured in the body of the button by any of several arrangements, that illustrated in FIG. 2 comprising an outer annular wall 46 molded integrally on the undersurface of the insert. Wall 46 projects into well 30 and makes an interference fit with the side wall 32 thereof. In order to increase the frictional engagement between the nozzle body and insert, the annular wall 46 of the insert, as shown specifically in FIG. 2, is received in an annular recess 34 surrounding and extending back from well 30 in body 20, of which wall 32 forms the outer surface and wall 36 forms the inner surface. Not only does this assure a tighter frictional fit and better retention of the nozzle insert in the body of the button but it also assures a more fluid tight arrangement.

In addition, nozzle insert 40 is provided with an inner annular cylindrical wall 48 immediately surrounding orifice 44 on the underside of disc 42. This wall 48 likewise extends into a recess 31 forming a second rearward or inward extension of well 30 in body 20 of the spray button. As will be described further presently, the outer surface or periphery 50 of wall 48 may or may not make a close or interference fit with the adjacent wall 52 of the well extension 31, but as seen in FIG. 2 the arrangement is such as to provide a snug fit between these surfaces.

The inner surface 54 of the annular wall 48 defines a chamber 56 surrounding the upstream side of orifice 44. Fluid under pressure which has been delivered by socket extension 23 and feed passage 26 of the button body 20 to well 30 is routed from the well to orifice 44 primarily by one or more tangentially oriented slots 58 cut generally radially through wall 48 of the orifice insert 40. As illustrated in FIG. 3, two slots 58 are provided at substantially diametrically opposite points of wall 48. Preferably also, the slots are of truncated triangular form as seen in plan (FIG. 3), with the wider portion of the slot opening into well 30 and the narrower end of the slot opening into chamber 56. Fluid entering the chamber is thus caused to swirl about the chamber in the immediate vicinity of the discharge orifice 44, and atomization of the fluid leaving the orifice is greatly improved by this mechanical swirling action. The increasing constriction of slots 58 in the direction of fluid flow also has the effect of producing a velocity increase and coordinate pressure drop across the wall 48 of the swirl chamber, increasing the effectiveness of the mechanical break-up of fluid into finely atomized condition upon emergency from orifice 44.

The configuration of the spray pattern of fluid discharged from orifice 44 is modified by the provision of a peg 60 molded in the back wall of well 30, or more particularly well extension 31, which peg projects axially into swirl chamber 56 concentrically of orifice 44. The length of peg 60 determines in large measure the included angle of the cone of spray which is emitted from the orifice 44. It is not necessary that the peg fit tightly within wall 48 of the chamber 56, but some preference has been indicated in buttons that have been manufactured for the arrangement specifically shown in FIG. 2 wherein there is an easy sliding fit in which no actual surface contact is made between peg 60 and the surrounding wall 48. Furthermore, it has been found that a peg extending to within about 0.005" from the rear face of disk 42 in a typical spray button produces an extremely narrow cone of spray, although occasional lack of repeatability of the pattern has been observed in such arrangement. A slightly shorter peg, extending to within about 0.01" behind the rear face of orifice 44, produces good spray characteristics and repeatability of spray pattern. Progressively shorter pegs provide increasingly wider spray angles. In general it appears that there is a relationship between

good spray pattern characteristics and repeatability where the overlap between peg 60 and wall 48 amounts to one-half to three-fourths the depth of chamber 56.

Mechanical break-up of the fluid product being dispensed through the spray head is obtained without any peg in the center of the swirl chamber. This arrangement is illustrated in FIG. 4 and the spray pattern produced is one of a very wide cone angle. In general this arrangement is less desirable than that incorporating the peg.

An alternate construction is illustrated in FIG. 5 wherein button 70 is provided with a modified nozzle insert 72 which is recessed in a socket 74 of the body so as to maintain a flush face 76 on the bottom. In this instance, insert 72 is retained in socket 74 by either preforming a bead 78 which overhangs the wall of the socket and under the lip of which insert 72 may be snapped, or such bead is formed after insertion of the nozzle member 72 in the socket by conventional heat welding procedure. In this modification no outer annular retaining wall corresponding to wall 48 of the previous form of button is required. As in previous construction, annular swirl chamber wall 80 is formed integrally on the rear face of insert 72 immediately surrounding the discharge orifice 82. This arrangement also illustrates an arrangement wherein the effective depth of the swirl chamber 84 and the amount of overlap of central peg 86 can be obtained by employing a relatively thick orifice insert member and forming a portion of the swirl chamber by recessing the wall of the insert behind the orifice.

The foregoing modifications are illustrative of various changes which may be made in details of construction within the scope of the invention defined in the appended claims.

What is claimed is:

1. A spray button for an aerosol dispenser or the like, comprising

(a) a molded plastic body having a socket in one face to receive a tubular valve stem for delivery of fluid under pressure to the spray nozzle, a well let into an adjacent face of said nozzle body and an internal feed passage providing communication between said socket and said well, a peg upstanding in the bottom of said well in peripherally spaced relation to the side wall thereof to form an annular space between the peg and wall, said peg being less in height than the depth of the well; and

(b) a nozzle insert of molded plastic fitted into said well and having an end face completely covering said well, said insert having a fine discharge orifice passing through said end face into communication with the interior of the well substantially concentrically of, and in spaced relation to, the end of said peg, said nozzle insert having an annular wall extending into said annular space in overlapping relation to said peg and defining a swirl chamber adjacent the discharge orifice, said annular wall having at least one tangentially oriented slot passing therethrough to provide communication through said swirl chamber from said internal feed passage to said discharge orifice, whereby to impart a swirling motion to the fluid in said well immediately adjacent said discharge orifice; and

(c) means for securing said nozzle insert to said nozzle body in fluid tight relation about the periphery of said well.

2. A spray button as defined in claim 1, wherein the overlap of said peg and annular wall is from about one-half to three-fourths of the depth of the swirl chamber.

3. A spray button as defined in claim 1, wherein said annular wall forms an interference fit with a portion of the surface of said well which is remote from said discharge orifice.

4. A spray button as defined in claim 1, wherein said peg forms a close but readily slidable fit in said annular wall.

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5. A spray button as defined in claim 1, wherein two slots are provided in said annular wall at substantially diametrically opposite points therein.

6. A spray button as defined in claim 1, wherein the slot in said annular wall is wider at the outer face of said wall than at the inner face.

7. A spray button as defined in claim 1, wherein said internal feed passage opens into said well at a point radially outside of said annular wall of said insert.

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EVERETT W. KIRBY, *Primary Examiner*.

U.S. Cl. X.R.

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