

July 7, 1970

R. L. DU PLAIN

3,519,210

MECHANICAL BREAKUP BUTTON

Filed April 18, 1968

Fig. 3

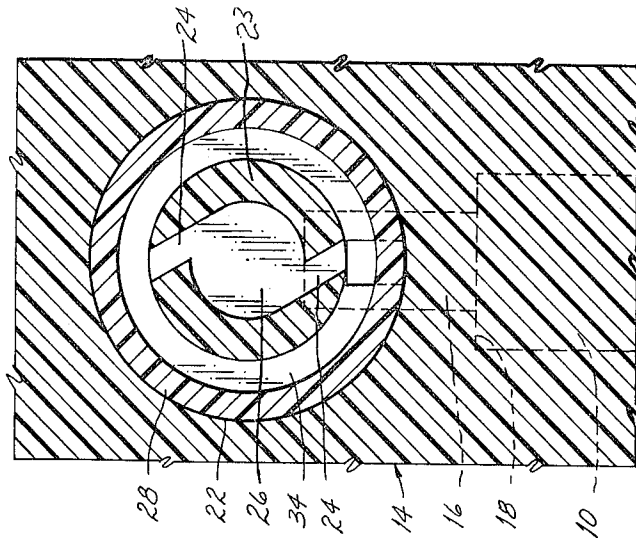


Fig. 2

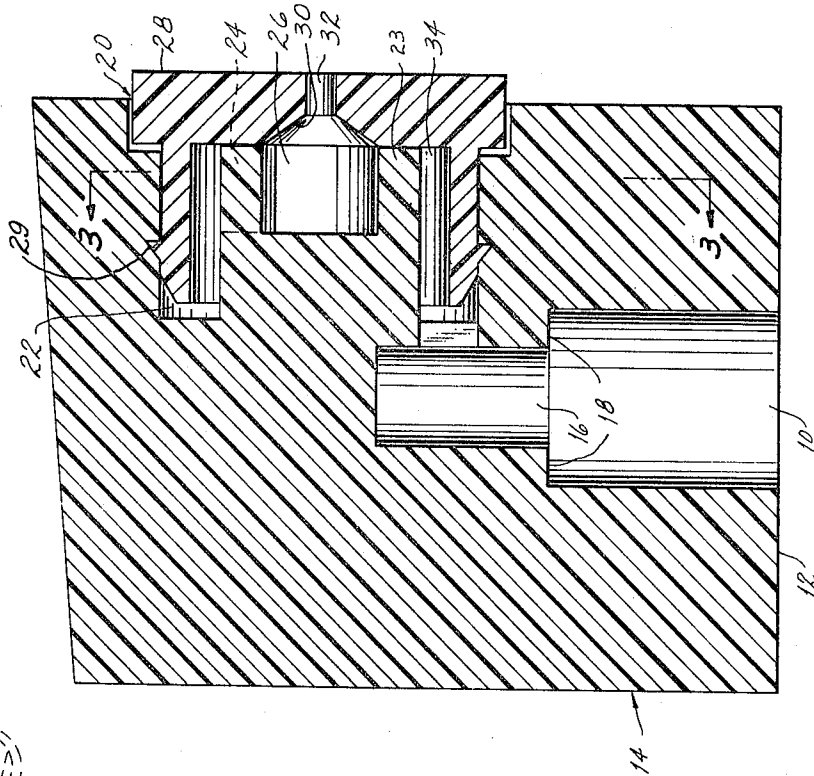
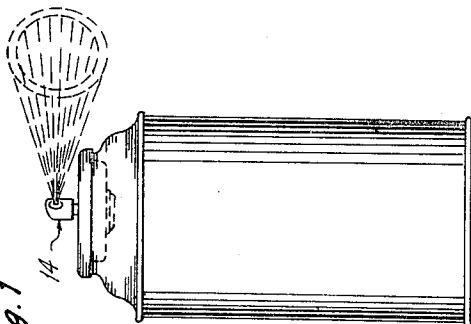


Fig. 1



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3,519,210

MECHANICAL BREAKUP BUTTON

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4 Claims

ABSTRACT OF THE DISCLOSURE

A mechanical breakup type aerosol valve button with an annular rotation chamber and a tangential passageway leading into a central swirl chamber behind the terminal orifice. The orifice is contained within an insert.

This invention relates to a valve button or actuator for an aerosol valve and more particularly to a unique structure for a mechanical breakup type button or actuator.

Numerous designs for mechanical breakup type buttons or actuators for aerosol valves have been proposed. In most of these designs, the liquid to be dispensed, is given a swirl action, prior to leaving the terminal orifice whereby the emitted stream is mechanically broken in an outward pattern into a fine mist. Such "mechanical-breakup" devices have been widely employed commercially in conjunction with a variety of products. There is, however considerable room for improvement.

One area for improvement lies in the structure employed. It is desirable to have as few parts as possible yet with passageways which are not subject to becoming blocked. The structure also should not require orientation of the parts prior to assembly.

One prior art device is illustrated in U.S. Pat. 2,767,023. The structure utilizes an annular groove with four slots leading to a central depression with critical ratios alleged for the cross-sectional area of the slots with the area of the terminal orifice. Unfortunately, for some unknown reason, the use of four slots causes clogging. It appears that such action is successive, one slot clogs and the rest soon do likewise.

Another prior art device is illustrated in U.S. Pat. 3,112,074. In the structure shown, four passageways effected by the configuration of a central peg feeds an annular groove just behind the terminal orifice. This structure too tends to clog.

Variations of the device of U.S. Pat. 3,112,074 are shown in U.S. Pats. 3,129,893 and 3,174,692. But they too suffer from clogging.

An object of this invention is to provide a mechanical breakup button which avoids clogging.

Another object is to provide a mechanical breakup button which will produce little or no sputtering or drip.

Still another object is to provide a mechanical breakup button which will produce a well defined spray pattern.

A further object is to provide a mechanical breakup button which will satisfy all of the above mentioned objectives, yet be adaptable to economical mass production.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

The invention in its most rudimentary form comprises a button with a depression having an annular feed groove and only two tangential passages, disposed in vertical fashion, leading to a central swirl chamber. A cup-shaped terminal orifice insert covers the chamber, and its walls extend into the annular feed groove with an anchoring ring on the outside to lock the insert to the button.

The invention accordingly comprises the features of construction, combination of elements, and arrangement of parts which will be exemplified in the construction here-

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inafter set forth, and the scope of the invention will be indicated in the claims.

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description taken in connection with the accompanying drawing, in which:

FIG. 1 is a perspective view of an aerosol can and valve with the breakup button of this invention attached thereto, showing the spray pattern that is effected.

FIG. 2 is a cross sectional side view of the button with the terminal orifice insert in place.

FIG. 3 is a cross sectional view of the button taken along line 3-3 of FIG. 2.

Similar reference characters refer to similar parts throughout the several views of the drawing.

As seen in FIG. 2, the button 14 of this invention has a vertical valve stem recess 10, in its base 12 to receive the stem of the aerosol valve (not shown). Immediately above and concentric with recess 10 is an inlet 16 of smaller diameter than recess 10 to provide a circular support rim 18 whereby button 14 may, during use, abut against and seal the valve stem (not shown). A seal ring (as in U.S. Pat. 3,257,044) may be employed on rim 18, if desired.

Inlet 16 leads to a depression 20 in the side of button 14. Said depression 20 has an annular outer feed groove 22 (FIG. 3) and two vertically disposed tangential passages 24 leading from groove 22 into a central swirl chamber 26.

A cup-shaped terminal orifice insert 28 is press fitted into depression 20, to completely cover the opening of said depression 20. The walls of the insert extend into the annular groove 22 of depression 20. The frictional contact between the outer wall surface of insert 28 and the outer wall surface of annular groove 22 will usually retain the insert 28 in place. However, an anchoring ring on the outer surface of insert 29 with a corresponding annular anchoring slot in feed groove 22 may be provided to firmly lock said insert in place. Insert 28 has a terminal orifice 32 which may also be provided with a reverse flare 30 to aid the flow of the dispensing steam.

It might be here noted that the outer diameter of knob 23 and the diameter of the terminal orifice 32 and the length of the central swirl chamber 26, have a direct effect in the spray pattern. This is evident from the table which follows:

TABLE

Knob, dia.	Terminal orifice, dia.	Swirl Chamber, length	Spray pattern
.155	.025	.125	Medium spray, round, full shallow pattern.
.155	.025	.062	Medium fine spray, round, full medium depth pattern.
.155	.025	.036	Fine spray.
.163	.014	.032	Fine spray, round shallow pattern.
.163	.016	.032	Fine spray, round, slightly shallow medium depth pattern.
.163	.020	.032	Fine spray, round hollow deep pattern.
.163	.025	.032	Do.
.210	.025	.125	Coarse spray, slightly oblong full hollow pattern.
.210	.025	.060	Medium spray, round full medium depth pattern.
.210	.025	.032	Fine spray, round hollow fairly deep pattern.

In view of this, it should be evident that the button of this invention may be "customized" to the product being dispensed by the simple expedient of stocking different length terminal orifice inserts and different groove depth button bodies.

Referring back to the two tangential passages 24, it will be noted that they are in a slightly angular position to a vertical center line and purposely so. This is a critical feature. The lowermost passage thus can act as a drain

for the swirl chamber while the upper passage will, at least, unblock itself to act as the prime feed passage upon the next actuation of the valve. In draining from the swirl chamber, the drip material may settle in the bottom 34 of feed groove 22. If it is spray starch, it may dry and crystallize. Or it may remain in moist condition. Upon a second actuation of the valve, the starch crystals or the moist material is swept out of the lower tangential passage 24 and the valve button is thereby cleaned with each reactivation.

Should the drip material solidify, the upper tangential passage 24 acts as the main feed means until the solidified drip material is redissolved and swept out the terminal orifice.

If the structure had two or more additional tangential passages in horizontal fashion, as in the prior art, the drain flow as well as the "sweep-clean" flow would be impaired. These extra passages apparently do not drain as well and form a deposit on their inner end to enhance clogging.

To operate the valve, even though the complicated drip and sweep-clean flows occur, button 14 need merely be depressed. At such time, the pressurized liquid product passes into inlet 16 into annular outer feed groove 22. Here the product attains a rapid rotary flow within said groove 22 until it is forced by its own pressure through tangential passages 24 into swirl chamber 26. Since passages 24 enter chamber 26 tangentially, the fluid rotates with still greater velocity within chamber 26 and the principle of conservation of angular momentum is thus utilized. Ideally, this increased rotation will be inversely proportional to the ratio of the diameters of chamber 26 to annular feed groove 22.

The driving pressure then forces the rotating product within chamber 26 against flare 30 further reducing the diameter of the swirl while further increasing the angular velocity. The rapidly swirling aerosol mist is then forced through orifice 32 and the sudden drop in pressure and centrifugal acceleration produces a well defined hollow funnel-like spray pattern (either hollow—see FIG. 1—or solid dependent upon the dimensions used as seen in the table).

The great turbulence, produced by the very rapid rotation of the product breaks up the dispensed product into a very fine aerosol mist of extremely small droplet size.

It should be noted that the structure above described could very easily be incorporated into an actuator. Any

use of "button" herein should be construed as meaning an actuator as well.

It will thus be seen that the objects set forth above, among those made apparent from the preceding description, are efficiently attained, and since certain changes may be made in the above construction without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

Now that the invention has been described, what is claimed is:

1. A mechanical-breakup type spray button comprising a button body with a vertical recess in its base, said recess leading to a depression in the side of said button, said depression containing a knob spaced from the inner wall of said depression to form an annular outer feed groove, at least one tangential passage in said knob leading from said groove through said knob into a concentric centrally disposed swirl chamber in said knob and a substantially cup-shaped terminal orifice insert with its walls press fitted into said depression to completely cover said depression.

2. The button of claim 1 wherein said vertical recess leads to a vertical cylindrical inlet of less diameter and said inlet leads to said depression.

3. The button of claim 1 wherein said insert is provided with a reverse flare on the inside of the terminal orifice of said insert.

4. The button of claim 1 wherein said insert is provided with an anchoring ring and said depression is provided with a correspondingly shaped anchoring slot.

References Cited

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3,129,893	4/1964	Green	239—337 X
3,174,692	3/1965	Green	239—573 X
3,254,807	6/1966	Boch et al.	239—337 X
3,416,737	12/1968	Venus	239—579

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J. J. LOVE, Assistant Examiner

U.S. Cl. X.R.

239—573, 579

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,519,210 Dated July 7, 1970

Inventor(s) Richard L. DuPlain

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 2, line 36, after "ring" insert -- 29 --
line 37, delete "29" and insert -- 28 --
line 53, delete ".036" and insert -- .032 --

Signed and sealed this 22nd day of December 1970.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents