July 20, 1965 P. L. CROWELL 3,195,783

ACTUATOR CAP

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Fig. 1.

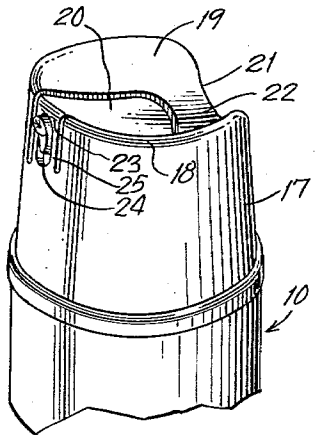

Fig. 2.

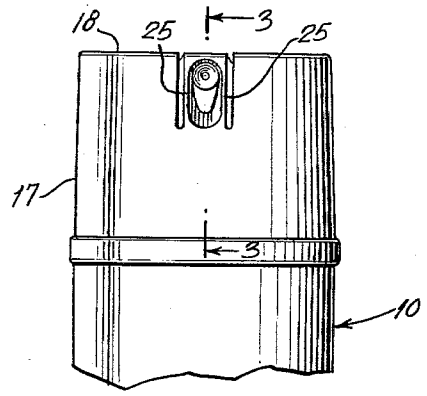

Fig. 3.

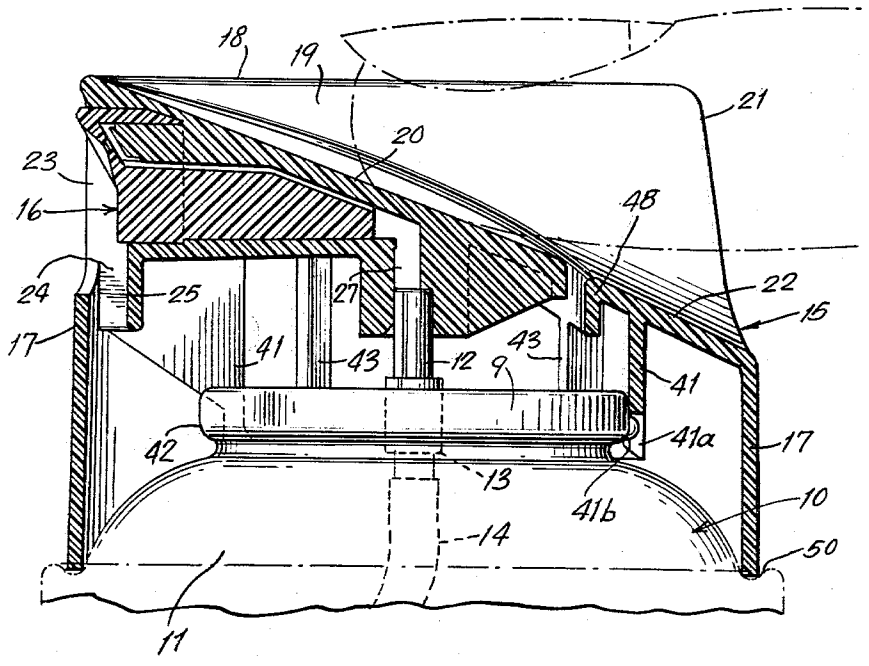

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Fig. 4.

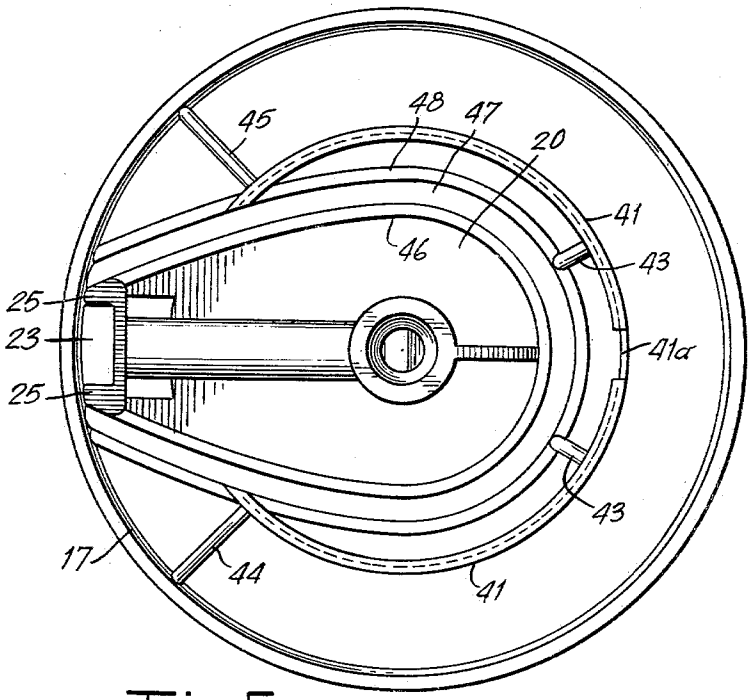
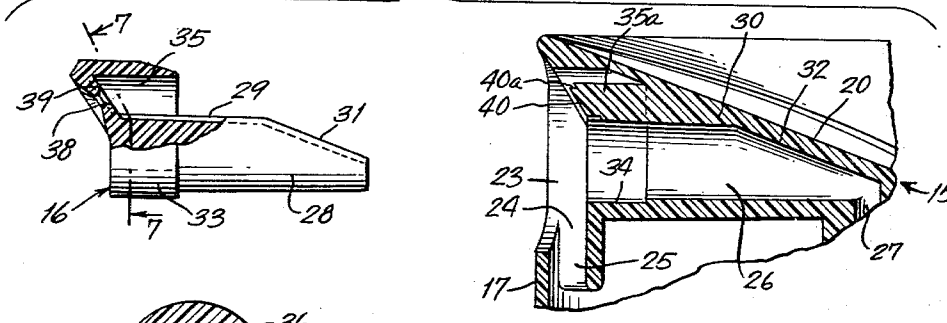


Fig. 5.



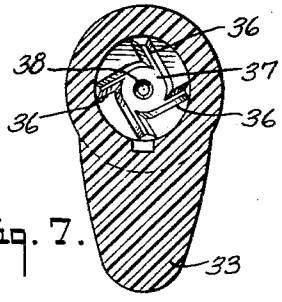
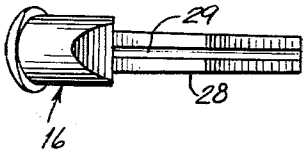


Fig. 7.

Fig. 6.



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ACTUATOR CAP

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11 Claims. (Cl. 222—182)

This invention relates to a dispensing cap for containers such as for aerosol and other pressure-packed fluid materials.

The invention is particularly adapted for use on cans or bottles for aerosol materials or the like wherein an upstanding tubular depressible valve stem is provided at the upper portion of the container, which stem when depressed opens a spring-pressed valve so as to release up through the stem the fluid which is propelled for discharge as an aerosol spray and also including usually a proportion of propellant fluid which has been packed under pressure in the container along with the aerosol material which is to be propelled. With such constructions, it is desirable to provide an overcap assembly of a form which will be decorative, convenient and easy to operate, as by applying pressure to a finger button for depressing the valve stem. To this end, it is desirable that the overcap be of a considerable diameter and to include a passage of substantial length through which the fluid may be directed generally radially outwardly to a discharge orifice at the peripheral wall of the cap.

For reasons of economy, convenience of manufacture and to present a decorative appearance, it is desirable to form such overcap arrangements of an inexpensive molded plastic material, and this involves certain problems in properly forming the above-mentioned passage of some length in the plastic material. If such passage is made quite small, difficulties will be encountered in so forming same so as to insure a truly and permanently free passage extending unobstructed in the predetermined desired direction. Accordingly it has been the practice generally in order to avoid this difficulty, to provide such passages of larger cross-section than essential for their proper functioning in use. Yet this in turn has the result that the aerosol or the aerosol and propellant mixture is discharged from the valve stem into a passage space of such relatively large dimensions that droplets of the material or mixture tend to form and accumulate on the walls of the passage and these may be irregularly blown out with the aerosol spray. It is desirable, however, that such aerosol sprays be free of such droplets or particles which have a diameter for example, larger than of the order of about 50 microns.

In accordance with the present invention, these problems in the manufacture of plastic overcaps are overcome by forming the construction in such a way that same is initially molded with a discharge passage of quite large cross-section and then a suitable insert preferably of plastic material is lodged in such passage, the insert having a shape such that in conjunction with the wall surfaces of the passage, it will still leave a passage of a desired small predetermined cross-section with assurance that the passage despite its small size will be permanently free of obstructions and irregularities. With such a small passage, the formation of droplets therein is avoided.

Such insert may also be preferably integrally molded at its outer end portion with a so-called "mechanical break-up button" formation, comprising a small cavity containing on its inside wall and surrounding an exit opening of pinhole size, a plurality of small channels for imparting a swirl to the mixture just before it is discharged.

Various further and more specific objects, features and

advantages of the invention will appear from the description given below, taken in connection with the accompanying drawings, illustrating by way of example a preferred form of the invention.

In the drawings:

FIG. 1 is a perspective view showing the upper portions of a container as provided with an overcap construction in accordance with a preferred embodiment of the present invention;

FIG. 2 is a side elevational view of the construction of FIG. 1 as viewed in a direction looking toward the aerosol discharge orifice;

FIG. 3 is an enlarged vertical sectional view, taken substantially along line 3—3 of FIG. 2, and illustrating the manner in which the overcap is applied to the top portion of a pressure-packed container;

FIG. 4 is a plan view of the overcap as viewed from the underside thereof;

FIG. 5 is a vertical sectional view, partly broken away, showing those portions of FIG. 3 which are to contain the above-mentioned insert and the left hand portion of FIG. 5 being a side elevational view partly in section showing the insert in a position ready to be slid into place for forming the overcap assembly;

FIG. 6 is a top plan view of the insert piece; and

FIG. 7 is an enlarged sectional view taken substantially along line 7—7 of FIG. 5.

Referring now to the drawings in further detail, there is indicated at 10, the upper portion of a pressure-packed container which may for example comprise a sheet metal can or a bottle having a top sheet metal portion as at 11 suitably permanently secured in place in any desired known manner. A hollow valve-operating stem 12 extends upwardly through the top of the container, this stem being depressible so as to operate a suitable known form of spring pressure-closable valve at the location indicated by dotted lines at 13. The underside of such valve may in known manner have attached thereto a suitable flexible plastic dip tube as at 14 extending down within the lower portion of the container. The container is packed under pressure in a known way with a suitable aerosol material or the like which is to be used as a space deodorant, or as an insecticide, or for some other desired purpose, together with a propellant fluid such as a normally gaseous hydrocarbon liquefied under pressure or a halogenated hydrocarbon propellant such for example as a type well known under the trademark "Freon." Thus, when the valve-operating stem 12 is depressed to open the valve at 13, the aerosol mixture will be discharged through the stem.

The portions of FIG. 3 as thus far described in the foregoing paragraph are, of course, of a typical well known construction.

The overcap assembly embodying the features of the present invention may comprise a molded plastic body portion 15 formed for example of high density polyethylene and an insert piece 16 which may for example be formed of molded medium density polyethylene. The body portion comprises an upstanding and generally cylindrical and relatively thin wall portion 17, which may, if desired, be slightly tapered upwardly and inwardly, same terminating at the top in a preferably horizontally-extending rim 18 which will provide a ridge adapted to be engaged by the bottom of another like container, to provide a stable support therefor when pluralities of the containers are packed for shipment. This rim surrounds as best shown in FIGS. 1 and 3, a central depressed area 19, containing a tab 20 adapted to be pressed downwardly by the user's finger or thumb which may be extended through an interrupted region as at 21 in the rim portion, in the manner indicated in FIG. 3.

The tab **20** as best shown in FIGS. 1, 3 and 5 is integrally formed with a front portion **23**, the upper edge of which may be coterminous with the rim **18** and the lower portion of which as at **24** preferably flexibly and integrally joins the wall portions of the cap.

The depending front portion **23** of the tab **20** is preferably channel-shaped, ridges **25** at either side thereof being provided, one of these being shown in FIG. 3 where it will be noted that same extends down on the inside of the wall **17** and is integrally molded there with such wall portion, whereby the whole depending front of the tab construction is rendered quite rigid, yet same is capable of being tilted by swinging somewhat about a flexible portion of the wall **17** as shown in FIG. 3 at the region where the ridges **25** join the wall.

As best shown in FIG. 5, the underside of the tab portion **20** is formed with an enlarged cavity **26** which is to receive the insert **16**. This cavity at its inner end communicates with a cavity **27**, the lower end of which is shaped to receive and fit on the valve-operating stem **12** (FIG. 3). The walls of the cavity **26** integrally depend from the finger-tab **20** and are of dimensions such that the whole tab construction, including its front portion **23**, is rigid, whereby when pressure is applied thereto by the finger, this whole structure as containing the insert **16** will be tiltable as a rigid unit about a flexible portion of the wall **17**, thus insuring that no parts of the discharge orifice and fluid cavities will be bent, deflected or possibly squeezed shut from their predetermined shapes.

Referring in further detail to the construction of the insert **16** as shown in FIGS. 5, 6 and 7, this part has an elongated body portion **28**, adapted to fit closely within the cavity **26**. The upper edge of this portion is formed with a channel **29** of a semi-circular cross-section and this channel when brought into position against the upper wall **30** of the cavity **26**, will form the desired passage of small cross-section for discharging the aerosol or aerosol mixture from the cavity **27** to the outer end of the insert piece.

At its inner end, the upper edge of the inner portion **28** may extend inwardly and downwardly as at **31** at an angle corresponding generally to the angular position of the finger tab **20**. The angular portion **31** when inserted within the cavity **26**, will come into a firm wedging engagement with a corresponding angular portion **32** along the top wall of the cavity **26**.

The outer end of the insert may be formed with a somewhat enlarged portion **33**, adapted to fit in a corresponding portion **34** of the passage **26**. The upper outer portion of the insert **16** may be formed with a cavity **35**, which when the insert is slid into position, will be largely filled by a portion **35***a* of corresponding shape, formed just above the outer portion of cavity **26**.

As best shown in FIG. 7, the left hand face of the cavity **35** is formed with a plurality of small channels **36** directed tangentially toward a quite small chamber **37** at the center of which is an exit orifice **38** of pinhole size, from which the aerosol spray emanates after the material has been given somewhat of a swirling motion by the channels **36** on its way from the channel **29** to the orifice **38**. The outer end of the formation **35***a* which is received within the cavity **35** may, as shown, be formed at an angle and with a protruding portion **40** thereon so as to provide, with the end face **39** at a like angle within the cavity **35**, a closure for the channels **36** which would be open to the space **35** except for the protruding portion **40**. This portion is surrounded by an annular recess **40***a*, which provides an annular passage for the discharging material in flowing from the channel **29** to the channels **36**. The parts described above in this paragraph provide the equivalent of the so-called "mechanical break-up button" hereinabove referred to and similar to what has heretofore sometimes been provided as a separate removable piece in which the discharged aerosol material or mixture is received, swirled and separated into fine particles before being finally discharged from an orifice. The mechanical break-up button is a well known expedient in the aerosol art and is of course, not essential to the invention herein. It is often employed to improve the quality of the spray, especially with three phase systems, i.e. systems in which the ingredients in the container comprise two liquid phases and a gas phase.

The orifice **38**, as shown, is preferably directed outwardly and somewhat downwardly at a suitable angle so that the user may direct the aerosol spray therefrom conveniently down onto a horizontal surface for example, without unduly tilting the container. If, when the container becomes nearly empty, it should be tilted at a very substantial angle, then the liquid level therein may fall below the level of the lower end of the dip tube, allowing the pressure within the container to be exhausted before the container is substantially emptied. But this may be readily avoided with the orifice directed downwardly as shown. In order that the discharged aerosol spray will be properly thus directed downwardly, the surfaces at **39**, **40** and the annular chamber **40***a*, are preferably placed at right angles, as shown, to the axis of the orifice.

As shown in FIGS. 3 and 4, the space within the body of the cap may be formed with a depending flange **41**, adapted to engage with a "snap-on" fit upon a rim portion **42** of the valve cup **9** on the top of the container **11**. If desired, the flange **41** as shown in FIGS. 3 and 4, may be interrupted or formed with a notch as at **41***a* adapted to receive a detent portion as at **41***b* formed on the rim **42**. This will prevent relative rotation of the container and the overcap and make it possible to be assured that when the overcap is applied in place for use, the aerosol outlet orifice will be at an angular position with respect to the axis of the container properly oriented so that in case the container should be tilted forwardly and downwardly somewhat in use, the lower end of the dip tube **14** will be at a position as near as possible to the bottom of the liquid in the container, for example at a position substantially directly below the orifice, thereby making it possible for the user to utilize substantially all of the aerosol material or mixture which remains liquefied in the bottom of the container.

A plurality of strengthening ribs as at **43** may be molded on the interior of the flange **41** and other connecting strengthening ribs between the flange **41** and the wall **17** may be provided, as indicated at **44** and **45**. The outer edges of the tab **20** may terminate in a strengthening ridge as at **46** and also the space **47** within which the tab **20** is located may be surrounded with a strengthening ridge as at **48**. The outer depending lower edges of the wall **17** as shown in FIG. 6, are adapted to engage within an annular channel as at **50** formed around the periphery of the top of the container **11**.

Although a certain particular embodiment of the invention is herein disclosed for purposes of explanation, further modifications thereof, after study of this specification will be apparent to those skilled in the art to which the invention pertains. Reference should accordingly be had to the appended claims in determining the scope of the invention.

What is claimed and desired to be secured by Letters Patent is:

1. An overcap member for aerosol dispensing container members of the type having an upstanding tubular discharge valve stem, such overcap comprising: a body portion of molded plastic material, such body portion having an upstanding peripheral wall and a top portion within which a depressible tab area is provided and which has on its underside, means for engaging said stem and a passage of large cross-section extending inwardly from said peripheral wall to a region where it is in communication with said stem, a separately formed elongated insert element lodged in said passage and extending longitudinally thereof, a portion along the outer surface of

said insert element, in conjunction with a portion of the wall surface within said passage, serving conjointly to form an elongated passage of small predetermined cross-section substantially smaller than the cross-section of the passage in said body portion and in communication at one end with said stem and having its discharge end of said peripheral wall, a recess on one of said members and a projection on the other of said members, said recess and projections cooperating to prevent relative rotational movement of said members.

2. An overcap for aerosol dispensing containers of the type having a valve with an upstanding tubular discharge valve stem and a curved dip tube attached to its lower end extending to the lower portion of the container, said valve being supported in a valve cup member at the top of the container, such overcap comprising: a body portion of molded plastic material, such body portion having an upstanding peripheral wall and a top portion within which a depressible tab area is provided and which has on its underside means for engaging said stem and a passage of large cross-section extending inwardly from said peripheral wall to a region where it is in communication with said stem, a separately formed elongated insert element lodged in said passage and extending longitudinally thereof, a portion along the outer surface of said insert element in conjunction with a portion of the wall surface within said passage serving conjointly to form an elongated passage of small predetermined cross-section substantially smaller than the large cross-section of the passage in said body portion, said passage of small predetermined cross-section being in communication at one end with said stem and having its discharge end at said peripheral wall, a depending member extending from said top portion engaging said valve cup, a notch formed on one of said members and a detent formed on the other of said members, said notch and detent cooperating to prevent relative rotational movement of said overcap and container and to maintain the lower end of the dip tube substantially directly below the discharge end of said insert.

3. An overcap for aerosol dispensing containers of the type having an upstanding vertically depressible discharge valve stem, said overcap comprising a molded body member formed with an upstanding peripheral wall portion and a top portion, a depressible tab recessed within said top portion and hingedly attached to said body member, said depressible tab being formed to fit over said valve stem and having provided therein an elongated tubular cavity which extends between said valve stem and a point on said peripheral wall portion, an elongated insert member having a narrow shallow channel grooved along the length of its outer surface, said narrow, shallow channel having a cross-sectional area substantially smaller than the cross-sectional area of said elongated tubular cavity, said elongated insert member being lodged within said tubular cavity whereby said channel cooperates with a portion of the inner wall of said tubular cavity to define an elongated passageway of reduced cross section between said valve stem and said peripheral wall portions.

4. An overcap for aerosol dispensing containers of the type having an upstanding tubular discharge valve stem, such overcap comprising a body member of molded plastic material, said body member having an upstanding peripheral wall portion and a top portion, a depressible tab formed within said top portion, said tab being rigidly and integrally connected to, and supported by, a front portion which depends therefrom and forms a part of said peripheral wall portion, said front portion being integrally formed at its lower edge with a flexible portion of said upstanding peripheral wall portion, whereby when said tab is depressed, said front portion as supported thereby tilts about said flexible portion, means provided on the underside of said tab for engaging said stem, said last mentioned means being formed with an internal elongated tubular cavity which communicates between said stem and said front portion, and an elongated insert member having a narrow shallow channel grooved along the length of its outer surface, said narrow, shallow channel having a cross-sectional area substantially smaller than the cross-sectional area of said tubular cavity, said elongated insert member being lodged within said tubular cavity whereby said channel cooperates with a portion of the inner wall of said tubular cavity to define an elongated passageway of reduced cross section between said valve stem and said front portion.

5. An overcap for aerosol dispensing containers of the type having an upwardly protruding vertically actuable discharge valve stem, said overcap comprising a body member of molded plastic material, said body member having an upstanding peripheral wall portion for extending around the top of the container in widely spaced relation to said stem, said body member having formed therein a passageway of large cross sectional area in communication with, and extending between, said stem and a point on said peripheral wall portion and an elongated plastic insert member having a narrow shallow channel grooved along the length of its outer surface, said narrow, shallow channel having a cross-sectional area substantially smaller than the cross-sectional area of said tubular cavity, said elongated insert member being lodged within said tubular cavity whereby said channel cooperates with a portion of the inner wall of said tubular cavity to define an elongated passageway of reduced cross section between said valve stem and said point on said peripheral wall portion.

6. An overcap according to claim 5 wherein said insert piece is partly of wedge shape and is engaged in said passage of large cross-section with a forced fit.

7. In an overcap for aerosol dispensing containers of the type having a centrally located discharge valve stem, the combination of a molded element which fits over said valve stem and has formed therein an elongated tubular cavity extending between said valve stem and a point on the periphery of said overcap, and an elongated insert member having a narrow shallow channel grooved along the length of its outer surface, said narrow, shallow channel having a cross-sectional area substantially smaller than the cross-sectional area of said tubular cavity, said elongated insert member being lodged within said tubular cavity whereby said channel cooperates with a portion of the walls of said tubular cavity to define an elongated passageway of reduced cross section between said valve stem and said overcap periphery.

8. In an overcap for aerosol dispensing containers of the type having a centrally located discharge valve stem, the combination of a molded element which fits over said valve stem and has formed therein an elongated tubular cavity extending between said valve stem and a point on the periphery of said overcap, and an elongated insert member having a narrow shallow channel grooved along the length of its outer surface, said narrow, shallow channel having a cross-sectional area substantially smaller than the cross-sectional area of said elongated tubular cavity, said elongated insert member being lodged within said tubular cavity whereby said channel cooperates with a portion of the walls of said tubular cavity to define an elongated passageway of reduced cross section between said valve stem and said overcap periphery, the outer portion of said insert member being formed with a cavity having a small aerosol spray discharge orifice opening therefrom, said cavity being largely filled by a portion of the material on the underside of said molded element, the latter portion in conjunction with the interior surface of said cavity being shaped to form a small annular chamber communicating with said orifice by way of small channels extending generally tangentially from said orifice.

9. In an overcap for aerosol dispensing containers of the type having a centrally located discharge valve stem,

the combination of a molded element which fits over said valve stem and has formed therein an elongated tubular cavity extending between said valve stem and a point on the periphery of said overcap, and an elongated insert member having a narrow shallow channel grooved along the length of its outer surface, said narrow, shallow channel having a cross-sectional area substantially smaller than the cross-sectional area of said elongated tubular cavity, said elongated insert member being lodged within said tubular cavity whereby said channel cooperates with a portion of the walls of said tubular cavity to define an elongated passageway of reduced cross section between said valve stem and said overcap periphery, the outer portion of said insert member being formed with a cavity having a small aerosol spray discharge orifice opening therefrom, said orifice being directed outwardly and at a downward angle with respect to said tubular cavity walls, said cavity being largely filled by a portion of the material on the underside of said molded element, the latter portion in conjunction with the interior surface of said cavity being shaped to form a small annular chamber located in a plane substantially at right angles to the axis of said orifice and communicating with said orifice by way of small channels extending generally tangentially from said orifice.

10. In an overcap for aerosol dispensing containers of the type having a centrally located discharge valve stem, the combination of a molded element which fits over said valve stem and has formed therein an elongated tubular cavity extending between said valve stem and a point on the periphery of said overcap, and an elongated insert member closely fitted within and extending along the length of said tubular cavity, the outer peripheral walls of said insert member being a full contact with the corresponding peripheral walls of said cavity, except along a narrow grooved channel substantially smaller in width than the diameter of said elongated tubular cavity, said channel being cut into one of said walls and extending along the length of said tubular cavity to define an elongated liquid flow passageway of reduced cross section between said valve stem and said point, the outer portion of said insert member being formed with a second cavity having a small aerosol spray discharge orifice opening therefrom, said second cavity being largely filled by a portion of the material on the underside of said molded element, the latter portion in conjunction with the entire surface of said second cavity being shaped to form a small annular chamber connected with said orifice by way of small channels extending generally tangentially from said orifice.

11. In on overcap for aerosol dispensing containers of the type having a centrally located discharge valve stem, the combination of a molded element which fits over said valve stem and has formed therein an elongated tubular cavity extending between said valve stem and a point on the periphery of said overcap, and an elongated insert member closely fitted within and extending along the length of said tubular cavity, the outer peripheral walls of said insert member being in full contact with the corresponding peripheral walls of said cavity, except along a narrow grooved channel, said narrow grooved channel having a cross sectional area substantially smaller than the cross sectional area of said elongated tubular cavity, said channel being cut into one of said walls and extending along the length of said tubular cavity to define an elongated liquid flow passageway of reduced cross section between said valve stem and said point.

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