

ACTUATOR CAP FOR AEROSOL CONTAINERS FOR DISPENSING
DISCREET METERED QUANTITIES OF THE AEROSOL PRODUCT.
AND AEROSOL CONTAINERS FITTED THEREWITH

5 This invention relates to an actuator for metering a product from an aerosol container, especially a foam forming product, and aerosol containers equipped with such an actuator.

 Aerosol dispensers generally embody a container for a liquid "active ingredient", maintained under pressure in the container by a
10 "propellant" and adapted to be autogenously discharged therefrom through a manually operable valve when the latter is opened to pass an aerosol mixture of material through a tubular valve stem to a valve operating push button from which it is discharged to the atmosphere. The great majority of aerosol dispensers deliver the aerosol material
15 to the atmosphere as long as the valve is held open and the pressure within the container is sufficient to discharge the material therefrom.

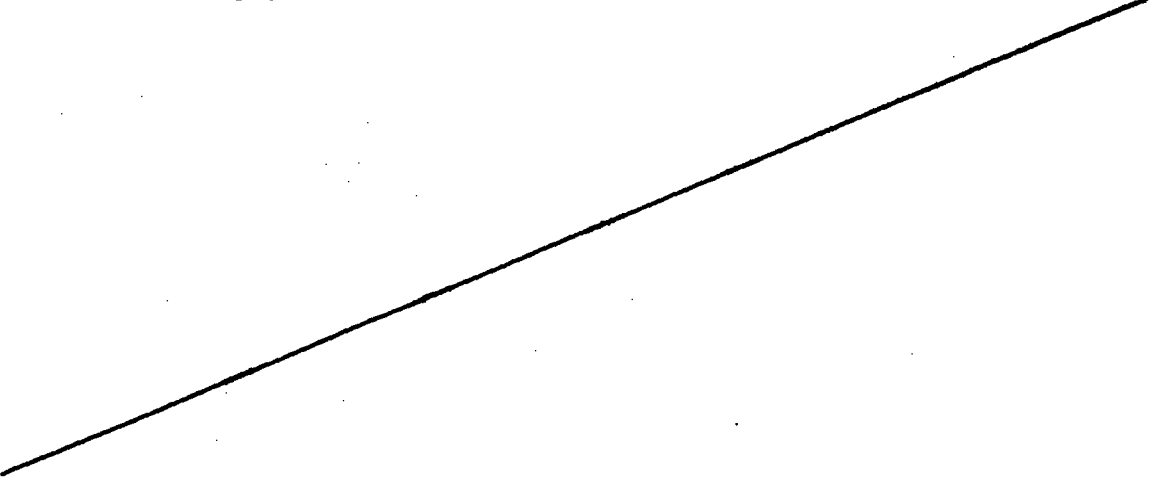
 Aerosol dispensers have heretofore been constructed to deliver from the container measured quantities of the material at each operation of the actuator. Many of said prior dispensers comprise
20 metering devices built into the container itself and usually forming an inherent portion of the valve, while others are so constituted that the metering function is carried out in the valve operating actuator. This invention is directed to the latter type and its object is to provide a more satisfactory and efficient metering actuator than those which

have gone before.

The present invention represents an improvement in the type of actuator shown in United States Patent No. 2,989,217, and in particular provides for improving the seal at several essential interfaces between
5 the member to which the actuating pressure is applied by the finger and the valve opening member of the actuator.

Actuators of the above type comprise two components, one is a valve opening member which frictionally engages with the valve stem that extends through a top opening of the valve-bearing closure of a
10 conventional aerosol container. The other is a cap member which is mountable on the rim of the container in surrounding relationship to the valve-opening member, with a metering chamber defined therebetween.

In that arrangement there are several critical seals between the valve-opening member and the cap member, which carries the finger-
15 bearing surface, i.e. the surface to which pressure may be applied by the finger to open the valve, that must be effected to achieve satisfactory performance of the actuator. There must be a seal, during



actuation or downward movement of the valve stem to open the aerosol valve, between the respective members to close-off the metering chamber from the conduit terminating in the discharge nozzle. Secondly, there must be a seal at the interfit between the valve-opening member and the cap member.

According to this invention, the improved actuator comprises a cap engageable on the rim of the container in surrounding relationship to the exposed end of the valve stem and comprising a dispensing nozzle;

a valve opening member mounted as an interference fit inside the cap and forming therewith an enclosed metering chamber for receiving a predetermined quantity of the contents of the container when the valve is opened by finger pressure on the cap, the said valve opening member having a central hub therein which defines a recess which frictionally engages the exposed end of the valve stem when the actuator is fitted to the container, the said hub having a conduit therethrough communicating at one end with the tubular valve stem, and at the other end with the said metering chamber, said hub further having a dome portion, an annular lateral flange portion, and an annular sidewall portion at the periphery of the flange portion;

the said cap comprising a pressure surface by means of which finger pressure may be applied to the cap, said surface extending transversely of the cap, a hub centrally positioned on the underside of said surface, an end face normally spaced from the said dome portion of the valve opening member, but engageable therewith when finger pressure is applied to said pressure surface thereby to effect the opening of the valve by the application of axial pressure to the valve stem via the valve opening member and the consequential charging of the metering chamber with a predetermined finite quantity of material to be dispensed, the said central hub having a passageway therein communicating at one end with the said nozzle and at the other with a recess in said end face, which, when said finger pressure is applied, sealingly receives and engages with said dome portion to prevent premature discharge of the predetermined quantity of material from the metering chamber, that discharge taking place when said finger pressure is released thereby allowing the hub portion to retract to its normal position thereby to provide open communication between the metering

chamber and the nozzle via said passageway and said recess in the end face of the central hub;

the said cap further comprising an annular side wall portion extending downwardly from the periphery of said pressure surface, so as to provide an interference fit with the annular side wall portion of the valve opening member, a flexible annular flange extending laterally of the cap from the rim of said side wall, and a further annular side wall extending from the periphery of that flexible flange with attachment means at its rim enabling the cap to be mounted on the rim of the container.

The accompanying drawing illustrates one practical embodiment of the invention, but the construction therein shown is to be understood to be illustrative only, and not as defining the limits of the invention.

Figure 1 is a vertical section through the actuator of the subject invention disposed on a valved aerosol container, the valve and container being shown in partial section. Figure 1 shows the aerosol valve in an open position as it will be at an intermediate stage during the dispensing operation and when finger pressure has been applied to the actuator to initiate the dispensing sequence.

Figure 2 is a vertical section similar to Figure 1 but showing the aerosol valve in the closed position, as it will be when the actuator is at rest and as it will be during the second stage of the dispensing process when finger pressure has been released.

Figure 3 is a vertical section through the cap member of the actuator of this invention.

Figure 4 is a partial vertical section through the valve opening member of the actuator of this invention.

Figure 5 is a plan view of the cap member shown in Figure 3.

Referring to Figures 1 and 2, the typical aerosol valve mechanism comprises a valve body 1, secured within the valve housing 2 associated with a container indicated generally at 3. An annular sealing gasket 4 is clamped between the valve housing and valve body. A valve core 5 is positioned within the valve body and has an upstanding tubular valve stem 6 which extends through the opening in the gasket 4 and has one or more orifices 7 which are normally sealed by the gasket 4 when the

parts are in the rest position as shown in Figure 2.

Downward pressure on the valve stem will move the valve stem and core into the position of Figure 1 to unseal the orifice 7, so that aerosol material within the container 3 may flow through this orifice and through the hollow valve stem and out of the upper end of the latter. A spring 8 normally maintains the valve in the closed position of Figure 2.

The present invention is directed, as hereinbefore stated, to an actuator of novel construction so constituted that it may effect the dispensing of measured quantities of the aerosol material delivered through the valve stem.

In Figures 1 and 2 of the accompanying drawings the actuator of this invention is generally designated as 10. The valve opening member 12 is disposed on the valve stem 6. The valve opening member 12 has a central hub portion 14 which defines a recess 15 for receiving the valve stem 6 in frictional engagement therewith. Extending from the recess 15 is a lateral conduit 16. Axially aligned with the recess 15 is a hemispherically-shaped dome portion 18. The hub 14 has a radially extending annular flange portion 20, which terminates in a side wall portion having at its terminus a lateral annular flange 24. Disposed outwardly from the side-wall portion 22 is an upstanding annular wall 26.

The cap member is generally designated at 32 and has a top surface 34 with a saucer-like depression 36 for the application of the finger pressure necessary to open the valve. Extending downwardly from the top portion 34 is an annular side-wall 38; the side-wall extends from the top portion 34. The side-wall 38 has an annular recess 40 at its lower end, which recess, as will be more fully described hereafter, is constructed to receive the upstanding annular wall 26 in an interference fit relation thereby forming a seal between the annular wall 26 and the recess 40. An annular lateral flange 42 which includes spaced flexible web portions 44 extends from the side-wall 38. An annular side-wall 46 extends from the lateral flange at the end of the flexible web portions 44, the side-wall 46 being constructed to snap-on the bead 48 of the container 3.

Depending from the underside of the top portion 36 is a hub 50 defining a recess 52 for receiving the dome portion 18 of the valve-

opening member, the recess 52 communicating with a lateral discharge nozzle 54. The hub 50 defining the recess 52 and the dome portion 18 form a seal when the hub is advanced toward the dome portion.

5 The cap member 32 is constructed to fit onto and surround the outer surface of the side-wall 22. A metering chamber 56 is formed by the top portion 36, the side-wall 38 and the valve-opening member.

To effect a better seal between the valve-opening member 12 and the cap member 32, the side-walls 22 and 38 of the valve-opening member 12 and the cap member 32, respectively, may have mating recesses 58 and
10 protuberances 60.

The normal relation of the parts is as shown in Figure 2 from which it will be noted that the orifice 7 of the valve-stem 6 is closed and the container is thus sealed. When it is desired to dispense material from the aerosol container, downward pressure is applied to
15 the top surface 36 of the cap member 32. As this pressure is applied the cap member, while held firmly on the bead of the container, is free to move toward the valve-opening member by the flexure of the flexible webs 44. This downward movement continues until there is an engagement between the dome portion of the valve-opening member and the hub
20 defining the recess in the cap member. The engagement of the dome portion and the hub isolates the metering chamber from the discharge nozzle. The above-described relative movement between the cap member and the valve-opening member results because the resistance to flexing of the webs is less than the resistance of the valve stem to recede.
25 Thus, during this initial movement to isolate the discharge nozzle from the metering chamber, no movement is imparted to the valve stem. However, continued downward pressure and consequent downward movement of the cap member will be imparted to the valve stem through the hub of the valve-opening member to the upper end of the valve stem with the
30 result that said valve stem will be depressed into the position shown in Figure 1, to establish communication between the interior of the container and the metering chamber. Material will then flow from the container until it fills the metering chamber and the hollow valve stem, after which such flow will cease.

35 When the pressure manually applied to the top surface of the cap member is released, the valve stem will return to the position shown in Figure 2, that is, to a sealed position. Continued upward movement of

the finger-bearing member will lift and separate the hub of the cap member from the dome portion of the valve-opening member. The separation of the hub and dome will open communication between the metering chamber and the discharge nozzle so that the measured quantity of the material from the aerosol container comprising the active ingredient and the propellant that have been trapped in the metering chamber and the valve stem will be autogenously exhausted through the discharge nozzle.

At the conclusion of the dispensing operation, the metering actuator and the aerosol valve will appear as shown in Figure 2 with both the metering chamber and the passage to the valve stem ready for the next dispensing operation.

The improvement in sealing accomplished by the subject structure to isolate the metering chamber from the discharge nozzle and to effect the seal between the side-walls of the cap member and the valve-opening member is best shown in Figures 3 and 4.

Referring to the seal between the hub 50 of the cap member and the hemispherically shaped dome 18, it has been found desirable to radius the hub at the entry of the recess 52.

The hemispherical dome is constructed such that recess 52 advances onto the dome 18 creating a plug-like seal between the dome 18 and the hub 50.

Referring to the seal between the side walls of the cap member 32 and the valve-opening member 12, it has been found that an annular upstanding annular wall 26 having a length of approximately .070" (1.8mm) is satisfactory.

Further, the upstanding wall 26 is preferably tapered outwardly from the base to the top of the wall; a three degree (3°) taper has been found satisfactory. The seal between the side walls of the cap member and the valve-opening member is enhanced by the substantial surface contact between the upstanding annular wall 26 and the wall defining the recess 40. Moreover, the mating recesses or undercuts 58 and protuberances 60 in the respective outer surfaces of the walls 22 and 38, aid in the seal.

The actuator of the present invention may be efficiently and economically manufactured by the well known injection moulding technique and the diaphragm and rigid superstructure of the button may

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be assembled simply and efficiently. The two parts of the actuator may be moulded from linear low density polyethylene.

The actuator of this invention is designed, as indicated, for dispensing metered quantities of foam forming aerosol compositions for
5 an aerosol container.

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CLAIMS:

1. An actuator for fitting to a pressurised aerosol container to enable actuation of the aerosol valve mechanism and consequent dispensing of the contents of the aerosol container through a dispensing nozzle, the aerosol valve mechanism being of the type comprising an upstanding tubular valve stem having an exposed end through which the contents of the container are dispensed upon the application of axial pressure to the valve stem, that axial pressure being effective to move the valve stem axially against a spring bias to open the valve thereby enabling the contents of the container to be discharged through the valve stem, the said actuator comprising:

a cap engageable on the rim of the container in surrounding relationship to the exposed end of the valve stem and comprising a dispensing nozzle;

a valve opening member mounted as an interference fit inside the cap and forming therewith an enclosed metering chamber for receiving a predetermined quantity of the contents of the container when the valve is opened by finger pressure on the cap, the said valve opening member having a central hub therein which defines a recess which frictionally engages the exposed end of the valve stem when the actuator is fitted to the container, the said hub having a conduit therethrough communicating at one end with the tubular valve stem, and at the other end with the said metering chamber, said hub further having a dome portion, an annular lateral flange portion, and an annular sidewall portion at the periphery of the flange portion;

the said cap comprising a pressure surface by means of which finger pressure may be applied to the cap, said surface extending transversely of the cap, a hub centrally positioned on the underside of said surface, an end face normally spaced from the said dome portion of the valve opening member, but engageable therewith when finger pressure is applied to said pressure surface thereby to effect the opening of the valve by the application of axial pressure to the valve stem via the valve opening member and the consequential charging of the metering chamber with a predetermined finite quantity of material to be dispensed, the said central hub having a passageway therein communicating at one end with the said nozzle and at the other with a recess in said end face, which, when said finger pressure is applied,



sealingly receives and engages with said dome portion to prevent premature discharge of the predetermined quantity of material from the metering chamber, that discharge taking place when said finger pressure is released thereby allowing the hub portion to retract to its normal position thereby to provide open communication between the metering chamber and the nozzle via said passageway and said recess in the end face of the central hub;

the said cap further comprising an annular side wall portion extending downwardly from the periphery of said pressure surface so as to provide an interference fit with the annular side wall portion of the valve opening member, a flexible annular flange extending laterally of the cap from the rim of said side wall, and a further annular side wall extending from the periphery of that flexible flange with attachment means at its rim enabling the cap to be mounted on the rim of the container.

2. An actuator according to claim 1, wherein the said annular flange portion of the valve opening means comprises an upstanding annular wall member which sealingly engages within a corresponding annular recess provided in the first annular side wall member of the cap to provide an additional seal between the two parts of the actuator.

3. An actuator according to claim 2, wherein said annular wall member on the valve opening means is upwardly tapered and the corresponding annular recess in the cap is correspondingly tapered.

4. An actuator according to claim 1, substantially as hereinbefore described with reference to the accompanying drawings.

5. An aerosol container when fitted with an actuator according to claim 1, 2, 3 or 4.



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6. An aerosol container according to claim 5, containing as the material to be dispensed a foam forming composition.
