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VALVE STRUCTURE FOR AN AEROSOL CONTAINER

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Fig. 1.

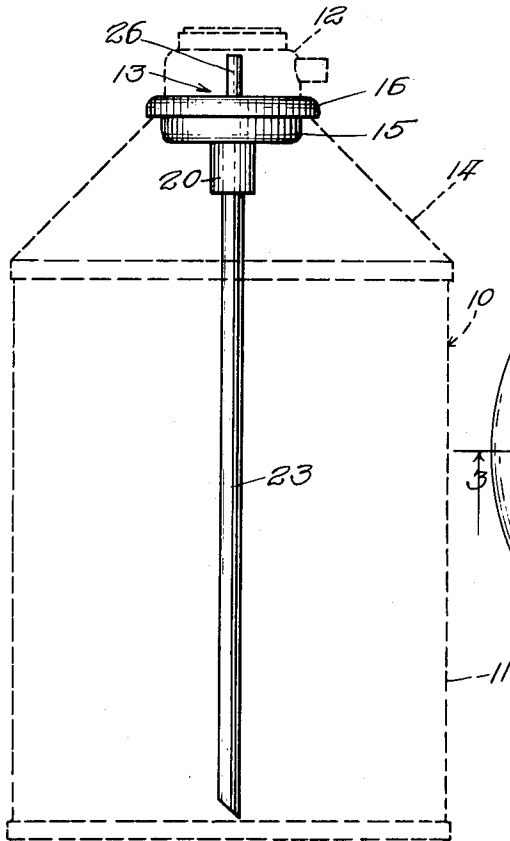


Fig. 2.

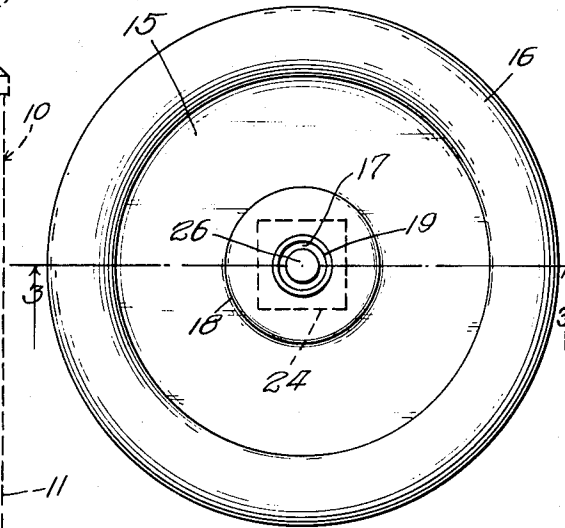


Fig. 4.

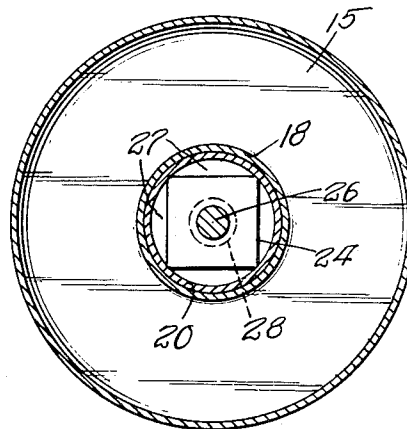
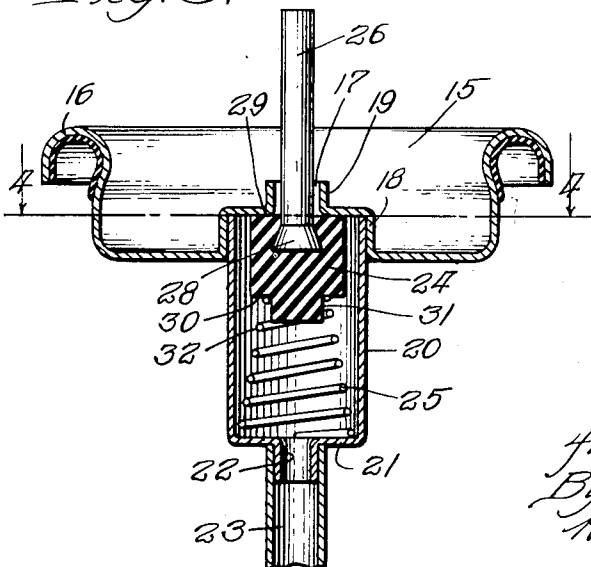


Fig. 3.



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VALVE STRUCTURE FOR AN AEROSOL CONTAINER

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11 Claims. (Cl. 222—394)

This invention relates to a valve structure, and more particularly to a dispensing valve structure for an aerosol container.

Aerosol containers or dispensers are in wide use as dispensing units for materials like shaving lather, whipping cream, perfumes, and insecticides. The aerosol container consists of a container portion and a dispensing valve mechanism of some type. The container is filled with the ingredient to be dispensed and charged with a compressed gas. When the valve is opened, generally by manual pressure, the ingredients, under the pressure of the charged gas, rush through the valve to the outside. After the manual pressure is released, the valve reseats itself to prevent further escape of the contents.

Especially when dispensing semi-solid materials like shaving lather, a difficult problem is encountered in manually regulating the flow of material from the aerosol container to get the small quantity that is usually required. In aerosol containers equipped with spring closed valves, the pressure exerted by the operator to open the valve against the pressure of the spring and compressed gas within the container is sufficiently great that as a result when the valve is finally opened, it generally moves to fully open position, permitting an unusually large and wasteful amount of material to issue from the aerosol container. Further, this larger amount has a tendency to spatter because of the force of expulsion.

Applicant's invention relates to a valve structure which will open only part way with the first exertion of pressure on the finger piece. This pressure is substantially less than that required in currently used valves for aerosol containers which require relatively great manual pressure just to open the valve.

Slight opening of the valve by application of relatively little pressure is accomplished through the use of compound valve members of two materials having different resistances to compression as means for opposing the pressure for opening the valve. The more easily compressed or deformed material forms the gate member of the valve and the material having the greater resistance, generally in the form of a spring, urges the gate member toward closure. Application of slight pressure compresses the gate member slightly, thus opening the valve slightly. Only upon application of substantially greater pressure will the spring be compressed, to open the valve to fully open position thus avoiding opening of the valve to such an extent that more of the contents are expelled than the operator desires. Thus, the tendency of the contents to spatter is substantially eliminated.

Applicant's gradual or staged opening valve is secured to a base which has a central opening. The base is secured to the aerosol container. Inside the container, and secured to the base about the central opening is a bonnet member or housing. Within the bonnet member is a slidable elastic gate element which moves into and out of engagement with the base to seal the central opening. Also within the bonnet member is a metal spring element in tandem with the elastic gate element that yield-

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ingly urges the elastic gate element toward closure against the base. The metal spring element has a greater resistance to compression or deformation than the elastic gate element. An external plunger or finger piece is provided for manual movement against the elastic gate element whereby the central opening may be gradually opened.

The intended life of the valve structure set forth in this application is relatively short. Since it is permanently secured to the aerosol container, it has no more use when the contents of the container are exhausted. It must, therefore, be constructed of reasonably priced materials and so designed as to be readily assembled by machine operation.

An embodiment of the present invention is shown in the accompanying drawings in which:

Fig. 1 is an elevational view of the gradual opening valve assembled on an aerosol container shown in the dotted outline;

Fig. 2 is an enlarged plan view of the cap portion of the aerosol container shown in Fig. 1;

Fig. 3 is a sectional view taken along the line 3—3 of Fig. 2;

Fig. 4 is a sectional view taken along the line 4—4 of Fig. 3.

As shown in Figure 1 an aerosol container generally designated 10 comprises a container portion 11, a cover member 12, and a valve, generally designated 13. The container is usually a steel can which the aerosol packager can purchase from a commercial source. The cans are filled with the material to be dispensed before the valve structure is sealed to the can. After sealing, a gas is then forced through the valve to charge the container and its contents. In the preferred embodiment as shown in Figure 1, the container portion 11 has a tapered top portion 14 which permits ready mounting and sealing of valve 13 to the container.

Referring to Figures 3 and 4, the valve 13 has a generally cup-shaped valve base 15. Base 15 is equipped with curved rim 16 so that it may be attached and sealed to the tapered top portion 14 of the container 11. Base 15 has a central opening 17 and about the opening, a circular inset portion 18 equipped with an upstanding lip 19. Inset portion 18 forms the seat of the valve.

Cylindrical bonnet member 20 is located internal to container 11 and is adapted to be secured about its periphery to the wall of inset portion 18 of base 15, as by a press-fit. Bonnet member 20 has a constricted cylindrical portion 22 connected to the wider portion 20 by an internal transverse shoulder 21. Eduction tube 23 is secured to the outer surface of constricted portion 22. In the preferred embodiment, tube 23 extends substantially to the bottom of container 11. Extending tube 23 in this fashion permits discharge of substantially all of the ingredients without undue loss of the compressed gas which generally rises to the top of the container. However, tube 23 is not essential to applicant's invention since the same result can be achieved by tilting the container during use.

Inside the chamber formed by inset portion 18 of base 15 and bonnet member 20 is slidable elastic valve gate element 24 which is adapted to move into and out of engagement with base 15 to seal the central opening 17. In the preferred embodiment, the elastic gate element 24 is rubber. Valve gate member 24 is in tandem with metal spring element 25 and is yieldingly urged against base 15 by one end of metal spring element 25, the other end of spring element 25 bearing against shoulder 21. Plunger 26 is loosely fitted into and extends through upstanding lip 19 of base 15 and bears against valve gate element 24, whereby downward pressure on plunger 26 will unseat gate element 24 from the central opening 17.

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As shown in Figures 3 and 4, the elastic valve gate element 24 is substantially cubical in shape, the corners thereof being slidably adjacent to the internal surface of cylindrical bonnet member 20. Thus, passageways 27 are provided for passage of the ingredients of the aerosol container around valve gate element 24. Plunger 26 is inserted into opening 23 in the sealing surface 29 of elastic valve gate element 24. Opening 28 is substantially coaxial with the central opening 17 of valve base 15. Metal spring element 25 is a coiled spring having the shape of a frustum of a cone, with the base of the spring adjacent shoulder portion 21 of bonnet member 20. The bottom surface 30 of valve gate element 24 is provided with a neck-like or cylindrical protruding portion 31 to be received into the narrower portion 32 of the conical spring element 25. The conical shape of spring element 25 is preferred so that passageways 27 will be unobstructed against passage of ingredients.

In operation, the first applied finger pressure against the elastic top portion of cover member 12 causes finger actuator or plunger 26 to be depressed a slight distance. The displacement of plunger 26 causes elastic valve gate element 24 to be deformed slightly, the pressure exerted through plunger 24 being insufficient to compress coiled spring 25. The compression of elastic valve gate element 24 results in displacing sealing surface 29 a short distance from the valve seat portion 18 of valve base 15. The pressure within the aerosol container forces the contents up through tube 23, through coiled spring 25 and passageways 27, between sealing surface 29 of elastic valve gate element 24 and valve seat portion 18 of valve base 15, and ultimately through the central opening 17 between plunger 26 and upstanding lip 19. Should the rate of discharge of ingredients be too slow, additional pressure applied to cover member 12 will result in additional compression of elastic valve gate element 24, thereby providing a wider separation between sealing surface 29 of elastic valve gate element 24 and valve seat 18 and consequently a higher rate of discharge of the contents of the container.

As the manually applied pressure is increased, a point is reached where the coiled spring element 25 begins to compress, thus permitting displacement of valve gate element 24 even a greater distance from valve seat 18. This point is determined by the relative resistances to compression of the materials used in the valve gate element 24 and the spring element 25.

While I have shown and described a certain embodiment of my invention, it is understood that it is capable of many modifications, changes, therefore, in the construction and arrangement may be made without departing from the spirit and scope of the invention as disclosed in the appended claims.

I claim:

1. A gradually opening valve for an aerosol container, comprising a valve base adapted to be secured to an aerosol container and having a central opening for communication with the container interior, an internal bonnet member secured to said base about the opening, said bonnet having an opening for receiving the contents of the container, a compressible valve gate element slidable within the bonnet member and compressible whereby to move into and out of engagement with the base to seal the central opening against passage of contents out of the container, a compressible spring element within the bonnet member yieldingly urging the compressible gate element toward closure against the valve base, said spring element being adapted to resist compression until said gate element has been at least partially compressed, and external means for manual movement against the compressible gate element for unseating the valve gate element, the compressible element and spring element being in tandem whereby said central opening may be gradually opened.

2. A gradually opening valve for an aerosol container, comprising a cup-shaped valve base having a circular

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central opening and adapted to be secured to the aerosol container, a cylindrical bonnet member secured internally to said base, and having an internal shoulder, said bonnet having an opening for receiving the contents of the container, a resilient valve gate element within the bonnet member and adapted to move into and out of sealing relationship with said base by compression with the base to seal the central opening against passage of contents out of the container, a coiled spring element within the bonnet member and adjacent the annular shoulder thereof, yieldingly urging the resilient gate element toward closure, said spring element being adapted to resist compression until said gate element has been at least partially compressed, and external means pressing against the resilient compressible gate element for unseating the valve, said resilient gate element and spring element being in tandem, whereby said central opening may be gradually opened.

3. A valve of the character described in claim 2 wherein the elastic valve gate element is essentially a cube with a depending neck-like portion and the coiled spring element has the shape of a frustum of a cone, with the neck-like portion of the elastic valve gate element being received into the smaller end of the said spring element.

4. A valve of the character described in claim 2 wherein the bonnet member has elongated tubular extension means which extends substantially to the bottom of the aerosol container.

5. A valve of the character described in claim 2 wherein the external pressing means is a solid plunger extending through the central opening of the valve base and secured to that portion of the elastic valve gate element adapted to engage the said valve base.

6. A gradually opening valve for an aerosol container, comprising a valve base having a central opening for communication with the container interior, an internal bonnet member secured to said base about the opening, said bonnet having an opening for receiving the contents of the container, a compressible valve gate slidable within the bonnet member, a compressible spring positioned within said bonnet member normally supporting said valve gate in sealing relationship to said opening and plunger means adapted to exert force against said valve element and said spring, said valve gate being adapted first to move during application of force by said means to provide for a substantial movement of said plunger means, and said spring being adapted to move upon application of threshold force greater than that required to compress said valve gate.

7. The device according to claim 6 wherein the valve gate element is substantially different in cross-sectional configuration from said bonnet whereby to form a channel between said valve gate element and said bonnet.

8. A gradually opening valve for an aerosol container as set forth in claim 6 wherein the bonnet member has an elongated tubular extension extending from the opening in the bonnet member which is capable of extending substantially to the bottom of the container.

9. In an aerosol dispenser: a dispenser container having an opening for receiving a valve; and a gradually opening valve for said container comprising a valve base secured to the container at said opening of the container and having a central opening for communication with the container interior, an internal bonnet member positioned in said container and secured to said base about said central opening, said bonnet having an opening for receiving the contents of the container, a compressible valve gate element slidable within the bonnet member and compressible whereby to move into and out of engagement with the base to seal the central opening against passage of contents out of the container, a compressible spring element positioned within the bonnet member yieldingly urging the compressible gate element toward closure against the valve base, said spring element being adapted to resist compression until said gate element has been at least partially compressed, and external means for manual movement against the compressible gate ele-

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ment for unseating the valve gate element, the compressible element and spring element being in tandem whereby said central opening may be gradually opened.

10. In an aerosol dispenser: a dispenser container having an opening for receiving a valve; and a gradually opening valve for said container comprising a cup-shaped valve base having a circular central opening secured to the container at said opening of the container; a cylindrical bonnet member having an opening for receiving the contents of the container, secured internally to said base and positioned in said container, said bonnet having an internal shoulder, a resilient valve gate element within the bonnet member and adapted to move into and out of sealing relationship with said base by compression with the base to seal the central opening against passage of contents out of the container, a coiled spring element within the bonnet member and adjacent the annular shoulder thereof, said spring element yieldingly urging the resilient gate element toward closure, said spring element being adapted to resist compression until said gate element has been at least partially compressed, and external means pressing against the resilient compressible gate element for unseating the valve, said resilient gate element and spring element being in tandem, whereby said central opening may be gradually opened.

11. In an aerosol dispenser: a dispenser container having an opening for receiving a valve; and a gradually opening valve for said container comprising a valve base

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having a central opening for communication with the container interior, said base member being secured to the container at the container opening, an internal bonnet member secured to said base about said central opening, said bonnet being positioned inside the container and having an opening for receiving the contents of the container, a compressible valve gate slidable within the bonnet member, a compressible spring positioned within said bonnet member normally supporting said valve gate in sealing relationship to said central opening and plunger means adapted to exert force against said valve element and said spring, said valve gate being adapted first to move during application of force by said plunger means to provide for a substantial movement of said plunger means, and said spring being adapted to move upon application of threshold force greater than that required to compress said valve gate.

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