Oct. 13, 1959 P. C. GOODSPEED, JR 2,908,479

AEROSOL VALVE

Filed Nov. 4, 1957

FIG. 1

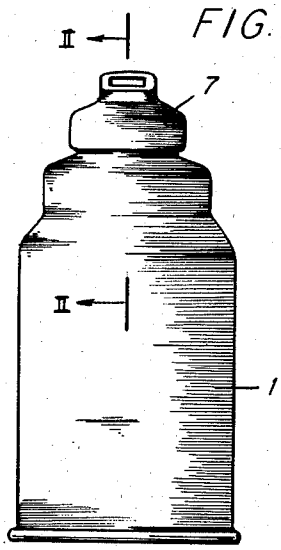


FIG. 2

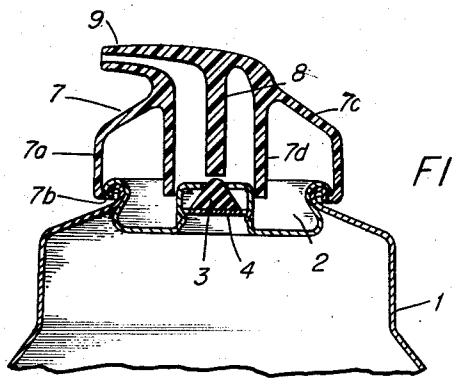


FIG. 3

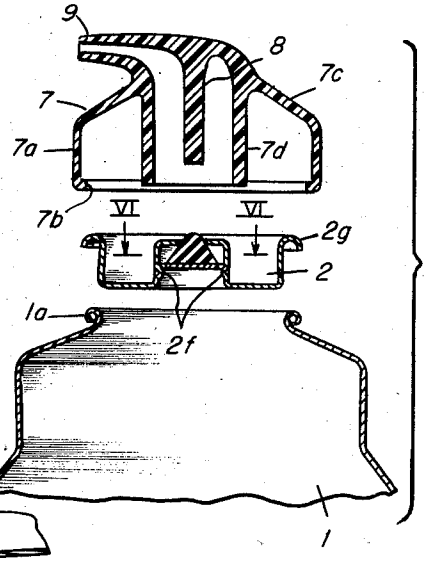


FIG. 4

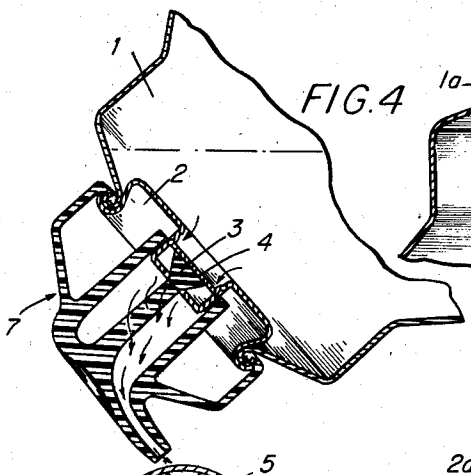
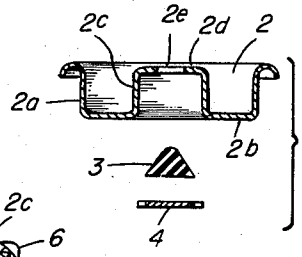


FIG. 5



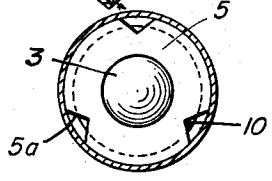


FIG. 7

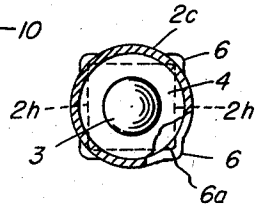


FIG. 6

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AEROSOL VALVE

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4 Claims. (Cl. 251—320)

The present invention relates to valve mechanisms, and is particularly concerned with valve mechanisms for controlling the dispensing of fluids such as foams or sprays from pressurized containers of the type commonly known as aerosols.

An aerosol may be defined as a container which holds under pressure a fluid to be dispensed as a foam or spray and a pressure producing agent, usually a liquid having a high vapor pressure at normal temperatures, whose expansion develops the pressure necessary to expel the product to be dispensed from the container when the dispensing valve is open. Products dispensed from such containers include shaving creams, insecticides, and various other products. The product may be dispensed as a foam, as is usually the case with shaving cream, or it may be dispensed as a spray, as is commonly the case with insecticides. Aerosols are commonly manufactured on a mass production basis. It is essential that any valve mechanism employed in such a device be inexpensive and easy to build. It is also essential that the valve seal the container tightly against leakage and loss of pressure and that the valve be easy to open by the application of manual force.

An object of the present invention is to provide a valve of the type described which is simple in structure and inexpensive to manufacture.

Another object is to provide a valve of the type described which seals tightly when closed, and may be readily opened by the application of a small manual force.

The foregoing and other objects of the invention are attained by providing a valve consisting of a compressible valve member of rubber or the like having a conical operating surface which cooperates with a circular seat. Means are provided for opening the valve by applying to the center of the cone, which projects through the seat, a compressive force tending to push the conical valve member back through the seat.

The conical valve member is retained in place adjacent the seat by a disc crimped in place in a cylindrical portion of the aerosol container. Preferably, this cylindrical portion is part of a top closure member which is crimped in place over the rolled edge of the body of the container.

Other objects and advantages of the invention will become apparent from a consideration of the following specification and claims, taken together with the accompanying drawing.

In the drawing:

Fig. 1 is an elevational view of an aerosol container equipped with a valve embodying the invention;

Fig. 2 is a cross-sectional view taken on the line II—II of Fig. 1;

Fig. 3 is a view similar to Fig. 2, but showing the parts partially disassembled;

Fig. 4 is a view similar to Fig. 2, but showing the aerosol inverted and the valve open as during dispensing;

Fig. 5 is a cross-sectional view showing the parts of the valve mechanism itself, completely disassembled;

Fig. 6 is a view taken along the line VI—VI of Fig. 3, on an enlarged scale, looking in the direction of the arrows; and

Fig. 7 is a view similar to Fig. 6, showing a modified form of valve supporting disc.

There is shown in the drawings an aerosol comprising a generally cylindrical container or can **1** having an open top with a rolled edge **1***a*, best seen in Fig. 3. The open top of the can **1** is covered by a closure member **2** which, like the container **1**, may be formed of tin plate. Closure member **2** is a single stamping and comprises a generally cylindrical portion **2***a* adapted to fit inside the rolled edge **1***a* of the can, a web portion **2***b* extending transversely from the lower edge of the cylindrical portion, another cylindrical portion **2***c* extending upwardly from the web portion **2***b* and terminating in a flat portion **2***d*, which is provided with a central aperture **2***e*, which serves as a valve seat.

A valve member **3** has a generally conical external surface, which conical surface is adapted to engage the seat **2***e*. The valve member **3** is constructed of compressible material such as rubber or the like. The term rubber as used herein is intended to include any of the various synthetic rubbers, or plastic or elastomeric materials, which may be suitable for the purpose of constructing the valve. The material must be easily compressible and deformable by light pressures. The valve **3** is held in place against the seat **2***e* by means of a disc **4**. The disc **4** is retained within the cylidrical portion **2***c* of the cover **2** by crimping the sides of the cover, as shown at **2***f* in Fig. 3.

In assembling the valve mechanism, the valve member **3** is first inserted against the seat **2***e*, and the disc **4** is then placed against the base of the valve member **3**, and the sides of the cylindrical cover portion **2***c* are crimped at **2***f* to hold the valve member **3** and the disc **4** in place. The complete assembly, including the cover **2**, the valve member **3**, and the disc **4**, is then inserted into the opening in the top of the can **1**, as illustrated in Fig. 3. After that insertion, a rolled marginal portion **2***g* of the cover member is crimped over the rolled edge **1***a* of the can **1** to hold the cover in place. The bottom of the wall **2***a* is also swaged or otherwise bent outwardly under the rolled edge **1***a*, as shown in Fig. 2, to assist in retaining the cover in place.

The disc **4** must be provided with apertures disposed outwardly of the periphery of the base of the valve member **3** to permit the passage of fluid, or apertures must be provided between the periphery of the disc **4** and the cylindrical cover portion **2***c*. The disc **4** may be in the form of a notched disc **5**, illustrated in Fig. 7, having notches **5***a*, which allow passage of fluid past the disc outwardly of the valve member **3**. Where the disc **5** is used, the crimping **2***f* of the cylindrical cover portion **2***c* may be uniform about the entire periphery of that portion, as shown at **10** in Fig. 7. Alternatively, the crimping of the sides of the cylindrical portion **2***c* may be done by four straight crimps **2***h* (see Fig. 6), which form chords in the circular cross-section of the cylindrical portion **2***c*. If the cylindrical portion is crimped in this manner, then the material between the ends of the chords **2***h* is bulged outwardly, as shown at **6** in Fig. 7, providing apertures indicated at **6***a* for the passage of fluid outwardly of the unperforated and unnotched disc **4**.

Whatever type of crimp is used, its spacing from the seat carrying portion **2***d* is so related to the dimensions of the valve member **3** and the disc **4** or **5** as to provide a forced sealing engagement of the valve against the

seat with the valve member free of engagement with the wall 2c and without covering the fluid passages 5a, 6a.

After the valve assembly is in place on the can 1, the can is filled by any suitable conventional filling mechanism which is provided with mechanism for depressing the tip portion of the valve member 3, thereby pushing the valve member away from the seat and allowing space for the entrance of fluid into the container.

After the container is filled, the pressure developed therein by the propellant fluid acts against the disc 4 and provides an additional force holding the valve member 3 tightly against the seat 2e. After the valve assembly is in place, a cap, including a valve operating member and a nozzle structure is mounted on the top of the can. Such a cap is shown generally at 7 in Fig. 1. It is molded of flexible plastic material and includes an outer cylindrical portion 7a, having a lip 7b on the inner side of its lower end. The lip 7b is adapted to slide over the rolled edge 2g of the cover and snap in under it to hold the cap 7 firmly in place. The cylindrical portion 7a is connected by a conical web 7c to an inner cylindrical portion 7d adapted to tightly fit over the cylindrical portion 2c of the closure member 2. Projecting down from the upper end of the cap 7 at the center of the cylindrical portion 7d is an operating pin 8. The space between the pin 8 and the cylindrical portion 7d communicates with a dispensing nozzle 9 formed integrally with the cap 7.

When it is desired to dispense material from the aerosol, it is inverted, as is conventional with such devices, and as shown in Fig. 4, and the resilient cap 7 is squeezed toward the can 1, deforming the cap 7 and pushing the pin 8 against the top of the conical valve member 3, thereby forcing it away from its seat 2e and allowing fluid in the can 1 to flow out past the disc 4 through the apertures and past the valve seat 2e. Upon the release of the pressure on the cap 7, the pin 8 and the valve member 3 spring back to their normal positions, in which the pin 8 just clears the tip of the valve member, and the valve member engages the seat 2e.

The specific structure illustrated for the cap 7 is not a part of my invention. Any other cap may be used with a valve constructed in accordance with the invention, as long as the cap has an operating pin or equivalent structure, and some means to hold that pin in an operative position with respect to the valve.

While I have shown and described a preferred embodiment of my invention, other modifications thereof will readily occur to those skilled in the art, and I therefore intend my invention to be limited only by the appended

I claim:

1. A valve comprising a cylindrical seat element of stamped sheet metal including an end wall and a side wall integral with the end wall at its periphery, said end wall having a circular central opening constituting an outlet, the portion of the end wall extending marginally about the opening and within the side wall constituting a valve seat, said cylindrical seat element being open at the end of the side wall remote from the end wall to provide an inlet, a valve member of compressible resilient material having a flat base portion and a convex apex portion narrower than and in opposed relation to said base portion and larger in diameter than the outlet, said valve member tapering from the base portion to the apex portion, said valve member having all its dimensions parallel to the base surface substantially smaller than the internal dimensions of the side wall, said valve member being located within the side wall and cooperating therewith to define an annular passage, a support element for said valve member, said support element being relatively rigid as compared to said valve member and having at least portions of its peripheral surface cylindrical and engaging the inside surface of the side wall to center the support element with respect to the wall, said support element having a flat surface transverse to said cylindrical surface and abutting the flat base portion of the valve member, said support element having passages therein providing fluid communication between said inlet and said annular passage, said valve member and said support element being insertable through the inlet into the cylindrical seat element, means integral with one of said elements to retain the support element within the cylindrical seat element at a position where the support element and the end wall cooperate to compress the valve member, said apex portion of the valve member and the end wall cooperating, in the event of misalignment of the valve member apex portion and the outlet, to apply to the valve member a force tending to center the apex portion in the outlet, the abutting flat surfaces of the valve member and the support element accommodating lateral movement of the valve member by said force necessary to accomplish said centering, said support element and end wall then cooperating to hold the apex portion of the valve member in forced sealing engagement with the seat, a valve operating pin, means supporting the pin at the opposite side of the end wall from the valve member in a normal position where it is adjacent the valve member but ineffective to compress the valve member and in alignment with the outlet, said pin being smaller in diameter than the outlet, said pin supporting means being movable to shift the pin from its normal position into engagement with the apex portion of the valve member to compress the valve further and move the apex portion out of engagement with the seat, thereby opening the valve to provide fluid communication between the annular passage and the outlet.

2. A valve comprising an integral cylindrical seat element of rigid material including an end wall and a side wall integral with the end wall at its periphery, said end wall having a circular central opening constituting an outlet, the portion of the end wall extending marginally about the opening and within the side wall constituting a valve seat, said cylindrical seat element being open at the end of the side wall remote from the end wall to provide an inlet, a valve member of compressible resilient material having a flat base portion and a convex apex portion narrower than and in opposed relation to said base portion and larger in diameter than the outlet, said valve member tapering from the base portion to the apex portion, said valve member having all its dimensions parallel to the base surface substantially smaller than the internal dimensions of the side wall, said valve member being located within the side wall and cooperating therewith to define an annular chamber, a support element for said valve member, said support element being relatively rigid as compared to said valve member and having at least portions of its peripheral surface cylindrical and engaging the inside surface of the side wall to center the support element with respect to the wall, said support element having a flat surface transverse to said cylindrical surface and abutting the flat base portion of the valve member, means including a portion of said support element defining at least one passage providing fluid communication between said inlet and said annular chamber, said valve member and said support element being insertable through the inlet into the cylindrical seat element, means integral with one of said elements to retain the support element within the cylindrical seat element at a position where the support element and the end wall cooperate to compress the valve member, said apex portion of the valve member and the end wall cooperating, in the event of misalignment of the valve member apex portion and the outlet, to apply to the valve member a force tending to center the apex portion in the outlet, the abutting flat surfaces of the valve member and the support element accommodating lateral movement of the valve member by said force

necessary to accomplish said centering, said support element and end wall then cooperating to hold the apex portion of the valve member in forced sealing engagement with the seat, a valve operating pin, means supporting the pin at the opposite side of the end wall from the valve member in a normal position where it is adjacent the valve member but ineffective to compress the valve member and in alignment with the outlet, said pin being smaller in diameter than the outlet, said pin supporting means being movable to shift the pin from its normal position into engagement with the apex portion of the valve member to compress the valve member further and move the apex portion out of engagement with the seat, thereby opening the valve to provide fluid communication between the annular passage and the outlet.

3. A valve as defined in claim 2, in which said support element has its peripheral surface entirely cylindrical and said passage defining means includes a portion of said cylindrical surface and an outwardly deformed portion of the side wall opposite said cylindrical surface portion.

4. A valve as defined in claim 2, in which said support element has notches between said cylindrical portions of its peripheral surface, said notches constituting said passage defining means.

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