ADAPTER APPARATUS FOR AUTOMATIC AEROSOL DISPENSER

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ABSTRACT OF THE DISCLOSURE

An adapter for an automatic aerosol dispenser integrally formed of plastic material and having a slotted, outwardly extending annular shoulder for resiliently fitting into the cap recess of an aerosol can. The adapter is urged resiliently downwardly until an annular shoulder engages the top of the aerosol can valve housing; thus precisely aligning the adapter therewith. The adapter further comprises a pair of upstanding shoulders having opposing parallel side walls for guiding a nozzle having conforming, closely adjacent side walls. A pair of coplanar slots in the upstanding shoulders are oriented with their side walls parallel to the top of the valve housing and their inner walls parallel to the upstanding opposite parallel walls of the shoulders. Thus, the adapter may be engaged by a U-shaped channel member of an automatic aerosol dispenser to establish a controlled dimension between the top of the valve housing and the actuator member thereof and to orient the nozzle. Additionally, the upstanding shoulders are provided with L-shaped recesses conforming to the opposed parallel vertical walls and the slots to facilitate low tolerance manufacture of the adapter.

This invention relates generally to dispensing apparatus and more particularly to adapter means for mounting containers that periodically and automatically dispense pressurized fluid by actuating a valve under control of motor driven devices.

The pressurized liquid container, commonly known as an aerosol can, that is used with the apparatus of this invention is provided with a spring-urged valve stem which projects upwardly from the container cap and when the valve is depressed releases a spray of atomized fluid from the container. The valve stem may be of the type which discharges a measured quantity of spray from a reservoir chamber that forms part of the valve upon each full depression of the valve stem and allows the valve to refill when the valve stem is permitted to elevate or close under the urge of the valve spring. Such type of valve is very well known to those skilled in the art of aerosol dispensing.

This invention is primarily concerned with an improved mounting for the container whereby orientation of the actuator for the valve actuating mechanism and the valve head or nozzle is held substantially constant. Heretofore, in the art of automatic aerosol dispensing, difficulty has been experienced in expeditiously positioning the nozzle relative to the valve actuator due to the wide differences in the overall lengths of the aerosol cans. That is, experience has taught that the dimension from the base of the container to the top of the nozzle may vary appreciably from one container to another.

In known types of automatic dispensers the container is placed on a platform beneath the valve actuator. In this type the overall longitudinal dimension of the container, valve stem and nozzle must be closely considered when fixing the distance between the mounting platform and the valve operating member of the actuating mechanism. More specifically, the distance must be such that the top of the nozzle should be a fixed safety distance away from the operating member to insure facile assembly and operability of the dispenser. It has been found, for example, that the tolerance build-up or "run-out" from one aerosol container to another may be as much as .090 inch. Thus, if the automatic dispenser is to be assembled with facility, the distance between the container-mounting platform and valve actuating member must be excess of .090 inch in order to accommodate container assemblies having the greatest "run-out." Moreover, this consideration is doubly important as such an automatic dispenser must be capable of easily accommodating replacement containers that are subsequently installed by the purchaser or user after the fluid in the factory-assembled container is spent. The replacement container assembly, however, may have a much shorter longitudinal dimension than the original and, as is well known in the automatic aerosol dispensing art, the farther that the nozzle is separated from the actuator the more pronounced is the hammer blow dealt to the nozzle during valve operation. Such condition is not only objectionable (particularly in a sick room) but results in eventual damage to the valve mechanism and, therefore, malfunction of the dispenser.

One prior art attempt to overcome the above difficulties features a generally cup-shaped adapter of resilient plastic material having a flat, circular bottom wall with a central opening therein and a surrounding side wall projecting upwardly from the bottom wall. At the juncture of the bottom and side walls an outwardly projecting rib is provided for fastening an annular recess in the rimmed cap portion of the container. The bottom wall has slots that radiate outwardly from the central opening therein and allow the peripheral portion thereof to deform upwardly when the adapter is inserted so as to frictionally grip a lower region of the valve housing. This, together with the outwardly projecting rib, fasten the adapter to the container. The side wall of the adapter is vertically slotted to form four resilient tabs having protrusions that are snap-fit through an annular opening in the mounting bracket. The protrusions frictionally grip the mounting bracket and suspend the container therefrom. Concurrent with the above mounting, the valve stem and operating member therefor are joined in telescopic fashion and this together with a cushioning arrangement are effective to minimize the hammer blow during operation of the valve. Such type of suspension mounting is fully disclosed in Patent No. 3,150,800, issued to R. L. Webber, Sept. 29, 1964.

While the suspension mounting disclosed in the above patent is an improvement over the platform mounting approach, as it alleviates the above-mentioned "run-out" condition, the method of anchoring the tabs to the mounting bracket proved cumbersome and the tabs also proved to be of insufficient rigidity to withstand repeated, unchinned valve operations performed by the relatively inexpensive mechanism such as the type disclosed herein. The tabs, therefore, were susceptible to yielding and either condition would of course render the dispenser inoperable. Moreover, due to the many dimensional variables inherent in the prior art adapter assembly, mounting of the container so that a constant relationship existed between the valve nozzle and valve operator could not be definitely established from one container to another and, as made evident above, such relationship is vital where automatic aerosol dispensers that require periodic container replacements are concerned.

With the apparatus of the present invention, a rugged adapter member having parallel slotted, twin shoulders is permanently fixed to the cap of an ordinary aerosol con-
A flange or a central wall of the adapter member seats on the upper, flat surface of the valve housing. A valve nozzle is particularly seated on the discharge end of the valve stem. As will be brought out more in detail hereinafter, such arrangement definitely fixes the dimensions from the central wall of the adapter member and the top diameter of the valve nozzle. In mounting the container to the automatic dispenser, the slotted shoulders of the adapter member are slidingly entered on a pair of shelves that form part of a U-shaped bracket that is made fast with and suspended from a lower mounting plate for the automatic dispenser. As the container is being mounted, a hinged actuator of the automatic dispenser mechanism is engaged by a sloping face of the valve nozzle and thereby is gradually elevated. When the actuator is moved to its upward limit, established by the track of an actuating cam, the valve nozzle is slightly depressed to condition the valve as the adapter member engages a homing stop on the U-shaped bracket.

The above mounting is simple, rigid and foolproof. Conditioning of the valve nozzle by the actuator results in quiet operation of the valve during a spray operation. According to it is an overall object of this invention to provide an aerosol container operating apparatus of the general nature stated which is overall superior to known prior devices that are associated with automatic dispensers.

A more specific object is to provide a suspended aerosol container that is rigidly adapted and accurately oriented with respect to an automatic dispenser. In keeping with the above object it is a further object to provide an improved adapter member.

A further object is to provide an aerosol container adapter assembly that contributes to quiet and reliable operation of the automatic dispenser mechanism, is easily assembled and inexpensive to manufacture.

Another object is to provide means to condition an aerosol container valve and thereby effect a pressured actuation thereof during a periodic spray cycle.

Finally, it is an important object to provide an adapter assembly for an automatic dispenser that insures accurate mounting of nonuniform containers.

Other objects and advantages will be apparent from the following detailed description of the preferred embodiment illustrated in the accompanying drawings in which:

FIG. 1 is an elevational view, partly in section, illustrating the adapter assembly of the invention associated with an automatic valve actuating mechanism;

FIG. 2 is an exploded perspective view illustrating the adapter assembly of FIG. 1; and

FIG. 3 is a bottom view of the adapter member.

With reference to FIG. 1 of the drawings it will be helpful to set out by briefly explaining the particulars of the automatic valve actuating mechanism with which the adapter assembly of the invention is associated. The complete valve actuating mechanism is disclosed in my co-pending applications: Actuating Device for Aerosol Dispenser Having Timing Control, Ser. No. 517,022, filed Dec. 28, 1965, and assigned to the same assignee as is the present invention.

As fully set out in the above application, to effect a periodic valve actuation a motor (not shown herein) rotates a pinion 10 which in turn drives a movement comprising a first reduction gear 12, a pinion 14, a second reduction gear 16, an elongated gear 18 and a last or cam gear 20. More specifically, gear 12 and pinion 14 are made fast with a first shaft 22 which makes up a first gear reduction assembly 24. The ends of shaft 22 are journaled in a pair of mounting plates 25 and 26. Gears 16 and 18 are made fast with a bushing 27 and comprise a second gear reduction assembly 28. As pinion 10 is rotated clockwise the first gear assembly 24 is rotated counterclockwise while the second gear assembly 28 is rotated clockwise. Elongate gear 18, emmessed with cam gear 20, rotates the latter counterclockwise.

An actuating assembly comprising a compression spring 30, last gear 20, a cam 31 and a cam bushing 32 is mounted on a third shaft 33. Gear 26 of the first assembly 24 is located at the lower portion of cam bushing 32 and forms a subassembly. Cam 31 is generally cup-shaped and has a track 35 of a generally helix configuration to provide a low level 36 and a high point 38. A collet 37 is fixed to the upper portion of shaft 33. Upon assembly, the compression spring 30 is fitted over bushing 28. Gears 31 and cam bushing 32 are then mounted on shaft 33. The upper coil of spring 30 nestles about and is contained by collet 37 while the lower coil presses downwardly on gear 20. A jig may be provided to fit over the top side of collet 37 and the underside of cam 31 to effect the slight compression of spring 30. Shaft 33 is then mounted between mounting plates 25 and 26 and the upper and lower ends of shaft 33 are fixed to the plates as by swaging or the like, and the jig is thereafter removed. Shaft 33 establishes a fixed axis for the subassembly of last gear 20, cam 31 and bushing 32; such subassembly is adapted to be rotated counterclockwise by elongate gear 18.

A cam stud 42 is fixed in lower plate 26 and serves to gradually elevate the subassembly in a linear direction when pinion 18 rotates last gear 20 at the start of a spray cycle. That is, when cam track 35 is rotated on cam stud 42 from the low level 36 to the high point 38, the subassembly is driven upwardly along the axis of shaft 33 to condition the actuating mechanism.

An actuating lever 44 is hingedly mounted at one end thereof as by a stud 46 which is fixed to the plate 26. The opposite or free end of lever 44 is provided with an operating end which includes an angular extension 48 that reaches into and through an aperture 50 provided at the central portion of plate 26. An upper, rounded portion 51 of the operating end of lever 44 projects a short distance beyond portion 48 to provide an engaging surface for track 35 of cam 31. The rounded portion 51 is adapted as to establish a short dwell for cam track high point 38 when it is rotated beyond cam stud 42 during a cyclic excursion of cam 31 and to facilitate rapid recovery for the actuating lever 44 together with the valve mechanism at the end of a spray cycle. It should be noted that in FIG. 1 the high point 38 is about to be rotated beyond stud 42 and that spring 30 has been compressed; cam track 35 slightly pivots lever 44 so that extension 48 thereof slightly depresses or conditions the valve mechanism preatory to spray operation.

Thus it can now be appreciated that when the high point 38 rotates beyond the cam stud 42, spring 30 suddenly snaps the subassembly downwardly whereupon high point 38 pivots actuating lever 44 about stud 46 and extension 48 fully depresses the valve mechanism to effect an aerosol spray.

Turning now to the novel container adapter means, an adapter member 55 is secured to the usual cup-shaped container cap 57 by force-fitting a lower, circular rib 59 of member 55 into the circular recess 60 of the cap. Member 55 is preferably injection molded of a comparatively rigid but resilient material such as polysulfone and the continuity of rib 59 is relieved at portions 62 to facilitate entry thereof into the cap recess 60. Rib 59 is flared outwardly from an annular peripheral wall 63 that extends downwardly toward recess 60. A pair of supporting shoulders 64 are formed on member 55 and the lower, outer portions of the shoulders are slotted, as indicated at 67, in order to grippingly engage a pair of adapted receiving shelves 68 of the mounting bracket 70. As best seen in FIG. 2, bracket 70 is of generally U-shape configuration having a pair of upward side walls 71 which reach upwardly to the mounting plate 26 (FIG. 1) and are rigidly fixed thereto as by swaging or the like.

Returning now to the adapter member 55, a pair of generally perpendicular inboard portions 72 of shoulders 64 act as guides for a valve nozzle 73 during reciprocation thereof. Recesses indicated at 74 are provided to hold
the linear uniformity of the inboard portions 72 during the cooling period of member 55 subsequent to the molding operation. As is clearly evident in the drawings, a circular opening 75 is provided in a central wall 76 of member 55 to allow free passage of the container valve stem 77 and a circular, downwardly extending wall 79 engagingly surrounds the usual housing 80 for the valve mechanism when adapter 55 is secured to the container cap. A circular embossment 82 located intermediate rib 59 and wall 79 gives added strength to member 55. A pair of twin, ramp-type notches 84, one of which is visible in FIG. 2, are formed in the outer periphery of central wall 76 and serve to facilitate entry of the mounting bracket shelves 68 within slotted areas 67 of member 55.

Nozzle 77 is in a position of generally square formation and faces 85 that taper forwardly to terminate in a reduced, square nose 86. As shown in FIG. 2, a bore 87 extends rearwardly from nose 86 and blends with an enlarged vertical bore 88, the latter of which is dimensioned to snugly fit and accurately seat on the valve stem 77. A fan spray affecting insert 89 is force-fitted into the outlet end of bore 87. Nozzle 77 is then entered on the valve stem 77 and moved a prescribed distance downwardly as established by the upper limit 90 of bore 88.

It is important to note that by virtue of the above adaptation arrangement the mounting portions 67 of member 55 and the top 91 of nozzle 73 are definitely fixed with respect to the top of valve housing 80. That is, the distance indicated at A in FIG. 1 will be constant from the top of the valve housing 80 to the upper limits of notches 67 and the flat top 91 of nozzle 73 will also be fixed a constant distance from the top of valve housing 80, as indicated at B. Plate 26 serves as a common mounting means for the automatic dispensing mechanism and bracket 70. The upper portions of shelves 68 are fixed a prescribed vertical distance from the base of mounting plate 26 to orient the automatic mechanism with respect to the adapter. This distance, as indicated at C, is determined by steps 71 (FIG. 2) in bracket side walls 71.

In adapting the container assembly the slotted portions indicated at 67 are aligned with the mounting bracket shelves 68, which in addition to being located a prescribed distance below mounting plate 26, define the open-end portion of bracket 70. Then the container is manually drawn onto bracket 70 so that shelves 68 receive shoulders 64. Upon such entry, the upper, inclined surface 85 of the valve nozzle gradually pivots the actuating lever 44 to its upper limit which is established by the track of cam 31, whereupon the valve nozzle is slightly depressed. This occurs about the time when the flat top 91 of the operating portion of lever 44 and immediately before the adapter member reaches the home position established by the closed-end 93 of U-bracket 70. When the adapter member is set in the home position, the automatic dispenser is in readiness for operation.

It will now be appreciated that a simple means for adapting an aerosol container to an automatic dispenser has been provided which can be mass-assembled and every assembly will fit the mounting bracket in a prescribed relationship with the valve actuator regardless of the tolerance variation of the containers. Moreover, due to the preparatory engagement of cam track 35 with extension 48 of lever 44, the valve mechanism is pressured and not hammered to operated condition during a spray cycle.

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 arrangement without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

3,398,864

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. An adapter of the class described integrally formed of relatively stiff, hard plastic material and comprising:
   (A) an outwardly extending slotted, resilient peripheral flange
   (a) for engaging the cap recess of an aerosol can, and
   (b) for engaging the adapter downwardly into snug engagement therewith;
   (B) an annular shoulder
   (a) surrounding an opening for receiving the vertically oriented stem of an aerosol can, and
   (b) said annular shoulder being urged into engagement with the top of the valve housing of an aerosol can by the action of said slotted peripheral flange;
   (C) a downwardly depending cylindrical shoulder surrounding said annular shoulder and said opening for engagement with the side of the valve housing of an aerosol can;
   (D) a pair of upstanding shoulders
   (a) each having one of a pair of spaced coplanar slots therein parallel to said annular shoulder,
   (b) a pair of spaced opposed vertical side walls, and
   (c) a pair of L-shaped recesses each in one of said shoulders and oriented parallel to the upper and side surfaces of said slots and to the said opposed side walls; and,
   (E) ramp-like notches at the forward ends of said slots depending downwardly therefrom.

2. The adapter defined in claim 1 and:
   (F) a nozzle
   (a) for engaging the stem of an aerosol can, and
   (b) having a pair of vertical side walls, each closely spaced adjacent to said opposed vertical walls.

3. The adapter defined in claim 2 and:
   (G) a ramp on the forward top surface of said nozzle in a plane oblique to the plane of said spaced slots and generally parallel to said ramp-like notches.

4. An adapter of the type designed for horizontal sliding engagement with a motorized automatic aerosol dispenser comprising:
   (A) means for engaging the top of an aerosol can;
   (B) a pair of linear horizontally oriented channels having generally parallel opposed inner walls for horizontally slideably engaging a pair of opposed linear shelves on said automatic aerosol dispenser; and,
   (C) nozzle guide means fixedly oriented with respect to said channels and forming a nozzle pathway opening upwardly through to the exterior of said adapter to permit a nozzle to slide downwardly into said guide means.

5. The adapter defined in claim 4 wherein said adapter further comprises:
   (D) a pair of upstanding shoulders
   (a) each having one of said channels therein, and
   (b) each having one of a pair of vertical walls forming said nozzle guide means.

6. The adapter defined in claim 5 wherein said vertical walls are flat, opposed, parallel to each other, and parallel to the inner walls of said channels.

7. The adapter defined in claim 6 wherein said adapter further comprises:
   (E) a pair of L-shaped recesses, each in one of said shoulders and oriented parallel to the upper and inner walls of said channels and parallel to said vertical walls of said nozzle guide means.

8. The adapter defined in claim 4, further comprising:
   (D) a central opening extending downwardly through said adapter for receiving the vertically oriented stem of an aerosol can; and
(E) an annular shoulder surrounding said opening and facing downwardly to abut against the upper surface of the valve housing of said aerosol can.

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