AEROSOL VALVE TRIGGER ACTUATOR

Field Of The Invention

The present invention relates to aerosol valve actuators of the enclosure type. Such actuators generally have a shell-like member (shroud) mounted onto the pressurized product container and/or onto the mounting cup of the aerosol valve on the container, and have finger actuatable means associated with the shroud and operatively connected to the aerosol valve stem for actuating the aerosol valve and dispensing the product through a nozzle exiting the shroud.

Background Of The Invention

In certain prior art actuators for aerosol valve or pump dispensers, the finger actuatable means is a trigger member that extends from outside into the shroud. The trigger member, when assembled into the shroud and finger actuated, may move about a hinge in a pivotal relation to the shroud as shown for example in U.S. Patent No. 5,018,647. Alternatively, the trigger member when assembled into the shroud and finger actuated, may move in linear relation to the shroud, as shown for example in certain embodiments of the pump and/or valve dispensers of U.S. Patent No. 4,264,037, U.S. patent No. 5,139,180, and U.S. Patent No. 4,138,039.

It is desirable in a aerosol valve trigger actuator that the trigger member operate in a simple and efficient manner, that the trigger member be easily molded and assembled into the shroud for mass production, and that the trigger member be

locked into the shroud upon assembly so as not to later become disengaged. It is also desirable that a positive return means with sufficient force other than the aerosol valve be provided to force the trigger member back to its non-actuated position after finger disengagement. Relying solely upon the aerosol valve's upward motion to return the trigger when actuation ceases does not necessarily assure that the trigger will always fully or quickly return to allow valve shut-off, particularly with the constructions and operations of certain types of aerosol valves including valves that desirably only require a low force to actuate. The prior art to date has not provided all of these above functions and benefits.

Summary Of The Invention

The aerosol valve trigger actuator of the present invention includes a plastic shroud mountable onto the aerosol container or onto the mounting cup of the aerosol valve on the container. A finger-engageable trigger member extends into the shroud and moves upon finger engagement and disengagement in a linear manner as opposed to a pivotal manner. The trigger member portion inside the shroud has either at least one camming surface or a cam follower which upon finger actuation and linear motion rearwardly of the trigger, acts against at least one corresponding cam follower or camming surface on a fluid conduit inside the shroud and connectable to the aerosol valve stem to extend upwardly therefrom. Finger actuation of the trigger member, therefore, cams the fluid conduit and consequently the aerosol valve stem to

release product from the container into the fluid conduit which dispenses product out of the shroud.

To assure that the trigger member returns forwardly to its unactuated position following finger release by the user, and in a first embodiment to assist in locking the trigger member into the shroud once assembled by insertion, an elongated bendable plastic spring member is integrally connected at one end to an interior surface of the rear of the plastic shroud. The plastic spring may be molded to the rear of the plastic shroud, for example. Adjacent the other end of the plastic spring are means to contact with at least one rearward extension of the trigger member upon assembling the trigger member into the shroud.

In the first embodiment, the at least one rearward extension of the trigger member may have one or more hook members which upon assembly of the trigger member to the actuator, push rearwardly against the plastic spring to bias its initially free end rearwardly to a point where the one or more hooks snap in a locking fashion into one or more openings in the plastic spring. The trigger member therefore cannot become easily disengaged from its assembled mounting onto the actuator.

In a second embodiment, the one or more locking hooks are eliminated but the at least one rearward extension of the trigger member still passes through the one or more openings in the plastic spring. In either embodiment, the passage of the at least one rearward extension through said one or more spring openings acts to restrain vertical motion of the

trigger when it is finger actuated. In the second embodiment lacking the one or more locking hooks, the trigger member may still be locked into the shroud by a raised protrusion on top of the trigger member which engages an adjacent shroud surface to prevent trigger removal from the shroud after assembly.

After the aerosol valve trigger actuator is assembled in either embodiment, finger actuation of the trigger member rearwardly biases said plastic spring member rearwardly to load the spring, and at the same time cams the aerosol valve open. When the finger actuation of the trigger member ceases, the trigger member is biased forwardly by the plastic spring pressing thereagainst to allow the aerosol valve stem and fluid conduit to return to closed position. Return of the valve stem and trigger member is thereby assured.

The present invention will operate effectively upon vertically acting aerosol valves with the at least one camming surface acting in an essentially vertical plane.

The fluid conduit of the present invention may have an upwardly extending portion hingedly connected to an outwardly extending portion.

Other features and advantages of the present invention will be apparent from the following description, drawings and claims.

Brief Description Of The Drawings

Fig. 1 is a partial cross-sectional view in perspective of the trigger actuator of the present invention mounted onto

the mounting cup of an aerosol container having a vertically acting valve;

Fig. 2 is an overhead plane view of the trigger actuator of the present invention with the top of the shroud removed to expose interior actuator structure;

Fig. 3 is a partial cross-sectional view in perspective of the trigger actuator of Fig. 1 taken at a different viewing angle;

Fig. 4 is a partial cross-sectional side view of the trigger actuator of Fig. 1 with the valve closed and the trigger member not actuated; and

Fig. 5 is a partial cross-sectional side view corresponding to Fig. 4 with the valve open and the trigger member in actuated position.

Detailed Description Of Embodiment

Referring to Figs. 1-5, aerosol valve trigger actuator 10 is shown mounted onto pressurized container 11 holding product to be dispensed. Mounting cup 12 is attached in conventional fashion to container 11, and a conventional vertically acting aerosol valve 13 with valve stem 14 is attached to the mounting cup 12. Fluid conduit 15 for product dispensing has a bottom socket member 16 that fits over the top of valve stem 14. Fluid conduit 15 has a first upwardly extending portion 17 and a second outwardly extending portion 18 for conveying fluid from the aerosol container 11 to the actuator nozzle 19 when the aerosol valve is actuated as described hereafter. Outwardly extending portion 18 is fixed in position at nozzle

19, and is otherwise flexible to a limited degree in the up and down direction. Portions 17 and 18 are hingedly connected to one another at hinge position 20.

Aerosol valve trigger actuator 10 includes a surrounding molded plastic shroud enclosure 30 having top wall 31, rear wall 32 and side walls 33, the near side being removed in Figs. 1, 3, 4 and 5 to show the interior mechanisms of the aerosol valve trigger actuator which normally will be hidden from view to the user. It should be understood that the external appearance and shape of the shroud enclosure 30 may take various forms. Shroud enclosure 30 includes inwardly extending annular flange 34 which snaps under the outside edge of the mounting cup 12 to install shroud 30 on the aerosol container in one form of conventional attachment.

Aerosol valve trigger actuator 10 (assembled into an opening in the front of shroud enclosure 30) is actuated by user finger pressure on trigger member 40 which has front trigger surface 41. Trigger member 40 is linearly acting and moves into and out of shroud 30 as shown by the arrow X in Fig. 1, trigger member 40 being vertically restrained between shroud surfaces 35 and 36 (see Fig. 3) in its travel. Trigger member 40 also has a top wall 44 and a bottom wall 45.

Trigger member 40 includes rearward extensions 55, 56 straddling conduit portion 17 and each having upwardly angled camming surfaces 42. Correspondingly, fluid conduit 15 has cam followers 43 integral with and extending outwardly on opposite sides of upwardly extending conduit portion 17. Therefore, as can be seen, finger actuation of trigger member

40 will move the trigger member rearwardly from its Fig. 4 position to its Fig. 5 position, causing camming surfaces 42 to engage against cam followers 43 and force fluid conduit portion 17 and aerosol valve stem 14 downwardly to open the aerosol valve 13. Product is then dispensed from the product container out the nozzle 19. If desired for ease in actuation, rearward extensions 55, 56 may be dimensioned such that their surfaces 46 are the resting places for cam followers 43 in the full valve open position.

Although the above discussion and referenced drawings describe and illustrate the camming surfaces 42 on trigger member 40 and the cam followers 43 on fluid conduit portion 17, it will be appreciated that these relationships can be reversed to provide for cam followers on the trigger member 40 and camming surfaces on the fluid conduit.

When the user ceases to finger actuate the trigger actuator 10 by releasing the user's finger from trigger front surface 41, the normal closing action of the aerosol valve 13 will tend to push valve stem 14, conduit portion 17 and cam followers 43 upwardly. This upward bias of cam followers 43 against camming surfaces 42 in turn will tend to bias trigger member 40 outwardly toward its non-actuated position of Fig. 4. With certain constructions of aerosol valves, however, there is a risk that the aerosol valve 13 will not generate sufficient force to fully return the trigger and close the aerosol valve, or will only return the trigger and close the valve slowly rather than with a desired sharp valve shut-off

action. Accordingly, separate trigger return biasing means are provided in the present invention.

The aforesaid separate return means comprises a plastic elongated bendable spring member 50 integrally connected at one end 51 as by molding to the inside of plastic shroud rear wall 32. Elongated spring 50 also has reverse curve 59 for efficient spring positioning and functioning. The opposite end 52 of plastic spring is free to move rearwardly and forwardly. Adjacent spring end 52 are slots 53 and 54 in the plastic spring.

In a first embodiment as previously referenced, the rearward extensions 55, 56 of trigger member 40 have upstanding hooks 57, 58 at the rear thereof. When trigger member 40 is assembled through a front opening into shroud 30, hooks 57 and 58 press against the plastic spring 50 to push spring end 52 rearwardly, line up hooks 57 and 58 with spring slots 53 and 54, and allow hooks 57, 58 to snap into slots 53, 54. Once the hooks snap into the slots, the dimensions of the hooks in relation to the slots prevent the hooks from thereafter disengaging from spring 50. Plastic spring 50 therefore provides a function in the first embodiment of locking the trigger member 40 into shroud 30 upon assembly.

In a second embodiment as previously referenced, the upstanding tips of hooks 57, 58 are removed so that rearward extensions 55, 56 of trigger member 40 are no longer locked into spring 50. However, rearward extensions 55, 56 still pass through slots 53, 54 that act, as in the first embodiment, to restrain vertical motion of the trigger when

actuated. The trigger of the second embodiment is still locked into the actuator shroud upon assembly by protrusion 70 on trigger top wall 44. Protrusion 70 has a raised front surface and slopes downward in a rearward direction toward trigger wall 44 so that the protrusion 70 does not unduly impede insertion of the trigger into the shroud upon assembly. When the assembled trigger is released after an actuation operation, the raised front surface of protrusion 70 will encounter shroud surface 71 which will prevent trigger member 40 from being removed from shroud 30.

Plastic spring 50 in both the first and second embodiments also provides a separate trigger return function as previously referenced. When trigger member 40 is first actuated from its non-actuated Fig. 4 position to its actuated Fig. 5 position, rearward extensions 55, 56 of trigger member 40 fill slots 53, 54 and force plastic spring 50 to pivot rearwardly (from its unloaded at-rest position) about the integral spring-shroud connection at spring end 51 to move spring 50 to the loaded spring position shown in Fig. 5. When actuation of trigger member 40 ceases, spring end 52 pushes back against rearward extensions 55, 56 of trigger member 40 to move it outwardly back to the Fig. 4 position and allow aerosol vertically acting valve 13 to close.

Although two rearward extensions 55, 56 of trigger member 40 are illustrated with terminating hooks 57, 58, for the first embodiment, it is possible that a single extension with a single hook might suffice.

As an additional spring modification, spring end 51 may be beefed up in its integral connection to shroud wall 32 by applying one or more annularly spaced ribs 60 shown by dotted lines in Figs. 4 and 5.

It should also be appreciated that a separate lock may be provided to disable the actuator until unlocked. This may be accomplished, for example, by a loop attached to the top of conduit portion 17 and by a movable member that can be moved into or out of the loop from outside the shroud; when movable lever is in the loop, conduit portion 17 will be locked in its upper position and cannot be depressed to cause valve stem actuation.

The several features of the present invention described above together define a unique aerosol valve trigger actuator which is easily manufactured and assembled, and functions reliably and efficiently for the consumer.

It will be appreciated by persons skilled in the art that variations and/or modifications may be made to the present invention without departing from the spirit and scope of the invention. The present embodiments are, therefore, to be considered as illustrative and not restrictive. It also should be understood that positional terms as used in the specification are used and intended in relation to the normal upright positioning of the actuator shown in the drawings, and are not otherwise intended to be restrictive.

What Is Claimed Is:

1. An aerosol valve trigger actuator, comprising in combination: a plastic shroud; means for mounting the shroud in relation to an aerosol valve container having an aerosol valve; a finger engageable linearly acting trigger member extending into the shroud, said trigger member including at least one camming surface or at least one cam follower; a fluid conduit member in the shroud for connection to a valve stem of an aerosol valve, said fluid conduit having associated therewith a corresponding at least one cam follower or at least one camming surface; said camming surface and cam follower on said trigger member and said fluid conduit acting together, upon finger actuation of said trigger member toward the shroud, to lower said fluid conduit member and valve stem to dispense product from the aerosol container through the said fluid conduit; a plastic spring member integrally connected to a shroud surface; said trigger member having at least one rearward extension engaged with said spring member; whereby finger actuation of said trigger member biases said plastic spring member rearwardly, said spring member biasing said trigger member forwardly upon release of the trigger member.

2. The trigger actuator of claim 1, wherein said plastic spring is an elongated bendable spring having first and second ends, the said spring being integrally connected to the shroud interior adjacent the first spring end and the second end being movable; said plastic spring adjacent its

second end having at least one opening through which said at least one rearward extension of the trigger member extends.

3. The trigger actuator of claim 2 wherein said at least one rearward extension of the trigger member has a hook at its end locked into said at least one opening.

4. The trigger actuator of claim 2, said trigger member having a protrusion on a surface thereof to interact with a shroud surface to prevent trigger disengagement after assembly into the actuator.

5. The trigger actuator of claim 2, said trigger member rearward extension having a surface against which said plastic spring presses upon finger trigger actuation to bias the trigger member forwardly upon release of the trigger member.

6. The trigger actuator of claim 1, wherein said aerosol valve is a vertically acting valve and said camming surface acts in an essentially vertical plane.

7. The trigger actuator of claim 1, wherein said fluid conduit has an upwardly extending portion and an outwardly extending portion.

8. The trigger actuator of claim 7, wherein said outwardly extending portion of the fluid conduit terminates and is fixed in position adjacent a nozzle, said outwardly extending portion being flexible in an up and down direction rearwardly of the nozzle.

9. The trigger actuator of claim 7, including a locking member which in locking position restrains downward movement of the fluid conduit.

10. The trigger actuator of claim 1, wherein said plastic spring is molded to a shroud surface.

11. The trigger actuator of claim 10, wherein said plastic spring has a reverse curve adjacent its first end.

12. The trigger actuator of claim 1, having two rearward extensions straddling the fluid conduit and each rearward extension containing a camming surface or a cam follower.