PERIODICAL DISPENSER FOR AEROSOL CONTAINERS

Inventor: Herbert S. Werner, Melville, N.Y.
Assignee: Mista-Matec Corporation, Lynbrook, N.Y.
Filed: Oct. 4, 1971
Appl. No.: 186,242

ABSTRACT

In an actuator for periodically dispensing metered quantities of the contents of an aerosol container, a housing is provided having means for maintaining the valve stem of the aerosol container in an open position. A metering chamber, formed in the housing, is provided with first valve means that communicate with the interior of the aerosol container and the metering chamber. The housing is also provided with second valve means that communicate between the metering chamber and the atmosphere by means of a passageway. Means responsive to drive means having low power requirements are used to concurrently reverse the position of the first and second valve means on a periodic basis, so that a metered quantity of the contents of the aerosol container is discharged into the atmosphere from the metering chamber when the second valve is open. The metering chamber is filled when the position of the valve means is reversed. Adjustable means are used to axially displace pins in the first and second valve means. In addition, an improved gasket is provided transversely of the valve pins for sealing the valve pins from the metering chamber and from the passageway.

The aforementioned abstract is neither intended to define the invention of the application which, of course, is measured by the claims, nor is it intended to be limiting as to the scope of the invention in any way.

14 Claims, 8 Drawing Figures
PERIODICAL DISPENSER FOR AEROSOL CONTAINERS

CROSS REFERENCE TO CO-PENDING APPLICATION

This application is a continuation-in-part of Ser. No. 851,389, filed on Aug. 19, 1969, which is now U.S. Pat. No. 3,610,471.

BACKGROUND OF THE INVENTION

1. Field of the Invention:

This invention relates generally to automatically timed valve actuating means and more particularly to such structure for use in periodically dispensing metered quantities of the contents of an aerosol container.

2. DESCRIPTION OF THE PRIOR ART

It has long been recognized that it would be desirable to have some means for automatically discharging the pressurized contents of an aerosol container. In addition to the absence of any manual manipulation is the requirement for dispensing metered quantities of the aerosol contents at periodic intervals over long periods of time. Low power input, reliability, and simplicity of construction are all important design considerations. Structure meeting in the foregoing requirements would find utility, for example, in unattended and automatic discharge of room deodorants, insecticides and the like.

Prior art structure in this field is characterized by costly and complex structure that limits usage and reduces reliability. The prior art generally required extensive gear trains and linkages in order to accurately meter the discharge from an aerosol container. The structure of the prior art, in turn, resulted in relatively high power requirements. In addition, much of the prior art, because of its large size and complex construction is not well adapted to remote and inaccessible locations.

One example of the prior art in this particular field is the U.S. Pat. No. 3,187,748, issued to R.I. Mitchell et al. on June 8, 1965. The Mitchell et al. Patent, however, differs from the present invention in that there are no drive means disclosed for periodically reversing the position of the valve means such as in the present invention. Nor does Mitchell et al. depress an aerosol can valve stem in the manner that will be disclosed more fully hereinafter. U.S. Pat. No. 3,321,107 issued to C.P. Govin, et al., on May 23, 1967, is still another example of the prior art. However, Govin et al does not teach the use of two separate chambers and a passageway for connecting the chambers in the manner that will be described more fully hereinafter. Examples of considerably more complicated devices in this general art are U.S. Pat. No. 854,097 issued on May 21, 1907 to J.J. MacKeown and U.S. Pat. No. 3,055,552, granted on Sept. 25, 1962, to R.A. Emmons. The present invention, as will become evident hereinafter, also distinguishes over these last two patents.

SUMMARY OF THE INVENTION

By way of contrast, the present invention is compact, simple in construction and relatively inexpensive to manufacture. Of paramount importance is the fact that very little power is required to operate the present invention for long periods of time. The present invention is, therefore, reliable and can effectively discharge precisely metered quantities of the contents of an aerosol container.

In its broadest aspect, the present invention provides a metering chamber within a housing that can be coupled to and which includes means for holding a conventional, integral valve of an aerosol container in the open position. First valve means in the housing provides fluid communication between the aerosol container that is maintained in an open position and a metering chamber. Second valve means in the housing provides fluid communication between the metering chamber and the atmosphere. A passageway fluidly connects the metering chamber and the second valve means. Adjustable means that are mounted on a single, pivotal member are used for actuating the first and second valve means. Improved gasket means are also provided for sealing the valve means.

A minimum of power is required to operate the present invention. Drive means such as a simple, transistorized clock motor, which may be energized for much as a year by 1.5 volt battery, moves the pivotal member. The only load on the clock motor and the battery is that required to open the valve of the aerosol container and close the second valve means that provides fluid communication between the metering chamber and the atmosphere. A simple torsion spring restrains the pivotal member and maintains the first valve means, which leads to the aerosol can, in a closed position. The clock motor need be strong enough to only periodically overcome the force imparted by the compression spring. Intermittent means couple the clock motor and the valve reversing means so that the metering chamber automatically charges on a periodic basis and then freely discharged.

Accordingly, it is a primary object of this invention to provide improved means for discharging a metered quantity of the contents of an aerosol container. Another object of this invention is to provide an improved actuator, as described above, having relatively low power requirements.

A further object of this invention is to provide an improved actuator, as described above, that is of simple and low cost construction.

An additional object of the present invention is to provide an improved, remotely located actuator, as described above, that is reliable over relatively long periods of time.

A particular object of this invention is to provide an improved actuator, as described above, that is driven by a clock motor and a low-voltage battery.

A specific object of this invention is to provide an improved actuator, as described above, that provides means for holding the aerosol container valve in a normally open position to feed a metering chamber and valve means for closing a passageway between the metering chamber and the aerosol container and for opening a passageway between the metering chamber and the atmosphere.

Another specific object of this invention is to provide adjustable means for depressing the pins of the valve means.

An additional object of this invention is to provide improved gasket means for sealing the valve means.

A feature of this invention is an improved gasket made of a resilient, fluid impervious material that lies in a plane transverse to the axis of the valve means whereby when the valve means pins are axially dis-
placed, the gasket stretches but does not lose any of its sealing characteristics.

These and other features, objects and advantages of the invention will, in part, be pointed out with particularity, and will, in part, become obvious from the following more detailed description of the invention taken in conjunction with the accompanying drawing, which forms an integral part thereof.

**BRIEF DESCRIPTION OF THE DRAWING**

In the various figures of the drawing, like reference characters designate like parts.

FIG. 1 is a front elevational view, partially in section and partially schematic illustrating the structure of the present invention;

FIG. 2 is a greatly enlarged, sectional view, elevational, taken through a typical valve means assembly;

FIG. 3 is a plan view, taken along line 3—3 of FIG. 1, illustrating the housing member comprising the present invention;

FIG. 4 is a sectional elevational view taken along line 4—4 of FIG. 3;

FIG. 5 is a fragmentary sectional elevational view taken along line 5—5 of FIG. 3;

FIG. 6 is a bottom plan view, taken along line 6—6 of FIG. 1, illustrating the cover member comprising the present invention;

FIG. 7 is a sectional, elevational, view taken along line 7—7 of FIG. 6; and

FIG. 8 is a schematic diagram illustrating an alternative drive means for the actuator comprising this invention.

**DESCRIPTION OF THE PREFERRED EMBODIMENT**

Referring now to FIG. 1, there is shown an actuator 10 comprising this invention. The actuator 10 includes drive means, for example, a conventional transistorized clock motor 12 that is energized by a 1.5 volt battery 14. The clock motor 12 includes an output shaft 16.

The clock motor 12 may be supported in any suitable manner, for example, by means of a U-shaped bracket 18. The drive shaft 16 of the clock motor 12 extends through one of the two spaced legs of the bracket 18 and supports a cam 20 on the free end thereof. A double leaf cam follower 22 is pivotally mounted on the bracket 18 by means of a pin 23 with one of the legs 22a of the cam follower 22 bearing against the peripheral surface of the cam 20. The function of the other leg 22b will be described subsequently.

A rocker arm 24, whose means for support will be described more fully hereinafter, is also provided. The rocker arm 24 includes a pair of angularly oriented lower faces 26 and 28 that extend from the periphery thereof to a common juncture. A transverse overhanging lip 30 is also formed integrally with the rocker arm 24. There is also provided a pair of adjusting screws 32 and 34 that extend through the rocker arm 24 so as to terminate just below the angular faces 26 and 28, respectively. A lever 36 extends outwardly from the rocker arm 24 and is engaged by the leg 22b of the cam follower 22. Finally, there is provided a torsion spring 38, one leg of which bears against the overhanging lip 30. The structure against which the other leg of the torsion spring 38 bears will be described subsequently.

The body portion of the actuator 10 is comprised of a housing 40 having a coupling member 42 extending downwardly therefrom and a cover 44 that is secured to the housing 40 by means of screws 46. The screws may be of the self-tapping type passing through bores 47 and tapping into bores 49. The body portion 40 is secured to one of the spaced apart legs (not shown) and the bracket 18 by means of screws 48 with the coupling member 42 being positioned in alignment with an opening 50 in the connecting leg of the U-shaped bracket 18.

Turning now to FIG. 2, there is shown typical valve means 52 comprising the present invention. The valve means 52, which may be a conventional tire valve but preferably made out of stainless steel, includes a threaded portion 54 that may be suitably secured in an opening in the body portion 40. There is also provided a valve stem 56 that is axially movable between the valve opened and the valve closed positions. It will be noted in FIG. 2, that the valve stem 56 extends slightly above the common plane of the body portion 40 and the cover member 44. Sealing means comprising a ring-like portion 58 and a neoprene diaphragm 60 secured to the ring 58, is positioned over and about the valve stem 56. Although the sealing means 58, 60, are illustrated as being compounded, it is within the scope of the present invention that the may also be formed as separate members that are suitably secured to each other.

A pin 62 extends loosely through an opening in the cover member 40 such that the inner end of the pin 62 is in opposition to the valve stem 56 and bears against the opposite surface of the diaphragm 60 while the other end of the pin 62 is in abutment with the lower end of the adjustment screw 32. It should be noted that the two valve means 52 used herein as well as the sealing means 58 and 60 therefor and the pin means 62 for moving the stem 56 of the valve means 52 between the opened and closed positions are identical.

The construction of the body portion 40 and the cover member 44 will now be described in connection with FIGS. 3–7. Turning first to the body portion 40, as shown in FIGS. 3, 4 and 5, it will be seen that there is provided an inlet opening 64 that is in fluid communication with the coupling means 42 shown in FIG. 1. One of the valve means 52 is threaded into the inlet 64 as shown in FIG. 2. A passageway 66 extends from the inlet 64 opening and terminates in a metering chamber 68. There is also provided an outlet opening 70 in the body portion 40 and the other valve means 52 is secured therein in the same manner. A second passageway 72 (FIG. 8) provides communication between the metering chamber 68 and the second or outlet opening 70. Still a third passageway 73, whose function will be described hereinafter, is in fluid communication with the outlet opening 70 and the atmosphere. A peripheral lip 74 is also formed on the surface of the body portion 40 that is adjacent the cover member 44.

The construction of the cover member 44 may best be seen in FIG. 6 and in FIG. 7. A boss 76 having an opening 78 therethrough is formed integrally with the cover member 44 and is used for supporting the rocker arm 24. As shown in FIG. 1, a shaft 80 extends through the opening 78 and thereby supports the rocker arm 24 with the torsion spring 38 being wound around the shaft 80. The second leg of the torsion spring 38 bears against the top surface of the cover member 44. A pair of counter-bored holes 82 and 84 are formed through the cover member 44 for receiving the sealing means defined by the O-ring 58 and the diaphragm 60 as well.
as the pin 62, as shown in FIG. 2. The counter-bored holes 82 and 84 are in alignment with the openings 64 and 70, respectively.

An opening 86 is also formed through the cover member 44 with the opening 86 being in alignment with the passageway 72. As shown in FIG. 1, an outlet tube 88 is inserted in the opening 86. Finally, a re-cessed peripheral lip 90 is formed on the inner surface of the cover member 44 so as to seeingly mate with the lip 74 formed in the body portion 40. Adhesives may be also used as required to provide adequate sealing between the body portion 40 and the cover member 44.

FIG. 8 schematically illustrates alternative means for driving the actuator 10 and is particularly useful for a plurality of remote installations wherein substantially simultaneous discharge from all of the plurality of aerosol containers is desired. A transistorized clock 90 is energized from a battery 92. The clock 90 is arranged to close the contacts of a switch 94 for, say, a 30-minute period. This time period eliminates the need for accurate clocks where a number of devices are employed for the simultaneous actuation of a plurality of aerosol containers. The switch 94 may comprise a solid state device such as a transistor. Closing of the contacts 94 energizes each one of a plurality of radio receivers 96. Upon receipt of a suitable pulse or control signal of predetermined frequency from a transmitter 98, a second switch 100 is closed through each of the radio receivers 96 thus energizing each one of a plurality of solenoids 102 from the battery 92. The armature of the solenoid 92 is coupled to a pivotal member 104 that is equivalent to the rocker arm 24 shown in the first embodiment. The pivotal member 104 operates on the pins 62 to substantially simultaneously close the first valve 52 in the inlet opening 64 and opens the second valve 52 in the outlet opening 70, in order to produce the mode of operation hereinbefore described. The solenoid 102 may be de-energized upon termination of the control signal from the transmitter 98 or by conventional, mechanical means. A suitable time delay can be introduced, if desired.

It will be appreciated that normally only the clock 90 draws power from the battery 92 and that the radio receiver 96 draws power only for a brief period of time. The solenoid 102 and the radio receiver 96 may be of a low power type used in conjunction with radio controlled model airplanes.

For use with corrosive materials, such as certaininsecticides, the valve means 52 as well as the pins 62 should be formed of stainless steel. As mentioned hereinafore, the gasket means 58, 60, which are illustrated as being of unitary, co-molded construction, may be made of a neoprene O-ring to which is adhesively secured a neoprene diaphragm. When the gasket means 58 and 60 are placed in sealing relationship with the valve means 52, the contents of the aerosol can may leak along the passageway 66 in order to fill the metering chamber 68. Similarly, the contents of the aerosol can may also leak along the passageway 72 from the outlet opening 70 to the orifice means 88. Thus, the valve means 52 are effectively sealed but still permit a metered quantity of fluid, as determined by the size of the metering chamber 68, to be discharged in periodic intervals. The cam means 20, together with the cam follower means 22 and the lever 26 that is coupled to the rocker arm 24, provide very simple yet effective means for determining the time periods during which the aerosol can will be discharged. Regardless of the drive means used it will be evident that a minimum quantity of power will provide for effective operation over long periods of time. Aerosol containers may be operated individually by mechanical means or a group of aerosol containers may be simultaneously discharged at a plurality of remote locations by means such as a radio signal in combination with a clock, a switch, and a rocker arm at each remote location. Complex gear trains, linkages or the like are not required so that the power input can be kept low to insure lengthy, unattended and reliable usage. The provision of reversible valve means, together with means for maintaining the opening of the normally closed valve in the aerosol container assures that only the material in the metering chamber will be dispensed each time the device is actuated.

There has been disclosed heretofore the best embodiment of the invention contemplated presently. However, it is to be understood that various changes and modifications may be made thereto without departing from the spirit of the invention.

What I claim as new and desire to secure by letters patent is:

1. An actuator adapted to be attached to the nozzle or an aerosol container of the type having a normally closed valve for dispensing metered quantities of the pressurized content therein, said actuator comprising:
   a. a housing;
   b. socket means on said housing for holding open the normally closed valve on the aerosol container;
   c. a cover sealingly secured to said housing;
   d. an inlet opening in said housing and in said cover, said inlet opening being in fluid communication with said socket means and the interior of the aerosol container;
   e. first valve means in said inlet opening in said housing;
   f. a metering chamber in said housing;
   g. a first passageway in said housing that downstream of said first valve means for fluidly connecting said inlet opening and said metering chamber;
   h. an outlet opening in said housing and said cover;
   i. second valve means in said outlet opening in said housing;
   j. a second passageway in said housing for fluidly connecting said metering chamber and said outlet opening;
   k. a third passageway in said housing for fluidly connecting said outlet opening to the atmosphere, downstream of said second valve means;
   l. drive means;
   m. rocker means responsive to said drive means for periodic reversing the position of said first and said second valve means whereby, when said second valve means is in the opened position and said first valve means is in the closed position, the material in said metering chamber is discharged into the atmosphere, said metering chamber being filled when said second valve means is in the closed position and said first valve means is in the opened position, said rocker means further comprising a cam secured to and rotatable by said drive means, said cam follow means responsive to the rotation of said cam and a lever actuated by said cam following means, said lever being secured to said rocker means for imparting a reciprocating, arcuate movement thereto, said rocker means being arranged to exert
an axially directed force on each of said first and second valve means; and
n. basket means for sealing said inlet and said outlet openings while permitting leakage through said first and said second passageways.

2. The actuator in accordance with claim 1 further including first and second pins loosely extending through said cover coaxially with said first and said second valve means, respectively, said first and said second pins being arranged to be sequentially depressed by said rocker means for reversing the positions of said first and said second valve means.

3. The actuator in accordance with claim 2 further including adjusting means in said rocker means for changing the length of axial displacement of said first and said second pins and said first and said second valve means.

4. The actuator in accordance with claim 1 wherein said gasket means comprises an O-ring and a resilient diaphragm secured thereacross.

5. The actuator in accordance with claim 4 wherein said O-ring and said resilient diaphragm are co-molded as a unitary member.

6. The actuator in accordance with claim 1 wherein said drive means is a motor and a low voltage battery for energizing said motor.

7. The actuator in accordance with claim 1 wherein there is further included a torsion spring for exeriting an angular force on said rocker means, said force being opposite in direction to the movement imparted to said rocker means by said lever.

8. The actuator in accordance with claim 1 wherein said drive means comprises serially connected antenna means, radio signal receiving means and switch means, said rocker means comprising at least one solenoid serially connected to said switch means and a pivotal member, said solenoid being coupled to said first and said second valve means by said pivotal member for reversing the position thereof in response to a signal at a frequency to which said signal receiving means is tuned.

9. The actuator in accordance with claim 8 wherein there are a plurality of said solenoids and a plurality of said actuators responsive thereto.

10. In combination with the actuator of claim 1:
a. a radio receiver;
b. a clock mechanism for energizing said radio receiver only at predetermined times;
c. switch means under control of said radio receiver means for closing an external circuit controlling said drive means, for actuating said drive means upon receipt of a specific signal by said radio receiver.

11. The actuator in accordance with claim 10 wherein there is a plurality of said actuators and a transmitting means for providing said specific signal.

12. The actuator in accordance with claim 10 wherein said clock mechanism is electrically energized.

13. The actuator in accordance with claim 12 wherein there is only a single energy source for energizing said receiver and said clock mechanism.

14. In combination with the actuator of claim 1 wherein said drive means is electrically actuated, a radio receiver, clock means for energizing said radio receiver at predetermined times and switch means controlled by said radio receiver for closing a circuit arranged to actuate said drive means upon receipt of a specific control signal by said radio receiver.