Nov. 19, 1968 J. J. MANGEL 3,411,670

AUTOMATIC DISPENSER FOR PRESSURIZED LIQUID

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FIG. 1.

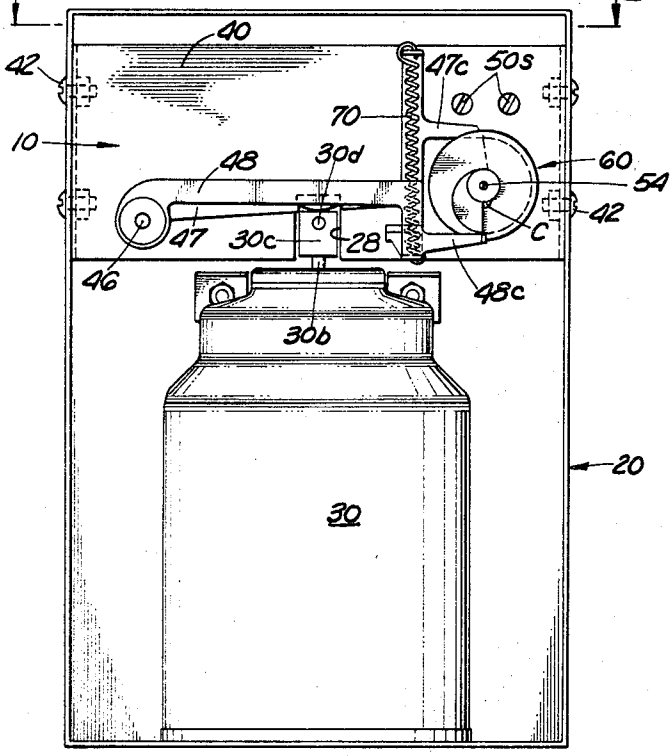


FIG. 3.

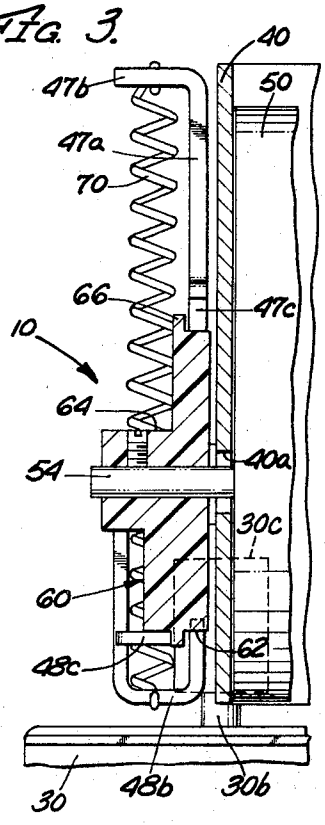


FIG. 2.

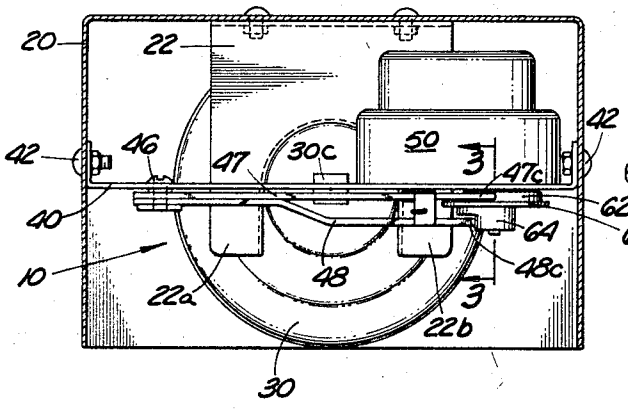
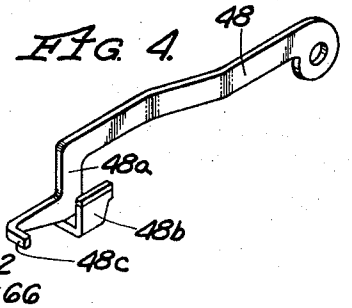


FIG. 4.



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FIG. 10.

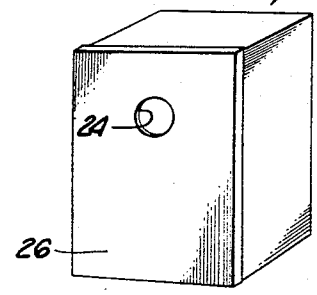
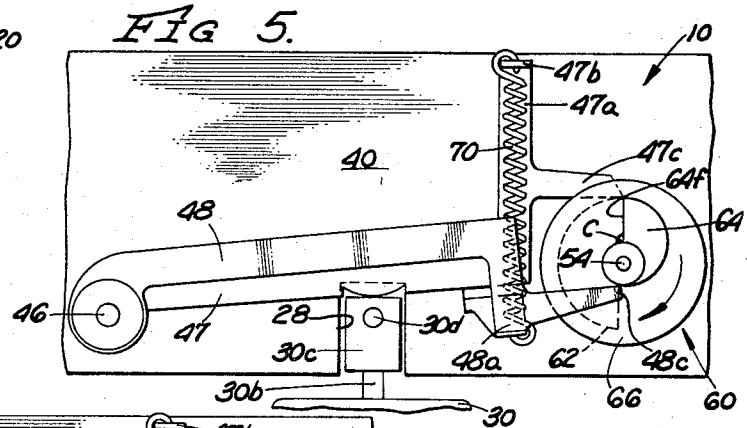


FIG. 5.



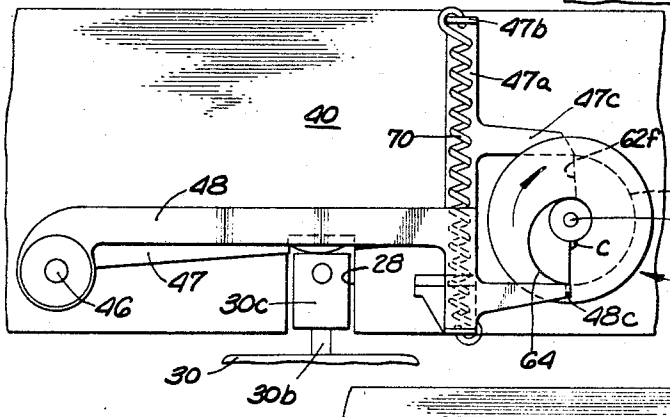


FIG. 6.

FIG. 7.

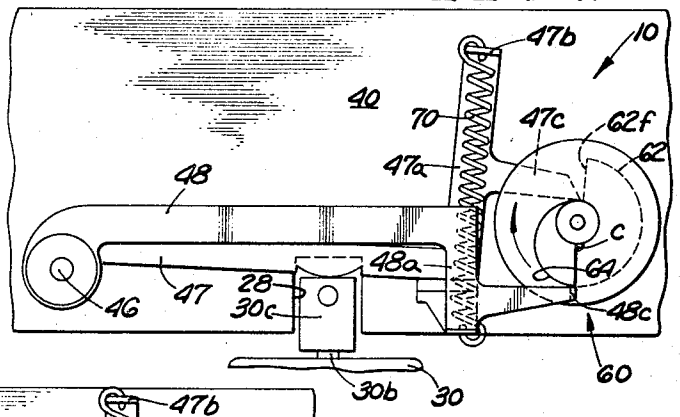


FIG. 9.

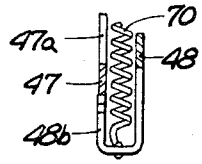
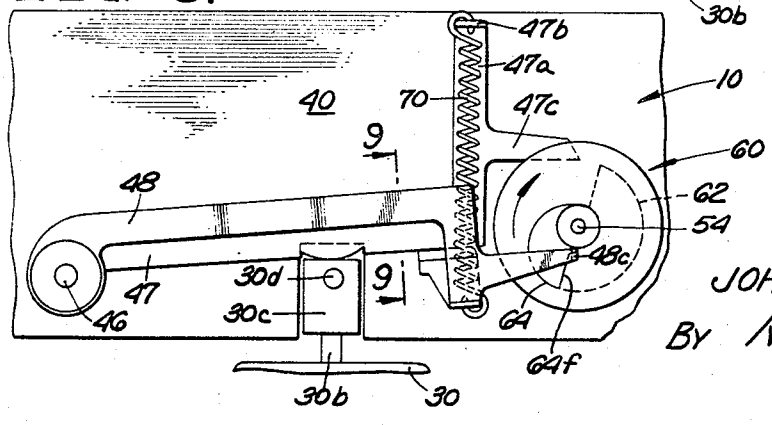


FIG. 8.



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3,411,670

AUTOMATIC DISPENSER FOR PRESSURIZED LIQUID

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Filed Sept. 11, 1967, Ser. No. 666,856
4 Claims. (Cl. 222—70)

ABSTRACT OF THE DISCLOSURE

An automatic dispenser for periodically depressing the valve stem of a pressurized aerosol container, comprising clockwork mechanism drivng a cam whch acts against upper and lower cam followers to move the same in opposite directions. A tension spring has its ends connected to the two cam followers, so that it is stretched as the followers are spread apart. The upper cam follower engages the end of the valve stem, and is released first by the cam and is pulled downwardly by the tension of the stretched spring, to depress the stem. The lower follower is then released by the cam, relaxing the spring so that the valve stem can return to its normal position.

BACKGROUND OF THE INVENTION

This invention relates to an automatically timed, clockwork-operated mechanism for periodically actuating the spray dispenser of a container filled with pressurized liquid.

A wide variety of pressurized liquid preparations is now available on the market, most of which are packed with a halogenated fluorocarbon propellant, of which Freon is the best-known example. The liquid preparations are packed in containers having a spring-loaded valve stem projecting from the top end thereof, and when this valve stem is depressed, a fine spray of atomized liquid is discharged into the atmosphere. The valve mechanism may be of the metering type, which delivers a measured quantity of spray each time that the stem is depressed, or it may be the type in which a spray is continuously discharged as long as the stem is held down.

There are times when it is desirable to maintain a more-or less constant dispersion of finely divded mist in the air to obtain continuous effect of the active ingredient. For example, it might be desired to spray metered quantities of an insecticide, or room freshener, or bronchial decongestant, into the air at predetermined intervals of time so as to keep a particular area completely free of insects, or to keep it constantly fresh, or to maintain an effective amount of decongestant dispersed in the air for long-lasting relief of bronchial congestion.

A number of devices are already known in the art, which function to discharge metered quantities of spray into the air at predetermined intervals of time. Most of these use an electric clockwork timer, which drives a cam that slowly stores up energy in a spring or similar device, and then after a suitable interval of time, releases the stored energy to depress the valve stem momentarily. The chief disadvantage of most of these devices is that they are complicated, relatively expensive, and cause rapid wear of the bearing supporting the output shaft of the clockwork timer. The last-named disadvantage is due to the relatively high side-thrust exerted against the output shaft by the spring, which presses the shaft hard against one side of its bearing. After a relatively short period of operation, the bearing becomes badly worn, and the timer mechanism soon becomes inoperative.

SUMMARY OF THE INVENTION

The primary object of the invention is to provide an automatic dispenser for pressurized liquid, which is extremely simple and inexpensive to manufacture, and in which the work of stressing a spring to store up the energy required to depress the valve stem of the aerosol container is accomplished without exerting any side thrust against the output shaft of the electric clockwork timer. As a result, the principal source of premature bearing wear is eliminated, and the service life of the mechanism is greatly extended.

A further object of the invention is to provide an automatic dispenser that is extremely reliable, trouble-free, quite in operation, and accurate in its timing.

Other objects and advantages of the invention will become apparent to those skilled in the art upon consideration of the following detailed description of the preferred embodiment thereof, which is illustrated in the drawings.

DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a side elevation of the invention in operative relationship with a conventional aerosol dispenser valve device and auxiliary supporting structure;

FIGURE 2 is a sectional view, taken at **2—2** in FIGURE 1;

FIGURE 3 is a fragmentary sectional view, taken at **3—3** in FIGURE 2;

FIGURE 4 is a pictorial view of one cam-follower device;

FIGURES 5, 6, 7 and 8 are fragmentary elevational views depicting operating parts of the apparatus at four distinctive stages of a cycle of operation of the mechanism;

FIGURE 9 is a fragmentary sectionl view, taken at **9—9** in FIGURE 8; and

FIGURE 10 is a perspective view, drawn to a greatly reduced scale, showing a housing with a cover plate having a spray-exit aperture.

The general organization of the invention is best shown in FIGS. 1 and 2, wherein the reference numeral **10** designates the actuating mechanism in its entirety. The mechanism **10** is contained within a generally rectangular, box-like housing **20** of sheet metal, which is also arranged to receive and hold a container **30** filled with the pressurized liquid to be dispensed.

Container **30** is a conventional sheet metal can of generally cylindrical form, having a spring-loaded valve stem **30***b* projecting from its top end. Mounted on the top end of valve stem **30***b* is a head **30***c* having a nozzle aperture **30***d* in one side, through which a fine, mist-like spray is discharged when the valve stem **30***b* is depressed. Valve stem **30***b* is preferably of the metered spray type, which delivers a measured quantity of spray each time the stem is depressed.

Housing **20** is open on one side, and includes a bracket **22** in the form of a spring clip, secured as by riveting to a rear wall of the housing (FIG. 2), and which bracket is arranged with opposed arms **22***a* and **22***b* shaped and disposed to embrace the neck of container **30**, so as to hold the same in place. The dispenser is oriented so that when stem **30***b* is depressed, a fine spray is discharged forwardly out of the open front of housing **20** (or through a circular aperture **24** in a cover plate **26** of the housing, as indicated in FIG. 10).

A support **40** is provided, which may take the form of a flanged plate, dimensioned to fit transversely within

housing **20** and be secured to the sides thereof, as by means of screws or rivets **42**. Support **40** is located in the upper portion of the housing, and passes over the top of container **30** in a vertical plane disposed slightly to the rear of center of valve stem head **30***c*, as best shown in FIGS. 2 and 3. The support plate **40** has a rectangular notch **28** formed in the bottom edge thereof, into which the valve stem head **30***c* is received. Mounted on the back side of support **40** is a clockwork unit **50**, the output shaft **54** of which extends through an aperture **40***a* (FIG. 3) provided in the support. The clockwork unit in the illustrated and preferred exemplary form of the invention is of the synchronous electrical motor type, but as will become evident, other types such as spring-powered clockworks may be used. The clockwork is secured to support **40** (near the right-hand side thereof, as viewed in FIGS. 1 and 2) by any suitable means, such as flat-head screws **50***s* (FIG. 1). The clockwork serves to provide the very small amount of mechanical power required to operate the valve-actuating means, and to time the operations thereof.

Pivotally mounted on the front face of support **40** near the left-hand side thereof, are first and second levers **47** and **48**. Levers **47** and **48** are arranged side-by-side, and are pivoted at one end on a pivot bolt **46**, from which they extend in a generally horizontal direction across the face of the support **40** toward the other side thereof. Affixed on the clockwork shaft **54** (FIG. 3) is a cam device or means **60**, comprising first and second cams **62** and **64**, respectively, which cams are spaced apart axially by a radial flange **66** that is preferably formed integral with the cams, as shown. Second lever **48** has a depending arm **48***a* (FIG. 4) from which extends a transversely disposed, bracket-like limit stop **48***b*, and a cam follower **48***c*. The follower **48***c* is generally perpendicular to the body portion of the lever **48**, and is disposed to ride on the outer surface of cam **64**, as indicated in FIG. 3.

First lever **47** has an intermediate straight portion passing directly over valve stem head **30***c* of the dispenser container **30**, as indicated in FIGS. 1 and 2, whereby when that lever is forcibly swung downwardly toward the container, the valve stem will be depressed, causing a spray to be discharged. At the outer end of lever **47** is an upstanding limb **47***a*, which terminates in a laterally projecting ear **47***b*. Intermediate the ends of limb **47***a* of first lever **47** is a cam follower **47***c* which overlies and rides on the top side of the first cam **62** as indicated in FIGS. 2, 3 and 6.

Extending between the ear **47***b* of lever **47** and bracket **48***b* of lever **48**, and pulling the two brackets toward one another (and, at the same time, urging the two associated cam followers against their respective cams), is an elastic means in the form of a coil tension spring **70**. End hooks of the spring are engaged over portions of the respective bracket members, with the spring-wire ends extending through holes provided as indicated, whereby the spring is retained in operative relationship to the levers.

As seen in FIG. 2, second lever **48** is offset from first lever **47** except next-adjacent the pivot **46**, whereby to clear the valve stem head **30***c* and to provide clearance space for spring **70** and proper alignment of follower **48***c* with cam **64**. The bracket **48***b* is dimensioned and arranged to underlie a portion of lever **47** and to provide a limit stop for the latter, as will be explained presently.

The cyclical operation of the mechanism will be explained with particular reference to FIGS. 5–8. In FIG. 5 the mechanism is depicted at a time at which follower **47***c* of the first lever **47** has been engaged by cam **62**, the rise of the latter being substantially coincident, spatially, with that of cam **64**. During the preceding half turn (approximately) of the shaft **54**, the levers were held in the positions shown by the upward pressure exerted on lever **47** by the valve stem head **30***c* under the influence of the internal valve spring (not shown). During most of that nearly half revolution of the shaft, follower **47***c* was out of contact with cam **62**, as indicated in FIG. 8, but was engaged by the cam just slightly before the cam reached the position depicted in FIG. 5.

As the cams advance in the clockwise direction from the positions shown in FIG. 5, follower **48***c* is engaged by cam **64** and follower **47***c* rides on the 180° crest of cam **62** while follower **48***c* is forced away from follower **47***c*. During that movement of follower **48***c* as the latter rides the rise of cam **64**, lever **48** is forced to swing downwardly with respect to lever **47**, and thus spring **70** is stretched. The stressing of spring **70** is completed by the time the cams and followers have reached the positions indicated in FIG. 6. At that time lever **47** is still substantially in contact wtih valve button **30***b*.

A very short time after the cams and followers have arrived at the relative positions indicated in FIG. 6, follower **47***c* of lever **47** rides over the crest of cam **62** and "falls" under the action of spring **70**. The fall of follower **47***c* brings the parts to the relative positions shown in FIG. 9, with follower **48***c* of lever **48** still on the high portion of cam **64**, and with lever **47** depressing valve stem head **30***c*. Thus at the fall of follower **47***c* the valve device of the aerosol container is depressed, and a metered spray of the contents is discharged forwardly therefrom.

The valve stem head **30***c* remains depressed for only the short period of time following the fall of follower **47***c*, during which the cam **60** turns through a small angular distance to carry the fall **64***f* of cam **64** past follower **48***c*; at which time the latter follower and lever **47** are permitted to be lifted away from the container by the spring in the valve stem. The levers and followers thus are moved to the relative positions indicated in FIG. 8, with follower **48***c* riding the idling portion of cam **64** and with follower **47***c* raised up from cam **62**, to an elevation nearly that to which it will later be moved by the latter cam.

As is evident only a, very short interval of time elapses between the falls of follower **47***c* and of follower **48***c*. That interval, during which the valve stem head **30***c* is depressed, is determined by the relative angular distance between the falls of the two cams and/or the relative positioning of the cam-contacting points of the two cam followers. Obviously that period can be any small fraction of a complete revolution of the clockwork mainshaft. In a typical model of the apparatus as presently contemplated, the clockwork turns the mainshaft at a rate of one revolution each five minutes, and the fall of follower **48***c* follows that of follower **47***c* by four seconds. Both the time for rotation of the cams, one complete revolution, and that of the period of valve actuation may be varied as desired, however, the former by selecting the clockwork speed and the latter by appropriate choice of cam and follower dimensions.

In instances where extreme quietness of operation is desirable, a cushion C (FIGS. 1 and 6) may be provided at the bottom of the fall portion of one or both of the cams. The cushion may take the form of a small insert or filler of a suitable elastomer such as rubber or synthetic rubber. The elastomer can be of the adherent type which is self-bonding, or it may be secured in a notch or recess in the cam.

From the foregoing description, it will be apparent to those skilled in the art that the work of stretching the spring **70** to store up enough energy therein to depress the valve stem **30***b*, is accomplished by two oppositely acting cam lobes working against diametrically opposed cam followers connected to opposite ends of said spring. Thus, the cam followers exert equal and opposite reaction forces against the cam, that balance one another and therefore cancel out. The cam means **60** "feels" no side thrust except for the brief moment between the fall of follower **47***c* from the cam **62** and the instant that follower **48***c* drops off cam **64**. Even this brief moment of side thrust is minimized because of the fact that in drop-

ping from cam **62**, follower **47***c* allows the spring to relax by the amount of the cam lift, and therefore the spring tension is only a little more than that required to depress the valve stem **30***b*. As a result, side thrust against the output shaft **54** of the clockwork timer mechanism is a negligible factor with respect to wear of the shaft's bearing, and the service life of the unit is greatly extended.

Variations within the true spirit and scope of the invention will occur to others in the light of the preceding disclosure of a presently preferred exemplary embodiment, and accordingly I do not wish the invention to be restricted to the details shown except as is required by the appended claims.

I claim:

1. Apparatus for use with a container of liquid under pressure, said container having a spring-loaded valve stem that discharges a spray of said liquid into the atmosphere when depressed, and said apparatus being operable to depress said valve stem at predetermined intervals of time, comprising:

supporting means for holding said container in operative position;

clockwork means mounted on said supporting means, said clockwork means including an output shaft;

cam means mounted on said output shaft to rotate therewith, said cam means including first and second cams, each having a gradual rise and an abrupt fall;

first and second cam followers movable toward and away from one another and engaging said first and second cams, respectively, on diametrically opposite sides of said cam means, said cam followers being moved in opposite directions as they ride up the rise of their respective cams;

spring means connected at one end to said first cam follower and at the other end to said second cam follower, whereby said first and second cam followers exert equal and opposite pressures against said cam means as said spring means is stressed;

said cam means being operable to release one of said cam followers ahead of the other, said one cam follower engaging said valve stem and being urged downwardly by said stressed spring means to depress the valve stem and thereby discharge a spray of said liquid into the atmosphere;

the other of said cam followers being released by said cam means after said spray has been discharged, thereby relaxing said stressed spring means and allowing said valve stem to return to its normal position.

2. The apparatus of claim **1**, wherein said cam followers comprise levers pivotally mounted at one end on said support means for swinging movement toward and away from one another, the other end of each of said cam follower levers riding on its respective cam, and said spring means being connected to said cam follower levers adjacent said other ends thereof.

3. The apparatus of claim **1**, wherein said cam followers comprise two levers disposed in juxtaposition, both of said levers being pivotally mounted at one end on a common pivot, and having attachment points adjacent the other ends thereof, to which the ends of said spring means are attached, said attachment points being spaced apart along a line perpendicular to the longitudinal axis of the levers in the plane of movement thereof.

4. The apparatus of claim **3**, wherein said cam means comprises two axially spaced cams separated by a radial flange, at least one of said cam follower levers having a lateral offset provided therein, whereby said cam followers contact their respective cams on opposite sides of said radial flange and at diametrically opposite sides of said cam means.

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STANLEY H. TOLLBERG, *Primary Examiner.*