

[54] VALVE STRUCTURE FOR PRESSURIZED
LIQUID DISPENSER

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[51] Int. Cl. G04c 23/38
[58] Field of Search 222/70, 402.20, 453, 504;
251/362, 360; 137/202

[56] References Cited

UNITED STATES PATENTS

2,644,662	7/1953	Powers.....	251/362 X
2,830,743	4/1958	Rinisha et al.	222/504 X
2,877,797	3/1959	Jordan et al.	251/360 X
3,149,640	9/1964	Klinefelter	137/202
3,187,949	6/1965	Mangel	222/70

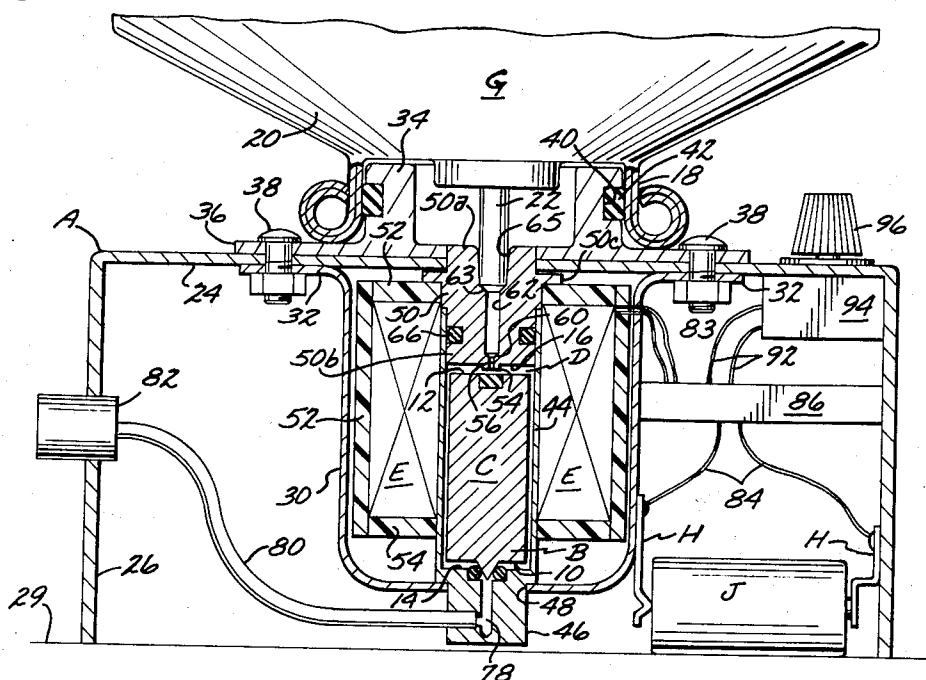
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[57] ABSTRACT

An improved valve structure for a pressurized liquid dispenser, which dispenser is of the type that operates intermittently and is actuated by an electronically controlled timer circuit.

In the operation of such a device, the pressurized liquid is admitted into a solenoid surrounded metering chamber in which a magnetically attractable armature is disposed. The armature normally occupies a first position in the metering chamber due to a differential in the sizes of first and second end areas thereof, which end areas are concurrently exposed to the vapor pressure of the liquid in the chamber. When the solenoid is periodically energized to generate a magnetic field, the armature moves to a second position to allow pressurized liquid in the metering chamber to flow therefrom to a nozzle that transforms the liquid to a spray prior to the latter being discharged to the ambient atmosphere. The improved valve structure is particularly adapted for preventing the escape of any liquid from the metering chamber to the nozzle when the armature is in a first position.

3 Claims, 4 Drawing Figures



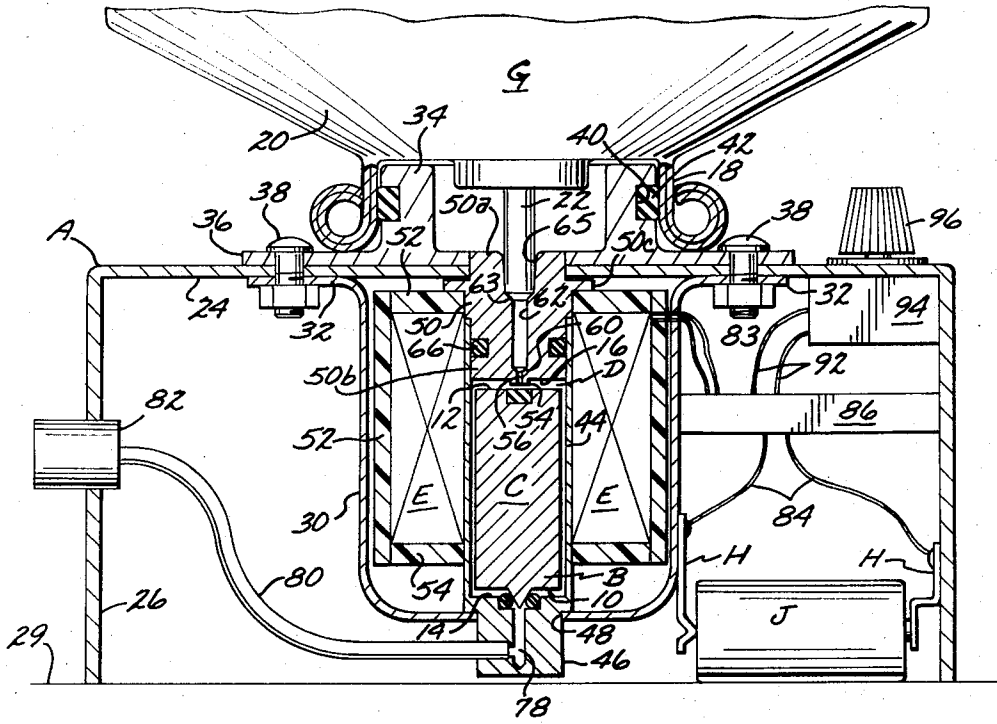


FIG. 1

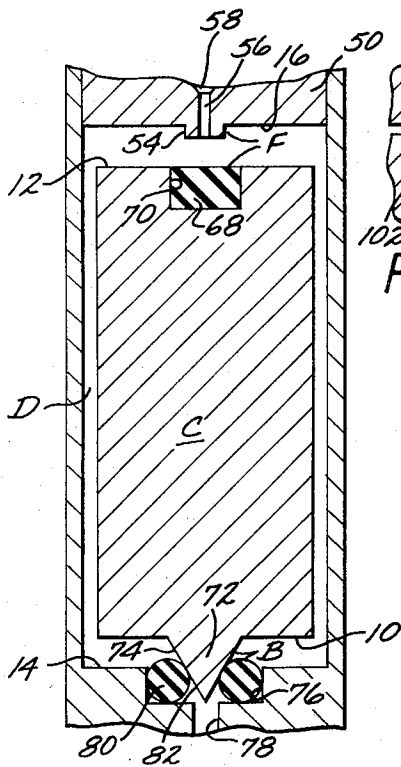


FIG. 2

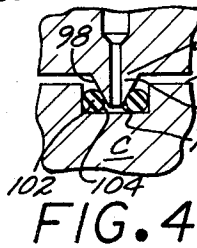


FIG. 4

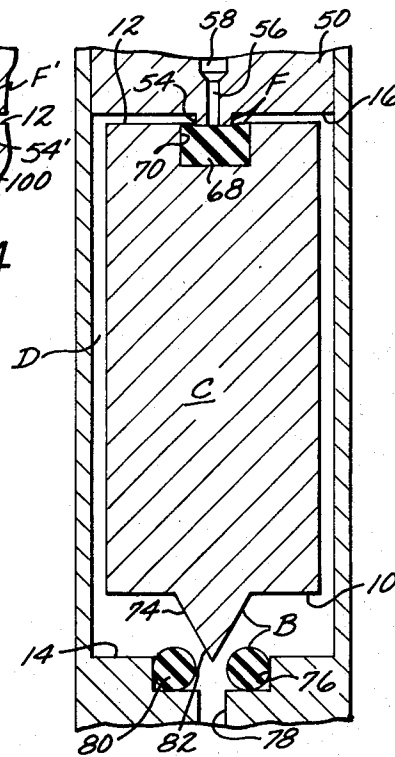


FIG. 3

VALVE STRUCTURE FOR PRESSURIZED LIQUID DISPENSER

BACKGROUND OF THE INVENTION

1. Field of the Invention

Improved valve structure for pressurized liquid dispenser.

2. Description of the Prior Art

In the past, timer controlled spray dispensers for pressurized liquid have been devised, and commercially sold for use with aerosol liquids. The liquids dispensed from such devices may be used as room fresheners, deodorants, disinfectants, and the like. Liquid is periodically discharged from such a device into the ambient atmosphere as a spray by means of an apparatus such as disclosed and claimed in U.S. Pat. No. 3,187,949 entitled "Spray Dispenser for Pressurized Liquid Having Timer Control" that issue to John J. Mangel on June 8, 1965 as a result of an application therefor filed Apr. 3, 1964.

The valving that permits an aerosol liquid to be maintained in a metering chamber of a device such as above identified for a substantial period of time presents a serious problem, as such liquids have a tendency to leak through even the most minute openings.

The major object of the present invention is to provide a valve structure particularly adapted for preventing undesired flow or leakage of pressurized liquid from a metering chamber, as well as sealing the flow into the metering chamber during the period it is being dispensed therefrom.

Another object of the invention is to supply a valve structure that is so operatively associated with a movable armature, that flow of pressurized liquid will take place from the metering chamber only when the armature is in a second position, and flow of a pressurized liquid into the metering chamber will occur only when the armature is in a first position.

A further object of the invention is to supply a valve structure that will remain operative for a prolonged period of time and one that requires a minimum of maintenance attention.

SUMMARY OF THE INVENTION

An improved valve structure for a pressurized liquid dispenser of the type that includes a metering chamber that is surrounded by a solenoid, with the chamber having an elongate armature formed from a magnetically attractable material situated therein. The lower first end of the chamber has a recess extending downwardly therefrom that is in communication with a first passage that extends to a nozzle, which nozzle is capable of transforming a liquid into a spray when the latter is discharged therethrough under pressure. The recess has a ring of resilient material snugly and sealingly engaging the surfaces defining the same, with the ring having a centrally disposed opening therein that is at all times in communication with the first passage. A rigid valve member extends downwardly from the first end of the armature, and this member having a downwardly and inwardly tapering external surface that sealingly engages the portion of the resilient ring adjacent the opening therein when the armature is in a first position.

When the armature is in the first position liquid may discharge from a container through a second passage

into the confines of the metering chamber through a tubular valve seat that projects downwardly from a second end of the chamber, with this flow continuing until the metering chamber is filled. A valve member is mounted on the second end of the armature that is brought into sealing engagement with the valve seat, when the armature moves to a second position.

The metering chamber is at least partially surrounded by a solenoid, and the solenoid, when electrically energized periodically by a timing circuit, creating a magnetic field that results in the armature moving to the second position. When the armature moves to the second position, pressurized liquid discharges from the metering chamber through the first passage to flow to the nozzle and be transformed into a spray prior to being discharged to the ambient atmosphere.

The weight of the armature and the effective areas of the first and second ends thereof are so regulated that when the solenoid is deenergized the armature will move to a first position where the valve member seats on a resilient ring and prevents discharge of pressurized liquid to the ambient atmosphere. The effective area of the second end of the armature includes both the ring shaped area defined by the armature and the circular area of a resilient valve member situated within the confines of the ring shaped area. The effective area of the first end of the armature is that of the ring shaped area defined thereon, and the portion of the tapered valve member situated above the resilient ring. The effective first and second end areas are so chosen that the second area is sufficiently greater than the first area, that when coupled with the weight of the armature, that vapor pressure in the metering chamber will cause the armature to remain in a first position until the solenoid is electrically energized to create a magnetic field that will move the armature to a second position where pressurized liquid can escape from the metering chamber to the ambient atmosphere. When the solenoid is deenergized, the vapor pressure of liquid entering the metering chamber together with the weight of the armature, forces the armature to the first position where the valve member is in sealing engagement with the resilient ring. The resilient ring is made from a material that is inert to the action of the aerosol liquid that flows into and out of the metering chamber as above described. The valve structure above described is simple and easy to manufacture, and does not require the close tolerances that were required previously in valves that attempted to seal the aerosol liquid within the confines of the metering chamber prior to the armature moving to a second position where the pressurized liquid could escape from the chamber due to the vapor pressure on the liquid.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a combined vertical cross sectional and side elevational view of a spray dispenser for pressurized liquid, which dispenser includes the improved valve structure;

FIG. 2 is an enlarged longitudinal cross sectional view of the metering chamber, valve structure and armature, with the armature in a first position;

FIG. 3 is the same view as shown in FIG. 2, but after the armature has moved to a second position to permit pressurized liquid to be discharged from the metering chamber; and

FIG. 4 is a fragmentary vertical cross sectional view of an alternate form of valve structure that may be utilized to prevent the flow of pressurized liquid into the metering chamber during the time the armature is in a second position.

DESCRIPTION OF THE PREFERRED EMBODIMENT

An intermittently operated spray dispenser A for pressurized liquid is shown in FIG. 1 that includes a first valve structure B as a part thereof. The valve structure B as may be seen in FIG. 1 is at least partially formed on an armature C, which armature is formed from a magnetically attractable material. The armature C is longitudinally movable in an elongate metering chamber D, which metering chamber is at least partially surrounded by a solenoid coil E. The armature C has a first end 10 and second end 12. The metering chamber has a first end 14 and second end 16. A second valve F is provided that prevents the flow of pressurized liquid (not shown) into the metering chamber D, when the armature C due to energization of the solenoid E moves from the first position shown in FIG. 2 to the second position illustrated in FIG. 3.

A cylindrical container G for the aerosol liquid is provided which has a tubular neck 18 on a first end 20 thereof, and a spring loaded tubular member being disposed within the confines of the neck and identified by the numeral 22 in FIG. 1 that remains in a closed position, except when subjected in a force directed toward the first end 20.

The spray dispenser A may take numerous structural forms, but is illustrated in FIG. 1 as including a cup shaped inverted base that is defined by a horizontal plate 24 from which a continuous side wall 28 extends downwardly to rest on a suitable horizontal surface 29. A U-shaped bracket 30 is provided as shown in FIG. 1 that has a pair of oppositely extending tabs 32 formed on the upper part thereof. A tubular boss 34 provided as shown in FIG. 1 that has a circular flange 36 extending outwardly from the lower portion thereof. Suitable fasteners 38 extend downwardly through openings (not shown) in the flange 36, plate 24, and tabs 32 to hold the last mentioned three elements together as an integral unit. The boss 34 has a circumferentially extending recess 40 formed therein in which an O-ring or other resilient sealing ring 42 is disposed. The ring 42 makes sealing contact with the interior surface of the neck 18 when the latter is slid downwardly thereover. The metering chamber D may be defined by a cylindrical non-magnetic shell 44 which on the lower end thereof develops into a body 46 that extends downwardly through an opening 48 formed in the bracket 30. A plug 50 of a rigid magnetizable material such as steel or the like is provided that includes an upper cylindrical portion 50a and a lower cylindrical portion 50b, which portions are separated by an outwardly extending flange 50c as shown in FIG. 1. The solenoid coil E is preferably surrounded by a cylindrical shell 52 formed of plastic or other nonelectrical conducting material, and the shell on the ends being closed by two end pieces 52 and 54.

The plug 50 as may be seen in FIGS. 2 and 3 includes a downwardly extending tubular valve seat 54 that has a passage 56 defined therein that is in communication with a bore 58 that on the upper end thereof develops into a first shoulder 60 from which a second bore 62

continues upwardly in the plug as shown in FIG. 1. Second bore 62 develops into a second circular shoulder 63 from which a third bore 65 extends upwardly. Tubular member 22 extends downwardly in third bore 65 and is held in an open position due to pressure contacting third body shoulder 63.

The flange 50c rests on the end piece 52 as shown in FIG. 1, with the cylindrical portion 50a of the plug extending through vertically aligned openings formed in the boss 34 and plate 24.

The upper portion of the shell 44 slidably engages the exterior surface of the lower plug portion 50b, and seals therewith due to pressure contact with an O-ring 66 mounted in this plug portion. In FIG. 2, the second valve F is illustrated as including the tubular valve seat 54 and a body of resilient material 68 such as rubber or the like that is situated within the confines of a recess 70 formed in the second end 12 of armature C and extending downwardly therefrom. The total area of the body 68 and the portion of the second end 12 extending therearound is greater than the area of the second end 12 extending therearound is greater than the area of the second end 10 that extends around the first valve member B.

The first valve member B as may best be seen in FIGS. 2 and 3 is centrally disposed relative to the second end 10 and is defined by a rigid valve member 72 that has a downwardly and inwardly tapering surface 74. The first end of the metering chamber that is defined on the upper portion of the body 46 has a centrally disposed recess 76 extending downwardly therein that is in communication with a first passage 78 that is connected to a first tube 80, which tube in turn is connected on the outer extremity thereof to a spray forming nozzle 82 that is conveniently supported in the side wall 26 as shown in FIG. 1.

First valve B includes a resilient ring 80 of a material that is inert to the pressurized liquid, and is snugly and sealingly mounted in the recess 76. The ring 80 defines a centrally disposed opening 82 that is in communication with the first passage 78. When the armature C is in the first position as shown in FIG. 2 the valve member 72 projects into the opening 82, and due to pressure contact with the exterior surface of the ring 80 adjacent the opening 82, effectively forms a seal therewith. This seal prevents the flow of pressurized fluid from the metering chamber D to the first passage 78 until such time as the armature C is moved upwardly to the second position as shown in FIG. 3. Two clips H of an electrical conducting material are secured to the bracket 30 and interior of the side wall 26 and serve to support a battery J therebetween. The clips H have electrical conductors 84 extending therefrom to an electronic circuit 86 that may be of the type described in the previously mentioned Mangel patent, and this circuit having two conductors 88 extending therefrom to the solenoid E through openings formed in the shell 52. Two connectors 92 connect a variable potentiometer 94 to the electronic circuit 86, to regulate the frequency with which pulses of electric energy are discharged from the battery J to the solenoid E. The potentiometer 94 may be adjusted to control the time period at which pulses of electric current are discharged to the solenoid E by means of a handle 96 that projects upwardly from the plate 24.

When a pulse of electric current is discharged to the solenoid E, the solenoid is electrically energized to cre-

ate a magnetic field, and the armature C moves upwardly as a result thereof from the first position as shown in FIG. 2 to the second position illustrated in FIG. 3. When the armature C is in the second position pressurized liquid (not shown) in the metering chamber D is free to discharge therefrom through the passage 78 and be formed into a spray by the nozzle 82 as the liquid discharges to the ambient atmosphere. When the flow of electric current to the solenoid E is terminated, the armature C moves downwardly not only due to the weight thereof, but also due to the differential in force exerted by the pressurized liquid on the first and second ends 10 and 12 of the armature to assume the first position shown in FIG. 2 where the valve member 72 is in sealing engagement with the ring 80. The opening 82 in the ring 80 must be of sufficient transverse cross section to permit the valve member 72 to partially enter the same, as the armature C moves from the second position shown in the FIG. 3 to the first position illustrated in FIG. 2.

When the armature C is in the second position illustrated in FIG. 2, the resilient valve body 68 is in sealing engagement with the tubular valve seat 54 as shown in FIG. 3, to prevent flow of pressurized liquid into the metering chamber D during the time that a charge of the pressurized liquid is flowing from the metering chamber through the passage 78 to the nozzle 82 to be discharged as a spray from the latter.

A modified second form of valve F' is shown in FIG. 4 in which the valve seat 54' is formed with a downwardly and inwardly tapering surface 98. The second end 12 has a recess 100 formed therein that extends downwardly therefrom, with the recess and valve seat 54' being longitudinally aligned. The recess 100 has a ring 102 of a resilient material snugly and sealingly disposed therein, with the ring 102 having a centrally disposed opening 104 formed therein. In FIG. 4 it will be seen that the size of the opening 104 and the exterior surface 98 of the tubular valve seat 54' are so related that the valve seat effects a fluid tight seal with the portion of the ring 102 adjacent the opening 104, when the armature C is moved upwardly to the second position as illustrated in FIG. 4.

The upward movement of the armature C when the solenoid E is electrically energized is in part due to the plug 50 becoming a magnet when such energization occurs, and the plug then attracting the armature C to move upwardly. In FIG. 1, it will be noted that the length of the armature C between the first and second ends 10 and 12 thereof is less than the longitudinal distance between the first and second ends 14 and 16 of the metering chamber D. Also, it will be noted that the transverse cross section of the armature C is less than the interior transverse cross section of the shell 44 to provide space between the armature and shell that is filled with pressurized liquid when the armature is in the first position as illustrated in FIG. 2.

The use of the first form B of the valve structure as well as the alternate form F' for the second valve structure, provides an easy and convenient means of effecting a fluid type seal when the armature C is in the first and second positions, and such valve structures overcome the numerous operational disadvantages encountered when valves of the type illustrated and described in the Mangel patent previously identified are attempted to be used to control the flow of pressurized liquid into and out of the metering chamber D.

The use and operation of the invention has previously been described in detail and need not be repeated.

I claim:

1. In a dispenser that automatically discharges metered quantities of a pressurized liquid from a container at timed intervals, said dispenser of the type that includes a body assembly that defines an elongate vertical liquid metering chamber having first and second ends, an elongate armature of less length than said metering chamber movably disposed in the latter, said armature formed from a magnetically attractable material and having first and second ends, said armature of less transverse cross section than that of said metering chamber, a spray nozzle, first passage means in communication with said spray nozzle, a solenoid surrounding at least a portion of said metering chamber, a source of electric power, second passage means that maintain communication between the interior of said container and a tubular valve seat that extends into said metering chamber from said second end thereof, a normally open electric circuit means connected to said solenoid and said source of power that periodically close to momentarily energize said solenoid to move said armature from a first to a second position, first valve means on said second end of said armature that seal with said tubular valve seat when said armature is in said second position, an improved valve structure for maintaining said liquid in said metering chamber when said armature is in said first position, said valve structure including:

- a. a tapered rigid element of circular transverse cross section that projects outwardly from the center of said first end of said armature;
- b. a resilient first ring snugly and sealingly disposed in a recess formed in said first end of said metering chamber, said first ring having a centrally disposed opening therein coaxially aligned with said element, said recess in communication with said first passage means, with said element when said armature is in said first position extending into said opening to pressure seal with said ring and exert an outward radially directed force thereon to maintain said first ring in sealing engagement with said recess, and said element when said solenoid is energized moving out of said opening as said armature moves to said second position to permit said liquid to discharge from said metering chamber through said first passage means due to the pressure on said liquid, said armature when said solenoid ceases to be energized returning to said first position due to the weight of said armature and the action of pressurized liquid on said armature as said liquid discharges into said metering chamber from said tubular valve seat, said first ring formed from a resilient material that is inert to said pressurized liquid said second end of said armature including said valve means having a greater area than the portion of said first end and element exposed to said pressurized liquid when said element is in said first position, with said armature due to the differential in areas on opposite ends thereof exposed to said pressurized liquid at all times tending to remain in said first position to seal with said first ring, and said armature only moving from said first position when said solenoid is energized to create a magnetic field.

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2. A dispenser as defined in claim 1 in which said tapered element is in the form of a cone.

3. A dispenser as defined in claim 1 in which said tubular valve seat has a downwardly and inwardly tapered external surface, with said first valve means being a second ring of resilient material that is inert to said pressurized liquid and is snugly and sealingly disposed in a second recess formed in said second end of said armature, with the external tapered surface of said

valve seat sealingly engaging at least a portion of the interior surface of said second ring when said armature moves to said second position, and the combined area of the upper portion of said second ring and the portion of said second end of said armature extending outwardly from said second recess being greater than the area of the portion of said first end of said armature that extends around said element.

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