ABSTRACT: This invention comprises an improved dispenser including a propellant container having a positive displacement dispenser attached thereto, propellant flow being controlled by a manually operable valve and product metering, being controlled by a pressure differentiated valve. The propellant vapor acts upon a pistonlike member which forces a metered quantity of product from the dispenser.
DISPENSER AND METERING VALVE THEREFOR

BACKGROUND

This invention relates to dispensers and, more particularly, to a metering valve for an "isolation" type dispenser which is one in which a pressurized, gaseous or gasifiable liquid propellant is stored in a container or compartment separated from the container in which a fluent product to be dispensed is housed. In one form of "isolation" type dispenser, an aerosol dispenser, the propellant and product are isolated from one another until they are mixed at or near the discharge port during the course of discharge. In another form, the present form, which also can be an aerosol dispenser, the propellant and product remain isolated from one another at all times.

Dispensers of the "isolation" type have the advantage of keeping the product and propellant independent of one another at least until both are about to emerge from the discharge orifice of the dispenser. This isolation permits the use of certain propellants which, if maintained in contact with the product for a substantial time interval, would adversely affect the product. For example, a common propellant such as the fluorine derivative propellants (Freons) are unsuitable for use with food products and medicinal products. Furthermore, certain products are insoluble in certain propellants thus making the use of "isolation" type dispensers desirable where these propellants have other advantageous characteristics. In those instances where propellants may be toxic to the user or where the incompatibility between the product and propellant is such that any contact between them may result in undesirable consequences, it is necessary to isolate the product from the propellant at all times.

In the "isolation" type dispenser wherein a venturi effect is utilized to provide product flow, a rapidly moving stream of propellant is used to reduce the pressure in the product flow line to withdraw the product from the container and to atomize the product as it emerges from the dispenser. Use of the propellant in such a manner commonly results in a product to propellant utilization ratio of between 1:1 and 4:1 thus requiring the use of a substantial quantity of propellant. Since the propellant serves no purpose other than to dispense the product, it is desirable to reduce the quantity of propellant needed.

Other disadvantages to be found with present day systems include: the dispensing of excessive amounts of product due to improper and careless manipulation of the dispensing valve, uneven dispensing due to variation in manual pressure applied to the dispensing valve, and the relatively complex structure of many valves which make the dispensers and valves difficult to manufacture and assemble thereby increasing the cost of such valves.

BRIEF SUMMARY OF THE INVENTION

Briefly described, one embodiment of this invention comprises a dispenser of the "isolation" type having a product container, a propellant container mounted within the product container, dispensing means attached to the product and propellant container and a dispenser head having a discharge duct and orifice therethrough mounted on the dispensing means.

The dispensing means includes a dispenser housing having a flexible diaphragm dividing the interior of the housing into a product receiving chamber and a propellant receiving chamber. The diaphragm is spring-loaded in a manner tending to reduce the volume of the propellant receiving chamber and, consequently, tending to increase the volume of the product receiving chamber. The dispenser housing is mounted on a propellant control valve means which includes a valve housing fixedly attached to the propellant container. Mounted within the valve housing is a moveable valve member which, together with the valve housing, defines a propellant passageway which is exposed to the propellant container. The valve stem is received within the dispenser housing in such a manner as to provide communication between the propellant passageway and the propellant receiving chamber. The valve member is also provided with a vent port interconnecting the propellant passageway with the atmosphere.

A dip tube is attached to the valve member and extends into the product container. An axial passageway through the valve member communicates on one end with the dip tube and on the other end with the product receiving chamber. A flexible sealing gasket is mounted between the valve housing and the propellant container at a position contiguous to the vent port through the valve member. The sealing gasket serves to seal the valve housing within the propellant container and also serves as a valve means acting conjointly with the valve body to alternately expose the propellant passageway and, hence, the propellant receiving chamber to either the atmosphere or to the propellant container.

Mounted centrally within the dispenser housing is a support member having an axial passage therethrough. The support member receives the upper end of the movable valve member. A recess is provided in the uppermost end of the support member and a flexible disc valve is removably placed therein. A valve stem is fixedly mounted in the dispenser housing at the upper end thereof and includes an axial passageway therethrough ending in an annular valve seat within the dispenser housing. The seat is adjacent to the recess of the support member and is of a diameter smaller than the diameter of the recess. Due to the proximity of the lower portion of the valve stem to the support member, the disc valve spans both the recess in the support member and the valve seat. The upper end of the valve stem extends outwardly from the dispenser housing and has the dispenser head mounted thereon so that the discharge duct communicates with the axial passageway through the valve stem.

The dispenser is operated by applying a force on the dispenser head in the direction of the containers. This force will cause the dispenser housing and valve body to move downwardly with respect to the valve housing establishing communication between the propellant receiving chamber and the propellant container. The propellant vapor enters the propellant receiving chamber and forces the diaphragm upwardly, reducing the volume in the product receiving chamber. The increased pressure in the product receiving chamber, which initially is empty, due to the reduction of volume in the chamber causes the diaphragm to flex downwardly at its unsupported center resulting in exposure of the product receiving chamber to the atmosphere through the valve stem and the dispenser head. Relieving the force on the dispenser head results in movement of the valve body and dispenser housing upwardly with respect to the valve housing, exposing the propellant receiving chamber to the atmosphere to enable venting thereof. The spring causes movement of the diaphragm downwardly increasing the volume of the product receiving chamber and reducing the pressure therein. The pressure in the product container exceeds the pressure in the product receiving chamber resulting in forcing the product up through the dip tube, the valve body, the support member and past the disc valve into the product receiving chamber. When it is desired to dispense the product, a force is applied to the dispenser head and the process described above is repeated; however, this time and all subsequent times the product will be forced out through the dispenser head by movement of the diaphragm.

OBJECTIVES AND BRIEF DESCRIPTION OF DRAWINGS

Accordingly, it is one object of the invention to provide an improved dispenser which substantially increases the product to propellant ratio and which always isolates the product from the propellant.

It is another object of this invention to provide an improved dispenser utilizing a metering valve which is ready for dispensing the product upon initial actuation of the value and which dispenses the product at a relatively constant dispensing rate.
It is a further object of this invention to provide an improved dispenser having an inexpensive metering valve utilizing moldable parts which can be easily assembled.

The following objects and attendant advantages of this invention will become apparent and better understood from the following description and the accompanying drawings in which:

**FIG. 1** is a vertical sectional view of an aerosol dispenser formed in accordance with a first embodiment of this invention and illustrated in the dispensing mode.

**FIG. 2** is a vertical sectional view of the aerosol dispenser of **FIG. 1** illustrated in the product chamber filling mode.

**FIG. 3** is a perspective view of a modification of the first embodiment wherein the dip tube extends into an unattached product container.

**FIG. 4** is a vertical sectional view of a modification of the first embodiment.

**FIG. 5** is a vertical sectional view of an aerosol dispenser formed in accordance with a second embodiment of this invention and illustrated in the dispensing mode.

**FIG. 6** is a vertical sectional view of the aerosol dispenser of **FIG. 4** illustrated in the product chamber filling mode.

**FIRST (PREFERRED) EMBODIMENT—FIGS. 1 AND 2**

Adverting now to the drawings, and more particularly **FIGS. 1 and 2**, there is shown an improved aerosol dispenser 10, formed in accordance with this invention, in a first mode (**FIG. 1**) wherein the product is being dispensed and in a second mode (**FIG. 2**) wherein the dispenser is being recharged. The dispenser 10 is formed of five basic parts, a product container 12, a propellant container 14, a propellant flow control valve means 16, a dispensing means 18, and a dispenser head 20. The product container 12 serves a fluid product 22, usually a liquid. Mounted within the product container 12 and closing the top thereof is the propellant container 14 which is held in place by a snap fit as is conventional in the art. The propellant container 14 stores under pressure a propellant which is either a gas or preferably (as shown), a vaporizable liquid 24 of high volatility, such as is commonly used in aerosol dispensers. Some of the well-known propellants are fluorinated-chlorinated hydrocarbons such as those sold under the names Freon and Genetron. The containers may be made out of either metal or plastic, provided the material is compatible with the material stored so that there will be no adverse reaction between them.

The dispenser head may be of a conventional design. The particular head 20 shown is of the type known as having breakup means for atomizing the product being dispensed, when atomization is desired. It is clear, however, that this system can also be used for dispensing products in liquid or semiliquid form in which case the dispenser head need not include the breakup means. The dispenser head 20 has a bore 26 extending from the lower surface 28 thereof upwardly and toward the front surface 30 and being exposed to the atmosphere through a discharge orifice 32.

**METERING VALVE**

**DISPENSER MEANS**

Metering of the product is accomplished by the dispenser means 18 which includes a dispenser housing 33 formed of a first member 34 providing the top wall and sidewall of the housing and a second member 36 forming the bottom wall of the housing. The second member 36 is sealingly attached to the first member 34 by rolling the edge around a flange 38 of the first member 34. In the alternative, the first and second members 34, 36, respectively, may be joined together by other conventional means, such as by a retaining ring or, when both members are made of plastic, by solvent welding. The first and second members 34, 36 form a cavity 42 therein. Positive displacement means, such as a diaphragm 44, is mounted within the cavity 42 and divides the cavity into an upper chamber 48 which serves as a product receiving chamber and a lower chamber 46 which serves as a propellant receiving chamber. The diaphragm 44 is formed with a bulbular peripheral surface 50 which is held between the dispenser housing first member 34 second member 36 and serves as a ring seal. A coil spring 52, mounted within an annular recess 53 in the upper chamber 46, biases the diaphragm 44 toward a position reducing the volume of the propellant receiving chamber 48. One or more compensating ports 54 are provided through the inner wall 55 forming the annular recess 53 in order to allow the product in the recess to flow freely and be dispensed.

The dispenser housing 86 is mounted on the propellant flow control valve means 16 which in turn is attached to the propellant container 14. The propellant container is closed at its upper end by a conventional mounting cup 56 which is seamed at its upturned outer rim 57 to the upper rim of the open top of the propellant container 14 by rolling over the lapped parts 60, 62 of the mounting cup 54 and container 14, respectively. The mounting up 56 is formed with a conventional central upwardly facing collar 62 for supporting the valve means 16.

**PROPELLANT FLOW CONTROL VALVE**

The propellant flow control valve means 16 comprises a cylindrical plastic housing 44, a vertically movable valve body 66 and an annular plastic valve gasket 68. The valve housing 44 and valve gasket 68 are fixedly mounted in the collar 62.

The valve housing 64 is formed with a central bore 70 having an enlarged counterbore 72 near the upper end thereof. A radial port 74 extends through the housing 44 providing communication between the interior of the housing 64 in the counterbore 72 and the propellant container 14.

Slightly retracted within the counterbore 72 of the housing 64 is the lower portion 76 of the valve body 66. The valve body is formed with a lower portion 78 separated by an annular groove 80. The upper portion 70 of the valve body 66 has an outer diameter less than the inner diameter of the counterbore 72 providing substantial clearance between the valve body 66 and the valve housing 44 forming a propellant flow passageway 82. The upper portion 70 of the valve body 66 is provided with an annular passageway 84 which extends from the upper end 86 of the valve body downwardly to a point displaced from the groove 80. An extension 88 of the passageway 84, which extends less than 360° around the valve body, interconnects the passageway 84 and the groove 80. In addition to the annular passageway 84, the valve body 66 is provided with an axial product passageway 90 which extends throughout the length of the valve body 66. The lower end of the valve body 66 is provided with a nipple 92 on which is mounted a resilient dip tube 94. The dip tube passes through the central bore 70 in the valve housing 64, and the bottom wall 96 of the propellant container through a sealed joint 98, and reaches the lower part of the product container 12 providing a fluid flow passageway for the product. The sealed joint 98 prevents vertical movement of the dip tube 94. When a vertical force is applied to the dispenser head 20 the valve body 66 moves downwardly causing the dip tube in the propellant container 14 to deflect. Upon removal of the force the resilient dip tube returns to its vertical position forcing the valve body 66 upwardly to its normal position.

The annular valve gasket 68, which serves as a gasket for the valve housing 44 and as a valve member in combination with the valve body 66, has an inner diameter less than the outer diameter of the valve body 66. The valve body 66 is provided with an annular recess 86 thereby extending to the diameter of the valve body groove 80, as may be seen in **FIG. 2**. The height of the groove 80, at least in the region adjacent the passageway extension 86 is greater than the thickness of the valve gasket 68 thus providing a vent port 100 above the mounting cup 56 when the valve body 66 is in its normal position (**FIG. 2**). Preferably, but not necessarily, the portion of the valve body immediately adjacent the vent port 100 is tapered. The propellant flow control valve means 16 in
its normal, unactuated position is seen in Fig. 2 where the valve gasket 68 interrupts flow communication between the passageway 84 and the interior of the propellant container 14 while providing communication between the passageway 88 and the atmosphere through the vent 100. The dispenser housing 33 is mounted with a forced-fit on the upper portion 78 of the valve body 66 through means of a central recess 102 provided in the bottom of the housing, the recess terminating at a shoulder 104 at the upper end thereof against which the upper portion 78 of the valve body 66 abuts. The upper portion 78 of the valve body 66 has a central extension 106 which projects through the shoulder 104 with adequate clearance between the extension 106 and the shoulder 104 to permit unobstructed flow of propellant vapor as described below. The extension 106 is received by a support member 108 which projects towards a central opening 110 in the diaphragm 44 to which it is sealingly attached to prevent flow of the propellant vapor into the product receiving chamber 46. The support member 108 has an axial bore 112 which leads to an enlarged bore 114 at the top of the support member 108. At the upper end of the support member an annular recess or valve seat 116 is formed. A disc valve 118 made of a flexible material which is compatible with the product, such as rubber or any suitable plastic, removably resides within the annular recess 116, obturating the passageway 88 and 92. A valve stem 120, fixedly mounted within the top wall of the dispenser housing 33 has a portion 122 which extends upwardly from the dispenser housing and which is received by the dispenser head 20. The valve stem 120 has an axial passageway 124 extending through and terminating at its lower end within a depending boss 128 having an annular knife edge valve seat 130 on the lower end thereof. The valve seat 130 is juxtaposed to and faces the annular valve seat 116 of the support member 108 and has an outside diameter substantially less than the inside diameter of the valve seat 116. The vertical or axial location of the valve seat 130 relative to the valve seat 116 is such that the disc valve 118 contacts and spans both valve seats simultaneously when the dispenser is not in use. Consequently, the disc valve 118 interrupts the flow communication between the discharge orifice 32 and the dispenser head 20 and the product receiving chamber 46 and also interrupts communication between the product container 12 and product receiving chamber 46.

**DISPENSER OPERATION**

Turning now to operation of the improved aerosol dispenser 10, FIG. 1 illustrates the first mode in which a substance located within the product receiving chamber 46 is dispensed. Initially, the product receiving chamber 46 is empty and it is necessary to operate the dispenser for one cycle without dispensing the product in order to fill the product receiving chamber 46 with the product. Once that has been accomplished, the product receiving chamber 46 will always be filled and ready for dispensing until the product container 12 is empty.

In order to fill the product receiving chamber 46, a force, such as a manual force F, is applied to the dispenser head 20 in a direction toward the product container 12 or, as illustrated in FIG. 1, vertically downwardly. Since the dispenser head 20 is fixedly mounted on the stem 122 which is fixedly attached to the dispenser housing 33 and which, in turn, is fixedly mounted on the valve body extension 78, the force will cause the dispenser housing 33 and valve body 66 to move downwardly with respect to the valve housing 64. Vertically downward movement of the valve body 66, which causes displacement of the valve gasket 68, results in obturation of the vent 100 and, concomitantly, exposure of the groove 80 to the propellant passageway 82 effecting flow communication between the propellant container 14 and the propellant receiving chamber 48. The pressure within the propellant receiving chamber is atmospheric pressure because prior to actuation of the valve body 66 the propellant receiving chamber 48 was exposed to the atmosphere through the vent 100. Consequently, when the propellant container is exposed to the propellant receiving chamber 40 a portion of the volatile propellant 24 vaporizes and the propellant vapor passes through the propellant passageway 82, 84, and into the propellant receiving chamber 46. The vapor pressure of the propellant providing a force greater than the force of the biasing spring 52 forces the diaphragm upwardly in a direction reducing the volume of the product receiving chamber 46. This reduction of volume of the product receiving chamber 46 increases the pressure within that chamber causing the disc valve 118 to be depressed at its unsupported central area, as illustrated in FIG. 1. Depressor of the disc valve 118 breaks the seal at the valve seat 130 and provides communication between the product receiving chamber 46 and the discharge orifice 32 permitting expulsion of the air that was in the product receiving chamber 46.

Upon removal of the force on the dispenser head 20, the diptube 94 which has been caused to deflect due to the downward movement of the valve body 66, returns the valve body to its normal position which, as illustrated in FIG. 2, is such that the vent 100 is reestablished. Since the propellant receiving chamber 48 is now exposed to the atmosphere, the higher pressure propellant vapor will pass outwardly through the passageway 92, 94, and 100 to the atmosphere. The coil spring 52 expedites expulsion of the propellant vapor and initiates return of the diaphragm to its starting position. Movement of the diaphragm in a direction decreasing the volume of the propellant receiving chamber 46, and, consequently, increasing the volume of the product receiving chamber 46, causes a decrease in pressure in the product receiving chamber producing a pressure differential across the disc valve 118, the higher pressure being within the product passageway 116, 90, and diptube 94. The relatively high pressure in the product passageway forces the unsupported periphery of the disc valve upwardly, as shown in FIG. 2, permitting the product to flow past the disc valve 118 into the product receiving chamber 46. The flowing product forces the center of the disc valve against the valve seat 130 obturating the passageway 124 through the valve stem and preventing any product from being dispensed at that time. After the diaphragm 44 has returned to its starting position, the product receiving chamber 46 will contain a metered quantity of product 22 which is now ready to be dispensed.

Repetition of the dispensing mode as described above, that is depressing the dispenser head 20 and valve body 66, results in forcing the product 22 outwardly through the discharge outlet 32 and discharge orifice 32.

The dispenser housing 18 and propellant flow control valve 16 are joined to the propellant container 14 by means of the mounting cup 56 thus forming an independent, integral dispensing unit 131. This unit is capable of use as a portable unit as shown in FIG. 3 for dispensing a fluid product from any container 132 to which the portable unit 131 need not be attached.

**MODIFIED FIRST EMBODIMENT (FIG. 4)**

The dispenser means 18 described above employs a diaphragm 44 as the means for providing positive displacement of the product. FIG. 4 illustrates a modified dispenser means utilizing a free floating piston 140 in place of the diaphragm. The remainder of the dispenser means structure, function and mode of operation is identical with the dispenser means illustrated in FIGS. 1 and 2 and, therefore, there is no need to describe this modification in detail.

**SECOND EMBODIMENT (FIGS. 5 and 6)**

A second embodiment, using the same concept as employed in the first embodiment described above, is illustrated in FIGS. 5 and 6. The aerosol dispenser 200 of the second embodiment comprises a product container 202, a propellant container 204 mounted within the product container and a dispensing
head 206, which can have the same construction as the dispensing head 20 of the first embodiment.

The propellant container 204 is divided into two sections, a main section 212 in which the propellant 24 is housed and a lower section 210 which serves as the dispenser housing. The two sections are separated by a wall 212 having an outer annular projection 214 and an inner annular projection 216 extending upwardly therefrom. The wall also includes a cylindrical depending extension 218 extending downwardly into the dispenser housing 210 and ending adjacent to the bottom thereof. The wall 212 is provided with a central bore 266 which connects the inner annular projection 216 and the extension 218 and is also provided with an orifice 222 aligned with the clearance 224 between the outer and inner annular projections 214, 216 respectively.

The dispenser head 206 is mounted on a movable valve stem 226 which is located within a valve housing 228 fixedly attached to a mounting cup 230 on the top of the propellant container 204. The movable valve stem 236 is provided with an axial product passageway 232 and a longitudinal propellant passageway 234 extending from the bottom of the valve stem 226 upwardly to a point immediately above the mounting cup 230 as illustrated in FIG. 6. A radial port 236 provides communication between the propellant passageway 234 and the atmosphere when the valve stem 226 is in the normal position as illustrated in FIG. 6. The valve body is provided with an annular flange or shoulder 238 which controls the extent of vertical movement of the valve body within the valve housing as described below. A clearance 240 between the valve stem 226 and the valve housing 228 serves as a propellant flow passageway through the valve housing. An annular plastic valve gasket 242 is mounted between the valve housing 228 and the mounting cup 230 and extends inwardly to abut against the valve stem 226.

The valve stem 236 terminates on its lower end in a nipple 224 on which is mounted a resilient tube 246. The lower end of the tube 246 slip fits over the inner annular projection 216 of the dividing wall 212 and provides a product passageway 247 interconnecting the axial bore 226 of the housing extension 218 and the axial bore 232 of the valve body. A second and larger resilient tube 248 is mounted on the outer portion of the lower section of the valve stem 226 and surrounds the first resilient tube 246. The lower end of the outer tube slip fits over the outer annular projection 214 of the dividing wall 212 and provides an annular propellant passageway 228.

Mounted within the dispenser housing 210 is a piston 252 which is spring-loaded in an upwardly direction. The piston divides the dispenser housing 210 into an upper or propellant receiving chamber 254 and a lower or product receiving chamber 256. The lower end of the dispenser housing 210 is formed with a bell-shaped bottom wall 258 having a hollow nipple extension 260 extending downwardly therefrom on which is mounted a conventional dip tube 262 which leads to the product container 202. A loosely mounted flexible foot valve 264 is located adjacent the bell-shaped lower wall 250 and is movable between two extreme positions, a first position wherein it rests against the bell-shaped wall 258 and a second position wherein it is lifted from the bell-shaped wall 258 and abuts against the dividing wall extension 218 (FIG. 6). In the first position the foot valve 264 obliterates the passage through the nipple 260 and, consequently, diverts the communication between the product receiving chamber 256 and the product container 202. In the second position the foot valve 264 obliterates the central bore 220 and diverts flow communication between the product passageway 247 and the product receiving chamber 256. If desired an annular support wall 256 can be provided at the lower end of the dispenser housing 210 to help rigidity the mounting of the extension 218. If such a wall is utilized, it is provided with a plurality of ports 268 to allow free fluid flow through the support wall 256.

Operation of the aerosol dispenser 200 is similar to that of the operation of the first embodiment described above. Assuming the product receiving chamber 256 is initially void of the product and the valve stem 226 is in its normal position as illustrated in FIG. 6, the first step is to depress the valve stem 226 by exerting a force F of the dispenser head 206 as shown in FIG. 5. Such a force moves the valve stem 226 downwardly until the annular flange 238 abuts against the lower wall 220 of the valve housing 228. In this position the radial port 236 is located below the valve gasket 242 providing flow communication between the interior of the propellant container 204 and the propellant passageway 228. A portion of the liquid propellant 24 rapidly vaporizes and the vapor passes through the propellant passageway 228, through the orifice 222 in the wall 212 and into the propellant receiving chamber 256 wherein it exerts a force on the piston 252 forcing the piston downwardly, reducing the volume of the product receiving chamber 256. The air that is contained within the product receiving chamber is forced through the ports 268 in the support wall 256 and forces the foot valve 264 downwardly against the bell-shaped lower wall 258 allowing the air to pass upwardly through the product passageway 228, 247 and out through the dispenser head 206. Upon releasing the dispenser head 206 the resilient tubes 246 and 248 move the valve stem 226 upwardly to its initial position wherein the radial port 236 is located above the mounting cup 230, being exposed to the atmosphere and serving as a vent for the propellant receiving chamber 218. The spring-loaded piston moves upwardly reducing the volume in the propellant receiving chamber 256 forcing the propellant vapor out through the propellant passageway 228 and into the atmosphere. Movement of the piston also increases the volume of the product receiving chamber 256 thus reducing the pressure therein and causing the foot valve 264 to rise upwardly until it abuts against the extension 218 as shown in FIG. 6. The reduced pressure in the product receiving chamber 256 provides a suction effect on the product container 202 causing the product to rise upwardly through the dip tube 262, past the foot valve 264, through the orifices 266 in the support wall 256, and into the product receiving chamber 256. The dispenser is now ready for dispensing operation. In order to dispense the product the valve stem 226 is depressed again as described above wherein the propellant forces the piston 252 downwardly, the piston in turn forcing the product up through the product passageway 228, 247 as illustrated in FIG. 5. The product emerges from the dispenser head 206 in the form as desired, such as an atomized spray or stream.

It can be seen that the force causing ejection of the product is produced by the vapor pressure of the propellant acting against the diaphragm or piston and, consequently, is a constant force which does not depend upon the manual force applied to the dispenser head. It can also be seen that once the product receiving chamber is filled the dispenser is always ready for dispensing a metered quantity of product and such will occur with the initial depression of the dispenser head. A pumping action is not required to effect dispensing of the product. It is also clear that the product and propellant are completely sealed from one another and at no time do they come in contact with one another. An advantage to this structure is the ability to utilize a ratio in the order of 16:25:1 of product to propellant because it is used to actuate the diaphragm rather than using a variable quantity of propellant intermixing with the product producing atomization of the product as well as a venturi effect to dispense the product. Another significant advantage to this structure is that each of the parts, with the exception of the coil spring, can be easily molded out of plastic and the entire structure can be easily assembled. This reduces the manufacturing expense and enables the structure to be used for throwaway units.
What is claimed as new and desired to be secured by letters patent of the United States is:

1. A dispenser adapted for use with a product container having a propellant container, a dispenser head with a discharge duct therethrough and dispensing means, said dispensing means comprising a dispenser housing having moveable means dividing said housing into a propellant receiving chamber and a product receiving chamber, first valve means for selectively exposing said propellant receiving chamber in a first mode to said propellant container and a second mode to the atmosphere, second valve means adapted for selectively exposing said product receiving chamber in a first mode to said discharge duct and in a second mode to a product container, said first and second valve means being arranged such that when said propellant receiving chamber is exposed to said propellant container, said product receiving chamber is exposed to said discharge duct, and when said propellant receiving chamber is exposed to the atmosphere, said product container is exposed to said product receiving chamber, and dispensing of said product being effected by said propellant causing said moveable means to reduce the volume of said propellant receiving chamber effecting pumping of the product through the discharge duct.

2. A dispenser as defined in claim 1 wherein said movable means is biased toward a position reducing the volume of said propellant receiving chamber.

3. A dispenser means as defined in claim 2 wherein said movable means is a flexible diaphragm.

4. A dispenser as defined in claim 2 wherein said movable means is a free-floating piston.

5. A dispenser as defined in claim 2 wherein said second valve means includes:
   a. valve stem having a first passageway therethrough providing flow communication between said product receiving chamber and said discharge duct, said valve stem having a first annular valve seat surrounding an inlet to said first passageway,
   b. a support member within said dispenser housing having a second passageway therethrough and a second annular valve seat surrounding an outlet from said second passageway and facing said first valve seat, said second passageway providing flow communication between said product container and said product receiving chamber,
   c. a valve member disposed between and across said first and second valve seats, said valve member permitting flow alternately from said product container to said product receiving chamber and from said product receiving chamber to said discharge duct.

6. A dispenser as defined in claim 2 wherein said first valve means includes:
   a. a valve housing having a first port therethrough providing flow communication between the propellant container and the interior of said valve housing,
   b. a valve body movable between two modes with respect to said valve housing and having a first passageway therethrough and a second port exposing said first passageway to the exterior of said valve body, said first passageway communicating with said propellant receiving chamber, and said discharge duct, said valve body being moveable with respect to said valve housing between said first and said second modes and being biased toward said second mode, and a sealing member juxtaposed to said second port,
   c. a sealing member juxtaposed to said second port such that when said valve body is in said first mode, said sealing member interrupts flow communication between said propellant receiving chamber and the atmosphere through said first passageway and when said valve body is in a second mode, said sealing member interrupts flow communication between said propellant receiving chamber and said propellant container,
   d. a second passageway therethrough which provides flow communication between said product container and said product receiving chamber.

7. A dispenser as defined in claim 6 wherein said valve body has a second passageway therethrough which provides flow communication between said product container and said product receiving chamber.

8. A dispenser as defined in claim 7 wherein said valve housing is fixedly mounted on said propellant container and wherein said sealing member comprises a flexible annular gasket mounted between said valve housing and said propellant container.

9. A dispenser as defined in claim 6 wherein said valve member is a flexible disc valve.

10. A dispenser having:
    a. a product container,
    b. a propellant container,
    c. a dispenser head having a discharge duct therethrough, and
    d. dispensing means comprising:
    i. a dispenser housing including positive displacement means dividing the interior of said housing into a product receiving chamber and a propellant receiving chamber, said positive displacement means being spring biased toward a position reducing the volume of said propellant receiving chamber,
    ii. first valve means for selectively exposing said propellant receiving chamber in a first mode to said propellant container and in a second mode to the atmosphere, said first valve means including a valve housing mounted on said propellant container and extending downwardly inside thereof, said valve housing having a first port providing flow communication between said propellant container and the interior of said valve housing, a valve body having a portion within said valve housing and a portion extending from said valve housing and said propellant container and having said dispenser housing mounted thereon, said valve body having a first passageway communicating with said propellant receiving chamber, and having a second port exposing said passageway to the atmosphere, said valve body being moveable with respect to said valve housing between said first and said second modes and being biased toward said second mode, and a sealing member juxtaposed to said second port,
    iii. second valve means including a valve stem mounted on and extending outwardly from said dispenser housing, said dispenser head being mounted on said valve stem, said valve stem having a first passageway therethrough providing flow communication between said product receiving chamber and said discharge duct, a first annular valve seat surrounding said first passageway, a support member within said dispenser housing having a second passageway therethrough and a second annular valve seat surrounding an outlet from said second passageway and facing said first valve seat, said second passageway providing flow communication between said product container and said product receiving chamber, and said product receiving chamber being juxtaposed to and facing said first valve seat, said second passageway providing flow communication between said product container and said product receiving chamber, and a flexible disc valve disposed between and across said first and second valve seats, said disc valve permitting flow alternately from said product container to said product receiving chamber and in a second mode, from said product receiving chamber to said discharge duct, the first and second valve means being arranged such that a force on said dispenser head in the direction toward the propellant container effects movement of said dispenser housing and said valve body relative to said valve housing providing exposure of said propellant receiving chamber to said propellant container and of said product receiving chamber to said discharge duct, the propellant entering said propellant receiving chamber forcing said positive displacement means toward a position reducing the volume of said product receiving chamber and forcing the product past said disc valve and through said discharge duct, upon removal of said force said valve body returning to said first mode exposing said propellant receiving chamber to the atmosphere.

11. An aerosol dispenser as defined in claim 10 wherein said valve body includes a second passageway which is in flow communication with said second passageway of said second
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11. Valve means and including a dip tube depending from the second passageway of said valve body, said dip tube projecting into said propellant container.

12. An aerosol dispenser as defined in claim 11 wherein said propellant container is mounted within said product container and wherein said dip tube extends through said propellant container into said product container.

13. An aerosol dispenser as defined in claim 12 wherein said valve housing is fixedly mounted on said propellant container, wherein said sealing member comprises a flexible annular gasket mounted between said valve housing and said propellant container and wherein said positive displacement means is a flexible diaphragm.

14. An aerosol dispenser as defined in claim 10 wherein a. said first valve seat of said second valve means has a diameter smaller than said second valve seat of said second valve means, b. said second valve seat includes an annular recess, and c. said disc valve removably resides within said recess.