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METERING DISPENSER CONTROLLING EMISSION
OF LIQUIDS WITH INSOLUBLE
GASES FOR EXPELLENT
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Fig. 1

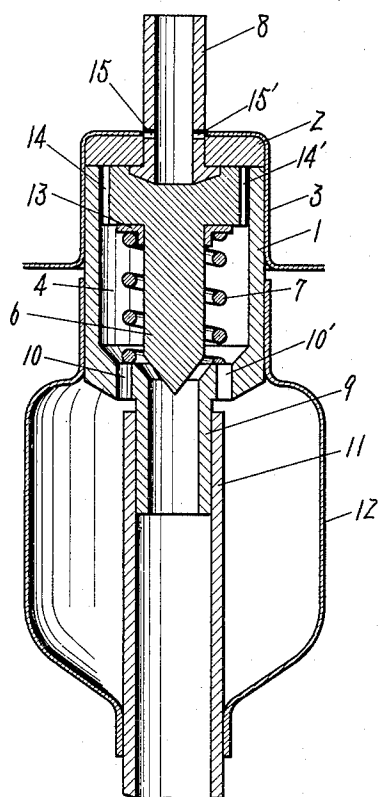
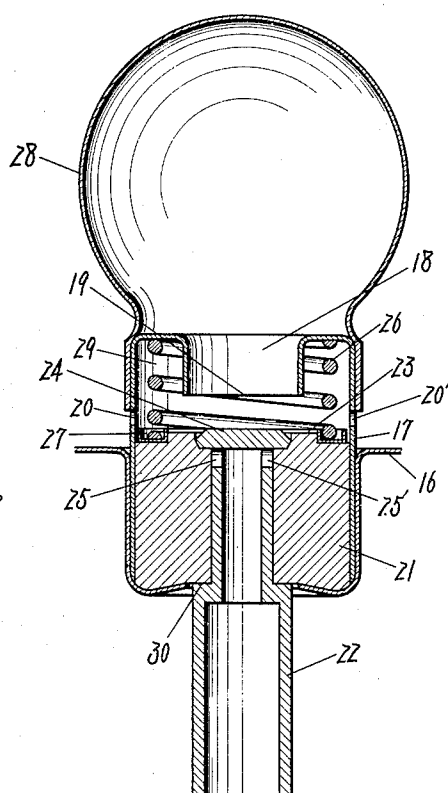


Fig. 2



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METERING DISPENSER CONTROLLING EMISSION OF LIQUIDS WITH INSOLUBLE GASES FOR EXPELLENT

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The present invention relates to metering dispensers of liquids with compressed gases as the expellent which are not soluble or only slightly soluble in said liquids.

Conventional aerosol metering dispensers are provided for use with soluble gases such as hydrocarbon fluoride or the like for the expellent. Such dispensers are generally provided with a reservoir for a liquid with the top wall of said reservoir supporting a metering valve which consists of a valve housing, the interior thereof or valve chamber thereof being equipped with a valve stem and a valve spring, serving as the metering chamber.

When in the off position, said metering chamber is filled through an eductor tube leading to the bottom of said reservoir with the expellent gas dissolving liquid. And when in operation, that is, when the valve stem is depressed and has the center bore thereof in communication with an emission nozzle, the metered liquid in said metering chamber, by expansion of dissolved gas, is emitted through said valve stem center bore and emission nozzle, consequent upon closure of the passage for the liquid adjacent the connection of said valve chamber and eductor tube, and upon communication of said valve stem center bore with said valve chamber. As a result when soluble gases are used for expellent, the structure of the aforementioned metering valve is capable of being used. But with insoluble gases for expellent, no liquid is emitted from the nozzle, because, when in operation said valve chamber is separated from the interior of said reservoir, with the result that the valve chamber is not subjected to gas pressure.

It has been determined that some matter such as food-stuffs or the like are considered to be capable of being discharged by some compressed gases insoluble or slightly soluble in liquid, that is nitrogen gas, carbonic acid gas, or laughing gas and the like. By the present invention I specially undertook to provide an effective means for emitting predetermined metered amounts of liquid subject for the above purpose. Naturally the application of this invention is not limited to a device in which insoluble gases for expellent are exclusively used, but adoption of soluble gases like Freons are also possible.

The most important feature of this invention is that an open end of a bag of soft and elastic material is tightly attached to an element of a valve housing within the reservoir and that the interior of said bag is in communication through a valve chamber with the interior of said reservoir.

The embodiment of my invention, illustrated in the accompanying drawings, will hereinafter be described.

In the drawings:

FIG. 1 is a longitudinal sectional view, of a metering valve according to the present invention fitted to the top wall of a reservoir, and which valve can be operated in an upright position.

FIG. 2 is a longitudinal sectional view of another modification of the present invention which will be operated in an inverted position as shown in the figure.

In FIG. 1, the valve housing 1 is topped with an annular sealing gasket 2, and the upper portion of said housing and said gasket is tightly encased by the wall of the reservoir 3. In the valve chamber 4, a plunger 6 of an elastic and somewhat soft material is provided with a conical terminus and is supported by a valve spring 7. Said spring is disposed between the bottom of said valve hous-

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ing and the horizontal portion of the step of said plunger. Said plunger is topped with a stem pipe 8 which extends through said gasket 2 and the wall of said reservoir leading to the emission nozzle (not shown in the figure).

Below the bottom of the valve housing, a valve seat pipe 9 extends downwards and is surrounded by several orifices 10, 10' formed through said bottom. Said valve seat pipe is fitted with an eductor tube 11 leading to bottom of said reservoir. The lower portion of the said wall of said housing is tightly encased by an open end of a metering bag 12 of soft and elastic rubber while the lower open end of said bag is penetrated by said eductor tube, and the penetrating portion of said tube into said bag is tightly encased by said bag. In FIG. 1, 13 is a metal washer, 14 and 14' are longitudinal canals provided through the upper side wall of said plunger, and 15 and 15' are orifices extending through said stem pipe.

In its off or closed position as shown in FIG. 1, the device will have a liquid passing through the eductor tube 11 and valve chamber 4 from the reservoir filling the metering bag 12. When the stem pipe 8 is depressed inwardly, the plunger 6 drops and the terminus thereof moves into the valve seat pipe 9 causing the passage of the liquid between the reservoir and said bag to close. Further depression of said stem pipe places the orifices 15, 15' open below the sealing gasket 2, causing the inner bore of said stem pipe with the metering bag 12, to be in communication with the canals 14, 14', valve chamber 4, and the orifices 10, 10'. Subsequently, said metering bag is subjected to the pressure of said expellent which fills the reservoir space, causing the pre-measured liquid in said metering bag to be discharged from the emission nozzle. When the depression of the stem pipe is stopped, emission of liquid from said bag ceases and said metering bag is again placed in communication with the reservoir upon the recovery of the plunger 6 and the stem pipe 8 to its original position under the action of the valve spring 7. Then the interior and exterior of said bag becomes equalized and said bag returns to the initial shape thereof, absorbing said liquid thereinto, on account of the elasticity thereof.

The recovering action of said metering bag may be determined by selecting the proper material or the thickness thereof, or by thickening the upper or lower shoulders thereof. Also, said action may be increased by a metal spring inserted in said bag.

With the above mentioned device, it is possible to provide a metering dispenser using gases insoluble or slightly soluble in liquid as an expellent for minute or big amounts of liquid emission using a simple structure.

In the dispenser of FIG. 2 a liquid is filled above the wall of the reservoir 16, and a compressed gas is enclosed in the head space above said liquid applying pressure on the surface thereof. The lower portion of the valve housing 17 is tightly encased by the wall of said reservoir, and the inwardly turned upper portion of said housing forms the passage 18 of liquid with the edge thereof forming the valve seat 19. Through the side wall of said housing, several orifices 20, 20' are provided which extend from the inside to the outside of said housing. A sealing gasket 21, serving also as a valve body, is composed of soft and elastic material such as rubber, and of a diameter such that it may be tightly but forcibly slid within the side wall of the valve housing 17, and is vertically penetrated by the slender upper portion of the stem pipe 22. The upper end of said gasket forms the closure face 23 for the valve seat 19. The lower end of the stem pipe 22 forms an emission nozzle (not shown in the figure), and the upper end thereof forms the end plate 24 of a diameter bigger than that of the upper portion of the stem pipe 22 serving for preventing said pipe from slipping out of said gasket. The orifices 25, 25'

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extend through the stem pipe 22 directly below said end plate. A valve spring 26 is disposed between the upper end of said valve housing and upper end of said gasket being seated on the metal ring 27 of said gasket. The spherical shell type metering bag 28, of a soft and elastic rubber, has the lower open end thereof tightly fitted on said valve housing.

When said device is in its inverted state and at its off position as shown in FIG. 2, a liquid from said reservoir fills the metering bag 28 through orifices 20, 20'. Said liquid is not discharged from the dispenser on account of the close fitting of said gasket 21 with the wall of the valve housing 17, with the stem pipe 22 and with the end plate 24. When the stem pipe 22 is upwardly pressed, the gasket 21 is also upwardly pressed against the valve spring 26 by the annular shoulder 30 of said stem pipe, causing the orifices 20, 20' to be closed, communication between the interior of said reservoir and said bag to be shut off, and finally the annular closing face 23 of said gasket to be tightly fitted against the valve seat 19. Upon further pushing up of said stem pipe, the end plate 24 is detached from said gasket, causing the interior of the metering bag 28 and the stem pipe 22 to be in communication. Thereupon, said liquid filling the interior of said bag is emitted from the emission nozzle through the stem pipe 22, due to the external pressure on said bag by said enclosed gas.

When said stem pipe 22 is released, the gasket 21 and the stem pipe 22 return to their initial position on account of the elasticity of the gasket 21 and the valve spring 26, causing said metering bag to recover the initial shape thereof, by the elasticity thereof, and said bag and the valve chamber 29 to refill with the liquid consequent upon the recovery of the equilibrium of pressure between the inside and outside of said bag.

By above mentioned example, it is possible to provide a metering dispenser with gases insoluble or slightly soluble in liquid for operation in an inverted position which dispensers are trouble free, suitable for mass production on account of the simplicity of structure of the valve, and of the small number of mechanical parts due to the sealing gasket which serves also for valve body.

Having thus described my invention, what I claim is:

1. A metering dispenser comprising a reservoir containing a liquid and a gas expellent which is insoluble or slightly soluble in said liquid, a valve body extending through a side of said reservoir, a resilient valve member slidably mounted in said valve body, a tube connected to said valve member and slidably extending outwardly of said valve body and said reservoir, said valve body having an end opening positioned for being closed by said valve member upon inward movement of said tube, a resilient metering bag having an open end fixedly connected to said valve body around said valve body opening and extending within said reservoir, said resilient metering bag being capable of drawing in the liquid by the elastic force of restitution thereof upon communication of said bag and said reservoir and forcing out the liquid therein into said tube by the deflation of said bag under the gas pressure

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within said reservoir upon communication of said bag and said tube, means operatively connected to said tube for placing said tube in communication with said bag upon continued inward movement of said tube, and said valve body having side openings for admitting fluid from said reservoir to said bag upon the opening of said valve body end opening by movement of said tube outwardly of said valve body.

2. A metering dispenser comprising a reservoir containing a liquid and a gas expellent which is insoluble or slightly soluble in said liquid, a hollow valve body extending through an end of said reservoir, a resilient valve member slidably mounted in said valve body, a tube slidably extending through said valve body, a second tube extending from said valve body into said reservoir and positioned for being closed by said valve body upon inward movement of said first tube, resilient means tending to separate said valve member from said second tube, a resilient bag having open ends fixedly encasing said valve body and said second tube, said resilient metering bag being capable of drawing in the liquid by the elastic force of restitution thereof upon communication of said bag and said reservoir and forcing out the liquid therein into said first tube by the deflation of said bag under the gas pressure within said reservoir upon communication of said bag and said first tube, said valve body having openings communicating with said bag, said valve member having openings for having the bore of said tube in communication with said valve body openings and said valve member openings upon inward movement of said first tube for the ejection of fluid from said bag.

3. A metering dispenser comprising a reservoir containing a liquid and a gas expellent which is insoluble or slightly soluble in said liquid, a hollow valve body extending through an end of said reservoir, a valve member of a resilient material slidably positioned in said valve body, a tube slidably mounted through said valve body and said valve member and having side openings at the end thereof within said valve body, said valve body having side openings within said reservoir and an end opening positioned for being closed by said valve member opening, a resilient bag within said reservoir having an open end fixedly encasing said valve body and the end opening thereof, said resilient metering bag being capable of drawing in the liquid by the elastic force of restitution thereof upon communication of said bag and said reservoir and forcing out the liquid therein into said first tube by the deflation of said bag under the gas pressure within said reservoir upon communication of said bag and said first tube, and resilient means tending to retain said valve member from closing said valve body end opening.

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