Feb. 11, 1958 E. J. POITRAS 2,822,962

DISPENSER WITH VARIABLE RATE FLOW CONTROL

Filed April 1, 1955

Fig. 1.

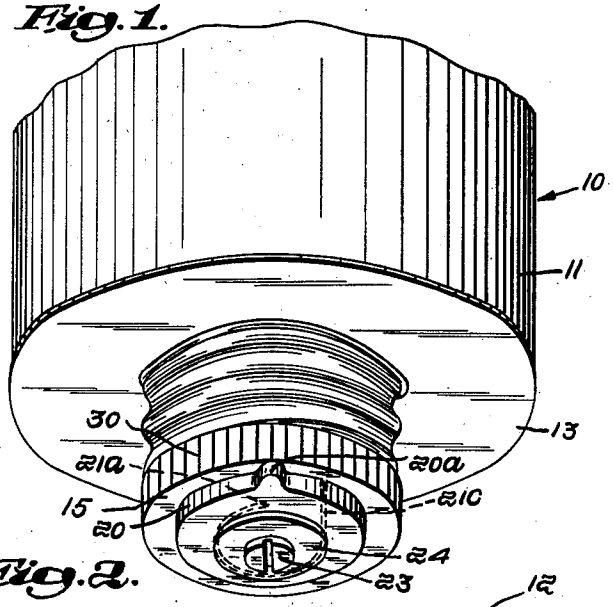


Fig. 2.

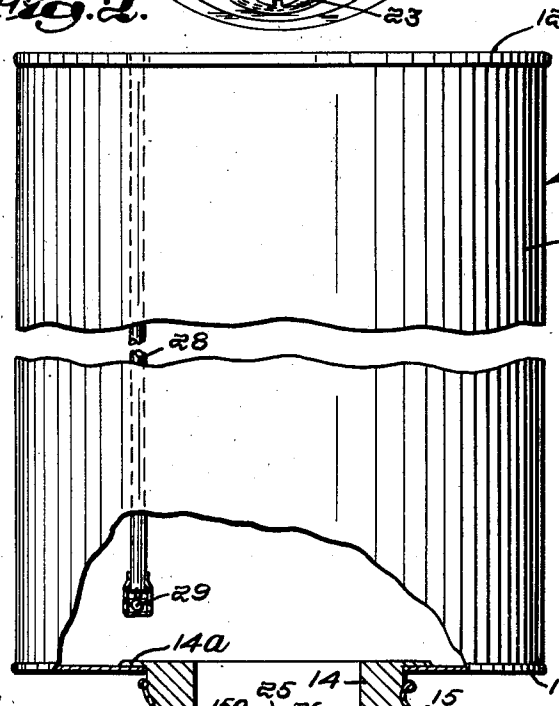


Fig. 4.

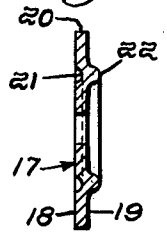
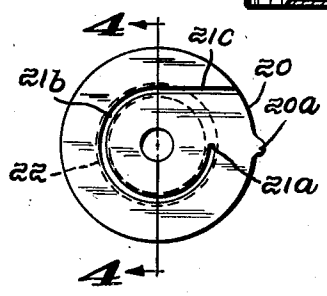
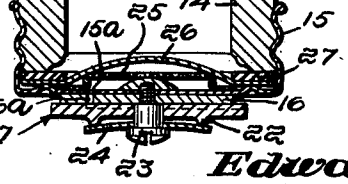


Fig. 3.





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DISPENSER WITH VARIABLE RATE FLOW CONTROL

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19 Claims. (Cl. 222—481)

This application relates generally to flow controlling devices and more particularly to liquid dispensers such as supplying disinfectant, lubricant, cleansing and the like liquids at regulated rates and over determined periods. The present invention aims to provide an improved dispenser having novel provision for control and adjustment of dispensing flow rate, and also for constant head. The further invention object is to provide a dispenser uniquely and advantageously formed and fitted for continuous and uniform liquid flow and for regulation of such flow, as correlated with supply volume, and adjusted to period length. The invention will be better understood from a consideration of the following specification taken in conjunction with the accompanying drawing in which:

Fig. 1 is a perspective view of the outlet of a liquid dispenser of the invention;

Fig. 2 is a side view, partly in section, of the dispenser of Fig. 1, and showing more particularly the constant head providing and dispensing flow regulating means of the invention;

Fig. 3 is a top view of an element of the flow regulating assembly of Figs. 1 and 2; and

Fig. 4 is a section of the same taken along the line 4—4 of Fig. 3.

This invention is directed particularly to apparatus for dispensing automatically, as from a concealed or unattended vessel or container, and at a constant, uniform generally slow rate. Such automatic level flow dispensing apparatus is characterized generally by a container for a liquid supply, means for equalizing the pressure or head of such supply, and means for regulating the supply dispensing flow rate. The present invention improves on the prior or conventional dispensing apparatus devices by the provision of novel self-contained means for standardizing the head of the container supply. Constant, uniform flow dispensers are further improved under the invention by novel variable length capillary passage means for regulating and adjusting the rate of dispensing flow.

In accordance with the invention the dispensing flow is regulated generally by plate means or members assembled and clamped face-to-face, and mounted further for relative shifting of their opposed faces. The plate assembly is provided in the one member with an access passage or opening and in the other with a discharge passage or opening. The shiftably clamped members are provided further and at the engaged face of one plate with a groove communicating with these openings, which groove is closed and sealed by the opposed face of the other plate and proportioned to define therewith a capillary passage. The rate of flow through the assembly is adjusted by the relative shifting of the plates, whereby the access and discharge passages are ordered for communication with varying lengths of the capillary passage.

In the present embodiment the invention flow controlling means is incorporated in a conventional dispenser indicated generally at **10**, Figs. 1 and 2, and there shown to comprise more particularly a liquid vessel or container

such as commonly presenting an annular side wall **11** and flat end or top and bottom walls **12, 13**. In accordance with the invention, a discharge or dispensing outlet or opening is provided at any flat or planar container wall, herein the bottom wall **13**. It will be appreciated that the flow controlling means of the invention may be applied directly to such bottom or other wall outlet or opening. Herein, however, the container outlet will be seen to comprise further a projecting neck or sleeve **14** received through the bottom wall **13** and having a radial flange **14***a* overlying and welded or otherwise secured to the same. The flow regulating means of the invention is applied to the sleeve **14** through a cup-shaped metal cap **15** received over and threaded or otherwise detachably secured thereto. This outlet closing, wall-forming cap **15** has a restricted, non-central outlet opening **15***a*, Fig. 2. Integrally joined to the base of the cap **15** is a strengthening plate **16** having a similar aligned opening **16***a*.

The invention flow regulating means is herein embodied in an annular plate or disc **17**, which may be of rigid metal or plastic construction, and which is defined by opposite planar faces **18, 19** and a conveniently thin annular edge or periphery **20**. The disc **17** is formed further and at its one or engaged side or flat face **18** with a shallow, elongated recess or groove **21**. The open groove or recess **21** has such depth, width, and contour as defines it when closed, as herein by the plate **16**, as a capillary passage. It may, for example, be of annular or half round section and of, say, $\frac{1}{64}$ inch depth by $\frac{1}{64}$ inch width, as providing a passage proportioned for capillary flow of the liquids here concerned. The groove **21** is seen further to extend from a closed inner end **21***a*, Fig. 3, through an intermediate section **21***b* of predetermined, herein annular or part circular configuration to an outer tangential straight section **21***c* extending to the disc edge or periphery **20**, Fig. 3.

In accordance with the invention, the plate **17** is mounted with the grooved face **18** normally clamped against the outlet wall **16**, and with the predeterminately annular groove part **21***b* over the outlet opening **15***a*, **16***a*. The dispensing flow passage thus comprises the outlet openings **15***a*, **16***a* and continuous therewith the capillary passage **21, 16** shown in dotted line in Figs. 1 and 2, and which may be characterized generally as spiraling outward to the plate and disc periphery.

The flow controlling means of the invention comprises further the shiftable mounting of the disc **17** at outlet wall **16** for adjusting the length of the capillary passage **21, 16**, and thereby varying the rate of dispensing flow. Herein the grooved plate **17** is mounted for relative rotation whereby the outlet opening **15***a*, **16***a* communicates at varying points of and with varying lengths of circular groove part **21***b*. Such shiftable or movable mounting or positioning of the disc **17** may be variously accomplished, as by a fastening screw or pin **23** received through a central annular opening in the plate **17** and threaded in or otherwise secured to plate **16**. It will be seen that the disc mounting may, as herein, be such as to constitute the flow regulating assembly as a valve device, with the disc rotatable to a position of non-communication of the groove **21** with the outlet opening **15***a*, **16***a*.

Further in accordance with the invention, the flow control plate elements **16, 17** are clamped together under spring tension, whereby to maintain fluid tight the partible passage **21, 16** defined therebetween. The desired non-leak passage sealing tensioning of the parts may be accomplished by forming an integral rib **22** on disc **17** opposite and paralleling the groove **21**, and by clamping a dished washer **24** between the head of the fastener **23** and said rib **22**.

The container outlet may be variously fitted as desired or expedient for screening or filtering the container out-

let as against sediment or the like material capable of clogging the capillary passage. For example, a metal screen 25 may be sealed over the opening 15*a* in cap 15, and filter paper 26 may be positioned between the cap and a sealing gasket 27 also clamped between the cap and the rim of the outlet 14.

Further in accordance with the invention novel means are provided for effecting at the container outlet a constant unchanging liquid pressure or head as required for the uniform, even, level flow herein contemplated. The prior constant head devices will be understood to have comprised generally an open vessel over which the container is inverted and from which the liquid is ultimately dispensed. The fluid level and hence flow controlling head is maintained constant in the open vessel because such level supports an equilibrium condition in the container. When the liquid level in the vessel drops, air bubbles into and decreases the vacuum in the bottle, releasing liquid to the vessel until the original head is restored.

The separate and open vessel just described as heretofore providing uniform head is not required with the invention apparatus. Considering now more particularly Fig. 2, an air inlet or vent tube 28 is mounted entirely within the container 10 and arranged to extend from a point or level adjacent or proximate the container bottom wall 13 through the container top 12. The air inlet or vent tube 28 may be supported on or from the container side or top by conventional means, not shown. It is fitted with a ball or the like check valve 29, Fig. 2, preventing liquid loss or escape therethrough, as when the container is inverted for filling.

It will be readily apparent to those skilled in the art that the described construction provides a constant, uniform liquid head. Such head is seen to be equal to the difference in height of the dispensing outlet and the container vent, or bottom of the tube 28, which may be, say, one inch above container bottom 13. While the container liquid column above the level of the tube bottom is variable, it is counterbalanced always by a like varying vacuum in the container air column above said liquid column.

The advantageous operation of the invention apparatus will be readily appreciated by those skilled in the art. The container is first filled from or through the neck 14 with a determined quantity of the desired liquid. The liquid charge or supply may be such as calculated, in respect of the rate of flow through the container outlet, to be expended in a desired length or period of time. In the case, for example, of a disinfectant drip device the container 10 may be such as conveniently stores and supplies, say, one quart of the disinfectant, and the drip rate may be such as expends or uses up such one quart liquid supply in, say, a one month or thirty-day period. The regulation of the flow or drip rate, or in other words of the length of the capillary passage 21 has been shown to require a particular positioning of the plate 17. The manipulation of the plate 17 may be facilitated by the provision thereon of a lateral or edge extensive tab 20*a*, Fig. 3, and by marking or otherwise mounting on the container an index or scale 30, Fig. 1, with respect to which the index tab 20*a* may be positioned. While the dispensing flow is desirably effectively initiated by the head or weight of the entire fluid volume, such flow inducing liquid head will be understood to be substantially instantaneously reduced to the described control level by reason of the arrangement already described, and whereby a negative pressure or vacuum is created in the container air volume.

It will be understood that numerous other and equivalent flow controlling assembly constructions may be provided without departing from the scope and spirit of the invention. For example, the container bottom may be provided as herein with an access opening and also at its outer or under face with a part circular groove communicating with the opening. In this case the disc rotatably clamped against said container bottom face would be provided either with a discharge opening at the radius of the groove which groove would desirably extend not quite full circle, or with a radial discharge groove extending from said radius to the disc periphery and communicable like the opening with varying lengths of the circular groove.

From the foregoing it will be appreciated that this invention provides new and improved flow controlling and dispensing means, wherein a fluid supply is maintained under constant or uniform flow inducing or controlling pressure or head by a self-contained air or vent tube, and without the use of open vessels or other auxiliary devices. The invention apparatus has been shown further to provide novelly a variable length capillary passage for regulating flow rate. This passage is seen as embodied in a unique assembly readily shiftable for flow adjustment and readily demountable for passage cleaning, but normally clamped and tensioned for desired non-leak sealing of the parts.

It will be understood that my invention is not limited to the exemplary embodiments herein illustrated or described, and I set forth its scope in my following claims:

I claim:

1. A flow control assembly comprising a pair of plates assembled face-to-face one said plate having a passage for access and the other a passage for discharge of fluid supplied to said assembly, a capillary groove formed at and between the opposed faces of said plates, and means for releasably clamping said plates under spring tension whereby said groove is fluid sealed and whereby the plates are shiftable for communication of said passages with varying lengths of said groove.

2. Flow regulating means comprising a plate engageable at one face against a container outlet and formed at said face with a capillary groove adapted to be closed and sealed by said outlet and extending at one end only to the plate periphery, said groove arranged upon shifting of said plate relative to said container for varying length communication with the outlet opening.

3. Flow regulating means comprising a plate having an opening therethrough, a disc formed at one face with a capillary groove extending from a closed inner end to the disc edge, and means for shiftably mounting said disc with said groove sealed against said plate and in adjustable length communication with said opening.

4. Fluid dispensing apparatus comprising means detachably sealing a container outlet, said means formed at a flat wall with a restricted opening; a disc formed at one face with a groove extending from a closed inner end through a circular inner part to the disc edge, and means for rotatably mounting said disc with said face sealed against said wall and said circular groove part aligned with said opening, whereby said groove and wall define a variable length capillary passage for fluid dispensed through said outlet.

5. A flow controlling dispenser comprising a container having an outlet and thereat a restricted opening, a disc formed at one face with a groove extending at one end to the disc edge, and means for shiftably supporting and clamping said disc at and against said outlet and with said groove aligned with said opening, whereby the groove and outlet define an adjustable length capillary flow passage for said dispenser.

6. A variable rate flow control dispenser comprising a disc formed at one face with a groove extending from a closed inner end to the disc edge, fastener means received through and for shiftably mounting said disc at the dispenser outlet and with said groove communicating through the outlet opening, and spring means associated with said fastener means and yieldably clamping said face against said outlet whereby the groove and outlet define a fluid sealed, variable length capillary flow passage for said dispenser.

7. Variable rate, constant flow dispensing apparatus comprising a container having an outlet, a disc formed with a groove having an annular inner part and an outer part extending to the disc edge, and means for rotatably mounting and yieldably clamping said plate at and against said outlet and with said inner groove part in communication with the outlet opening.

8. Flow control apparatus comprising a pair of plates assembled face-to-face, an access passage in one and a discharge passage in the other of said plates, a capillary passage formed at and between the opposed faces of said plates and communicating with said access and discharge passages, and means clamping said plates for fluid sealing of said capillary passage comprising a projection on one of said plates and opposite the passage, fastener means received through said one and secured to the other plate, and spring means tensioned between said fastener means and said projection.

9. Dispensing apparatus comprising a closed container having a bottom wall outlet and an air inlet defined by an internal tube extending through the container top and opening into the container proximate said outlet, and means for adjustably regulating the flow through said outlet, said means including a wall supported disc formed at its wall engaged face with a groove defining with the wall a restricted flow controlling passage, said disc positioned for communication of said passage with the outlet opening, and means for shifting said disc relative to said opening whereby to vary the flow conducting length of said passage.

10. Dispensing apparatus comprising a container having a bottom wall outlet and a vent defined by an internal tube extending through the container top and opening proximate said wall, said outlet including a plate having at one face a capillary groove extending from a closed inner end to the plate edge, and means for shiftably mounting said plate with said groove sealed against said wall and for adjustable length communication with said container.

11. Flow control means comprising a plate having an opening therethrough, a disc assembled to said plate and formed at its engaged face with a groove communicating with said opening and extending from a closed inner end to the disc edge, said groove constructed and arranged to define with said plate a restricted, flow controlling passage, and means for clamping said plate and disc under spring tension and thereby fluid sealing said passage.

12. A constant head even flow dispenser comprising a container for a fluid supply and having a restricted flow controlling outlet, said outlet including opposed members formed at their engaged faces with a fluid sealed capillary passage, and an air tube mounted within said container, said tube arranged for exposure to atmosphere at its one end above said supply and for opening into said container at its other end at a determined height above said outlet.

13. Flow control apparatus according to claim 12 wherein said members are shiftable for varying the length of said passage.

14. A level flow dispenser comprising a container for a fluid supply, a restricted flow controlling outlet on said container, said outlet including means defining a capillary passage, an unrestricted air tube mounted within said container, said tube arranged for exposure to atmosphere at its one end above said supply and for opening into said container at its other end at a determined, fluid-head-defining height above said outlet, and means for varying the length of said capillary passage.

15. A level flow dispenser comprising a container for a fluid supply, restricted variable length outlet means on said container for adjustably controlling the dispensing flow, and an unrestricted air tube mounted within said container, said tube having its one end opening to atmosphere through the external container wall above said supply and having its other end opening into said container at a determined height above said outlet means.

16. A dispenser according to claim 15 and check valve means associated with said tube and sealing the same against escape of said supply.

17. A constant head dispenser comprising a container for storing a fluid supply, restricted variable length outlet means on said container for adjustably controlling the dispensing of said supply, and an unrestricted air tube mounted within the container, said tube having its one end opening to atmosphere through the external container top wall and having its other end opening into said container at a determined height above said outlet means.

18. A level flow dispenser comprising a container for a fluid supply, a restricted flow controlling outlet on said container, said outlet having means defining a variable length capillary passage, and an unrestricted air tube mounted within said container, said tube having its one end opening to atmosphere through the external container wall above said supply and having its other end opening into said container at a determined height above said outlet.

19. A level flow dispenser comprising a container for fluid supply, a restricted flow controlling outlet for said supply, said outlet including a variable length capillary passage, and an unrestricted air tube mounted within the container, said tube having its one end opening to atmosphere through the external container top wall and having its other end opening into said container at a determined height above said outlet.

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