

Sept. 16, 1969

E. M. OSTROWSKY
DISPENSING APPARATUS

3,467,286

Filed Aug. 31, 1967

2 Sheets-Sheet 1

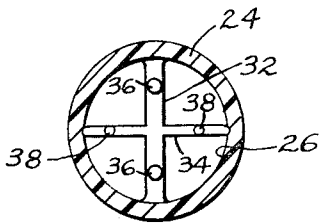


FIGURE 3.

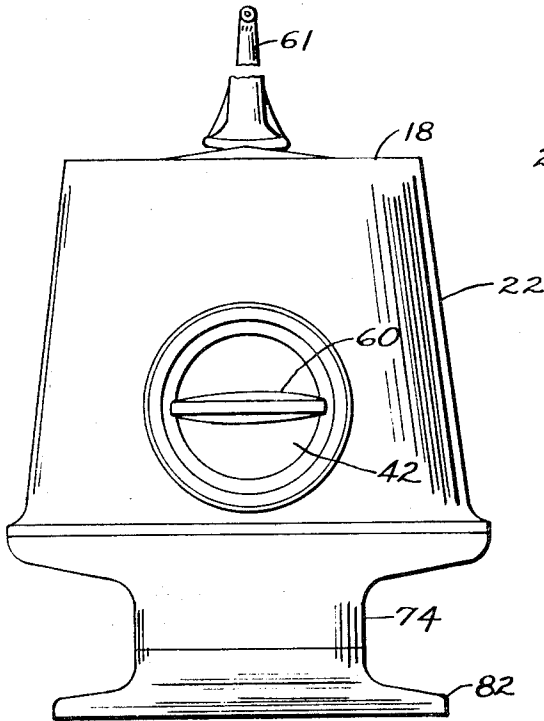


FIGURE 4.

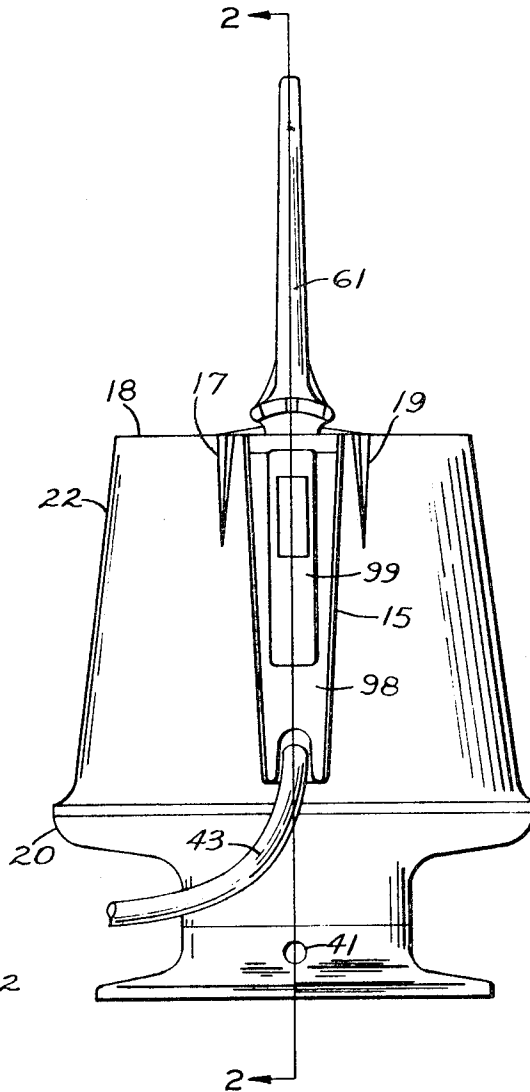


FIGURE 1.

INVENTOR
EFREM M. OSTROWSKY
BY *Louis E. Davidson*
ATTORNEY

Sept. 16, 1969

E. M. OSTROWSKY

3,467,286

DISPENSING APPARATUS

Filed Aug. 31, 1967

2 Sheets-Sheet 2

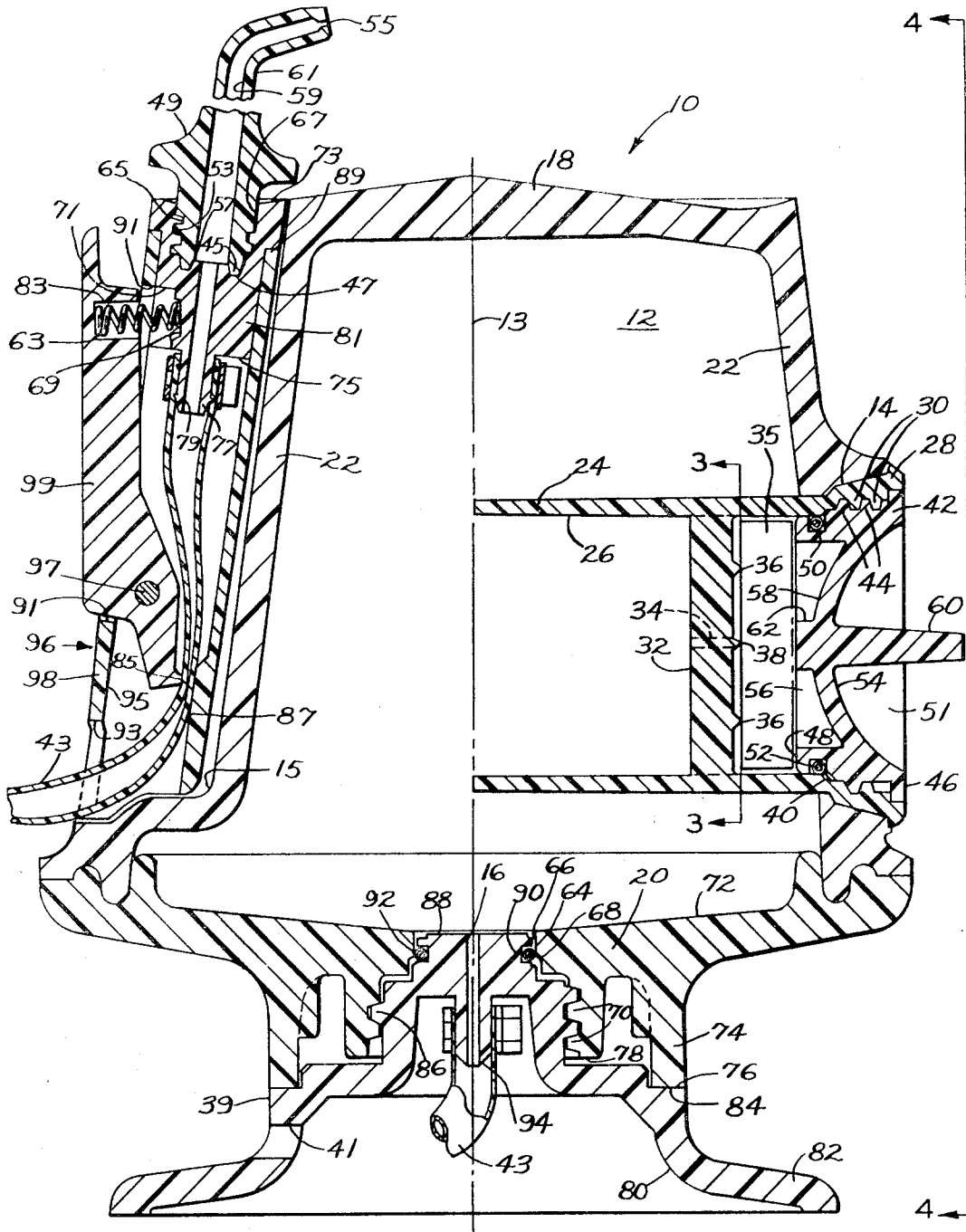


FIGURE 2.

INVENTOR

EFREM M. OSTROWSKY

BY

Louis E. Davidson

ATTORNEY

1

2

3,467,286

DISPENSING APPARATUS

Efrem M. Ostrowsky, Highland Park, Ill., assignor to Miles Laboratories, Inc., Elkhart, Ind., a corporation of Indiana

Filed Aug. 31, 1967, Ser. No. 664,671

Int. Cl. B65d 83/00, 83/06

U.S. Cl. 222—394

7 Claims

ABSTRACT OF THE DISCLOSURE

Liquid dispensing apparatus is described having a chamber provided with control means to prevent overfilling and to allow only a specified amount of liquid, which is less than the total storage capacity of the dispenser, to be poured into the chamber. This improved apparatus is especially useful for dispensing liquids under pressure generated by reaction between an effervescent composition and the liquid.

Background and Prior Art

It is well-known in the prior art to dispense liquids under pressure from suitable dispensing apparatus. Typical examples are soda-acid fire extinguishers, carbon dioxide-powered drink dispensers and the like. When a specified amount of liquid is to be added to this prior art dispensing apparatus for subsequent dispensing, the specified amount of liquid is either measured first and then introduced to the dispensing apparatus or liquid is introduced to fill the apparatus to a given level mark. There usually is no apparatus means to prevent overfilling. In some instances liquid overfilling may not present a problem other than mere inconvenience. In other instances liquid overfilling could drastically affect the overall performance of the dispensing apparatus.

When the dispensing apparatus is powered by gas pressure in a gas space above the liquid being dispensed, liquid overfilling could reduce the gas space to an amount which would provide undesirable dispensing characteristics. On the other hand, underfilling can also cause undesirable dispensing characteristics. Proper liquid filling has been found to be especially important in liquid dispenser powered by gas generated by the reaction between an effervescent composition and the liquid being dispensed.

Summary of the Invention

This invention relates to improved liquid dispensing apparatus having controlled liquid filling means. In accordance with the invention liquid dispensing apparatus is provided comprising container means defining a dispensing chamber capable of storing a liquid and having an inlet opening and an outlet opening, and dispensing means including valve means communicating with said outlet, the improvement which comprises control means in said chamber for trapping a predetermined volume of gas within said chamber during pouring of a liquid thereto through said inlet, and thereby limiting the amount of liquid which can be poured into said chamber to that resulting in a predetermined ratio of liquid volume to chamber volume.

Description of the Drawings

FIG. 1 is a side elevation of apparatus of the present invention;

FIG. 2 is an enlarged vertical cross-section view of the apparatus of FIG. 1 taken along line 2—2 of FIG. 1;

FIG. 3 is a vertical cross-section view of a portion of the apparatus taken along line 3—3 of FIG. 2; and

FIG. 4 is a side elevation taken along line 4—4 of FIG. 2.

Description of the invention

Referring to FIG. 2, the illustrated embodiment of the liquid dispensing apparatus 10 has a somewhat tapered generally cylindrical dispensing container or chamber 12 with an inlet opening 14 and an outlet opening 16. Chamber 12 is formed with generally parallel top wall 18 and a larger diameter bottom wall 20, and a tapered generally cylindrical side wall 22 which connects the top wall 18 and the bottom wall 20. Chamber 12 has a longitudinal axis 13 extending through the centers of top wall 18 and bottom wall 20 and is substantially normal to the top and bottom. In a preferred form of the apparatus, top wall 18 and side wall 22 form a unitary structure which is joined to bottom wall 20 at the base of side wall 22. The bottom wall and the unitary structure of the top wall and side wall are both preferably formed from organoplastic materials and are joined by spin-welding techniques.

Inlet 14 is in the form of an opening in side wall 22. A control conduit 24 having an internal passage 26 is coaxially located within inlet opening 14 and extends transversely rectilinearly into chamber 12 in a direction normal to longitudinal axis 13. As shown in Fig. 2, conduit 24 extends from side wall 22 to longitudinal axis 13. Conduit 24 has an outwardly flared outer portion 28 which matches a corresponding contour surface of inlet opening 14. Conduit 24 is preferably formed from organoplastic material and is preferably joined to the inlet portion 14 of side wall 22 by spin-welding techniques. The outer portion 28 of conduit passage 26 is formed with internal threads 30.

Conduit 24 also contains support means, shown in more detail in FIG. 3, consisting of coplanar transverse ribs 32 and 34 normal to each other, each extending across passage 26 and being attached at their ends to conduit 24. Ribs 32 and 34 are located in passage 26 within chamber 12. The support means consisting of ribs 32 and 34 can be a separate unitary part which is affixed into passage 26 by adhesives, for example, but it preferably is formed as a unitary part with conduit 24. Rib 32 has a larger transverse width than rib 34. This width difference can be used during assembly as a guide to proper positioning of conduit 24 in inlet opening 14 so as to achieve desired orientation of the threads 30. Ribs 32 and 34 each have two tapered projections 36 and 38, respectively, extending longitudinally from the ribs with the apex of each projection directed toward inlet opening 14.

Conduit passage 26 further contains an outwardly flared annular shoulder or step 40 adjacent to the inner end of the threads 30. The diameter of passage 26 on the thread-side of step 40 is slightly larger than the diameter of passage 26 inwardly thereof.

As shown in FIG. 2, an externally threaded closure 42, shown in the inlet 14, has an outer end 46, an inner end 48, peripheral threads 44 located near outer end 46 and cooperable with the threads 30, a peripheral groove 50 located near inner end 48, an O-ring seal 52 positioned in groove 50, an outer cavity 51 having a concave surface 54 communicating with outer end 46, and an inner cavity 56 communicating with inner end 48 having a convex surface 58 at the base of cavity 56. An external projection 60 formed on the surface 54 extends diametrically across cavity 51 and outwardly beyond the outer end 46 to form a handle for closure 42. An axial projection 62 formed on the surface 58 terminates in an end surface coplanar with inner end 48 of closure 42.

Closure 42 is placed in its operative position shown by introduction thereof into the outer end 28 of conduit 24, and rotation of the handle projection 60 in a clockwise direction, as shown in FIG. 4, causes threads 44 to engage threads 30. Projection 60 can be rotated clockwise until closure 42 moves to the left, as shown in FIG. 2,

3

and is tightly positioned in conduit 24 with the outer end 46 substantially flush with the outer end 28. In a preferred form of the apparatus, there is a predetermined spacing between the conduit ribs 32 and 34 and the inner end 48 of the closure 42 when closure 42 is in its innermost or operative position shown. In this position the O-ring 52 forms a gas and liquid-tight seal between closure 42 and the adjacent surface portion of passage 26.

When projection 60 is rotated counterclockwise as shown in FIG. 4, to loosen closure 42, the closure will move to the right, as shown in FIG. 2. As closure 42 moves O-ring 52 to the thread-side of step 40, the gas and liquid-tight seal is broken, but threads 44 are still in engagement with threads 30. This is a safety-feature to allow any pressure build-up within chamber 12 to be released without blowing closure 42 out of passage 26. Continued counterclockwise rotation of handle projection 60 will cause disengagement of threads 44 and 30 and allow closure 42 to be removed, if desired, from passage 26.

Chamber side wall 22 is also formed with a longitudinal cavity 15 located in the outer surface of side wall 22 substantially directly opposite to the inlet opening 14 and extending for substantially the entire longitudinal length of side wall 22. Chamber side wall 22 further has two external longitudinal tapered ribs 17 and 19 located on its outer surface, as shown in FIG. 1, each located on opposite sides of cavity 15 and extending downwardly from the upper edge of the side wall 22. The purpose of the ribs 17 and 19 will become apparent hereinafter.

Chamber bottom wall 20 has a somewhat concave upper surface 72 and is formed with a counterbored or stepped passage 64 coaxial with the longitudinal axis 13 of chamber 12 and extending longitudinally through the bottom wall 20. Passage 64 has, in longitudinal order, an inner end portion 66, an annular shoulder or step 68 substantially similar in construction to step 40, internal threads 70 and an outer end portion 78. Bottom wall 20 further has a coaxial tubular projection 74 having a diameter about half that of the bottom wall 20. Projection 74 terminates in an annular end surface 76 located beyond the outer end portion 78 of passage 64.

A circular base 80, shown in FIG. 2, has an outwardly flared skirt portion 82, a coaxial annular surface 84, a transverse passage 41 extending through skirt portion 82, a coaxial upstanding tubular extension having a larger diameter portion formed with external threads 86, and a smaller diameter upper end portion 88 formed with a peripheral groove 90. An O-ring seal 92 is located in groove 90 and an axial longitudinal outlet passage 16 extends through the end portion 88 and through a coaxial depending longitudinal nipple 94.

Base 80 is attached to the bottom wall 20 in the position shown in FIG. 2 by introducing the end portion 88 coaxially into passage 64 and rotating base 80 to bring threads 86 into engagement with threads 70. Continued rotation of base 80 moves it inward and tightens it against bottom wall 20 with annular surface 84 in face-to-face contact with end surface 76 and with the O-ring 92 sealingly engaging the surface of the inner end portion 66 of passage 64. O-ring 92 forms a gas and liquid-tight seal between base 80 and bottom wall 20. When base 80 is rotated in the opposite direction to loosen it from the bottom wall 20, the O-ring 92 will be moved outwardly beyond step 68 and will break the gas and liquid-tight seal while threads 86 are still in engagement with threads 70. This is a safety feature in case base 80 is unscrewed when chamber 12 contains liquid under pressure. The pressure build-up in chamber 12 is thus released without blowing base 80 out of passage 64. Continued rotation of base 80 will cause disengagement of threads 86 and 70 and allow base 80 to be removed, if desired, from outlet passage 64. In the normal use of the apparatus to dispense liquids, base 80 is tightly engaged with chamber bottom wall 20, and this relationship forms a circumferential groove 39 between skirt 82 and bottom wall 20.

4

Dispensing valve means 96, shown in FIG. 2, comprises a valve arm 99 and an elongated hollow housing 98 having a longitudinal internal passage 95 communicating between an inlet end 93 and an outlet end 89. An elongated longitudinal opening 91 is formed in the wall of housing 98, and a substantially flat surface portion 87 is located in passage 95 near the inlet end 93 and on the side of passage 95 diametrically opposite to opening 91. A transverse pivot pin 97 extends across passage 95 in a direction normal to the longitudinal axis of housing 98 and parallel to the flat surface of portion 87. Valve arm 99 has an arcuate trigger 85 located at one end and a transverse cavity 83 located near the other end of the arm. Valve arm 99 passes through opening 91 and is pivotally mounted on pivot pin 97 with the trigger 85 located adjacent to flat surface portion 87 of housing 98 as shown.

A dispensing nozzle support 81 has an inlet end 75 and an outlet end 73, as well as an axial longitudinal passage 79 which also extends through a nipple portion 77 at the inlet end 75. The support 81 is also formed with an eccentric cavity 71 having a flat surface portion 69, and with an axial cavity 67 internally threaded with threads 65 located at the outlet end 73 and communicating with passage 79. A coaxial circular groove 47 is located in the base of the cavity 67. Dispensing nozzle support 81 is fixedly mounted in the outlet end 89 of passage 95 with the cavity 71 thereof positioned in facing relation to cavity 83 of the valve arm 99. A spring 63 under compression extends between the flat surface portion 69 of cavity 71 and the base of the valve arm cavity 83. The action of this spring tends to force the trigger 85 of valve arm 99 into contact with the flat surface portion 87 of passage 95.

A tubular dispensing nozzle 61 has an axial passage 59 communicating between a base or an inlet end 57 and an outlet tip 55, and external threads 53 located at the inlet end 57 which terminates in a circular longitudinal projection 45. The inlet end of the nozzle 61 is also formed with an outwardly flared peripheral gripping means 49. The inlet end of the dispensing nozzle 61 is capable of being removably positioned in cavity 67 and rotation thereof by rotational action on gripping means 49 will cause engagement of threads 53 and 65. Continued rotation of nozzle 61 will form a liquid-tight engagement of projection 45 and groove 47 since projection 45 and groove 47 have matching contours. Dispensing nozzle 61 can be easily removed by a reversal of the nozzle rotation causing disengagement of threads 53 and 65.

A flexible conduit 43 has one end positioned in gas and liquid-tight relation over nipple 94 of base 80 and extends therefrom through passage 41 of base 80 to the inlet 93 of housing 98 and between trigger 85 of valve arm 99 and flat surface portion 87. The other end of the conduit 43 is positioned in gas and liquid-tight relation over nipple 77 of dispensing nozzle support 81. The action of spring 63 forces trigger 85 against conduit 43 and against flat surface portion 87 squeezing and sealing conduit 43 at this point. When the apparatus 10 is not being used to dispense liquid, the conduit 43 is wound around the base of the apparatus in the groove 39, and the dispensing valve means 96 is nested in cavity 15 of side wall 22 as shown in FIGS. 1 and 2.

The apparatus 10 is employed in the following manner to dispense liquid. The dispensing valve means 96 is removed from cavity 15, and the conduit 43 is unwound from the groove 39. Chamber 12 is rotated 90° from the normal storage and use position shown, wherein the longitudinal axis 13 extends in a vertical direction, to a liquid introduction position (not shown) wherein the longitudinal axis 13 is horizontal and conduit 24 is vertical with inlet opening 14 and removable closure 42 on top. If the apparatus is placed on a relatively flat surface, the longitudinal ribs 17 and 19 on the outer surface of chamber side wall 22 will prevent rotational movement of the chamber apparatus. Closure 42 is unscrewed and

5

removed from inlet opening 14. Liquid, such as water, is then introduced into chamber 12 by pouring through passage 26 of conduit 24. Gas, such as air, which is normally present in chamber 12 during storage will be trapped in chamber 12 around conduit 24 as the liquid level rises. As liquid is poured into the chamber and rises up beyond the end of conduit 24, the air trapped in an unvented portion of chamber 12 around conduit 24 will produce sufficient pressure to prevent the addition into said chamber of any further poured-in liquid. This prevents over-filling of the chamber. Under-filling is also prevented if one pours in liquid until no more can be added. The container is then given a little shaking motion which allows some of the trapped air to escape through passage 26 and allows liquid to drop down to a level below ribs 32 and 34. In the apparatus shown in FIG. 2, the cross-sectional area of conduit passage 26, the size of chamber 12 and the degree of extension of conduit 24 into chamber 12 are selected such that the trapped air will occupy about 40 volume percent of the chamber. It has been found desirable that in liquid dispensing apparatus powered by gas generated by reaction between an effervescent composition and the liquid, the ratio volume to chamber volume should be about 0.6.

When no more liquid can be poured into the chamber by the above-described procedure, an effervescent composition, preferably in the form of a tablet 35, is introduced through inlet opening 14 and placed on ribs 32 and 34. The effervescent tablet rests on the apex of each of the projections 36 and 38 so as to prevent and substantial premature contact of the tablet with any liquid remaining on the upper surfaces of ribs 32 and 34 from a preceding liquid filling operation. Closure 42 is then inserted into inlet opening 14 and screwed into place.

Various effervescent compositions can be employed in the apparatus of this invention. In general, an effervescent couple is employed comprising a weak organic acid, such as citric acid, gluconic acid, tartaric acid and the like, and an alkali or alkaline earth metal salt of carbonic acid, such as sodium bicarbonate, potassium bicarbonate, lithium bicarbonate, sodium carbonate and the like. These salts must be sufficiently soluble in the liquid to react with the acid component of the effervescent couple to generate carbon dioxide gas. The preferred couple contains citric acid and sodium bicarbonate. Other ingredients can also be present in the effervescent composition, if desired. When the present apparatus is used to dispense a liquid mouthwash, for example, the active mouthwash components would conveniently be present in the tablet composition.

In order to prevent excessive gas pressure from being generated in the chamber by reaction between the effervescent tablet and the liquid, it is desirable that only a fixed quantity of effervescent material be introduced to the chamber. In the apparatus shown in FIG. 2, the projection 62 of closure 42 extends substantially to the tablet 35, thus insuring that no more than one tablet is used. If more than a predetermined thickness of tablet is supported on ribs 32 and 34, such as if more than one tablet were inserted, it would not be possible to properly screw closure 42 into gas and liquid-tight relation with passage 26.

When the liquid, tablet and closure are in place as described above, the apparatus is then rotated 90° back to its normal upright position. The liquid in chamber 12 now flows to the bottom of the chamber and comes into contact with the tablet 35, and effervescent action takes place to liberate carbon dioxide gas. Within a short time, the tablet is completely dissolved, and the chamber is under desired pressure.

Application of external force, such as finger pressure on valve arm 99 at its top end adjacent to spring 63 will cause arm 99 to pivot around pin 97 and move trigger 85 away from flat surface portion 87. This will open conduit 43 at this point and allow liquid under pressure

6

to flow from chamber 12 by means of outlet passage 16, through conduit 43 and out through the tip 55 of nozzle 61. The concave or downward slope of the bottom wall surface 72 toward outlet passage 16 allows all the liquid in the chamber to drain to passage 16 and be dispensed. When less than the total amount of liquid stored in chamber 12 has been dispensed, liquid flow through nozzle 61 can be stopped, when desired, by release of the digital force on the valve arm 99.

The exemplary apparatus of the present invention shown in the accompanying drawings is intended primarily to dispense mouthwash for oral hygiene use. The size and shape of nozzle 61, and especially the size and shape of the tip 55, are designed for maximum effectiveness of a liquid stream directed into a human mouth and against teeth and gums. Nozzle 61 can be easily unscrewed from nozzle support 81 and replaced with another nozzle when the device is used by a different person. It is understood, however, that oral hygiene apparatus is merely exemplary of the present invention and other apparatus forms can be used for other applications.

From time to time it may be desirable to flush out the chamber 12. For this purpose the closure 42 is removed and the base 80 is unscrewed from bottom wall 20 thus opening passage 64. Liquid can be introduced through inlet opening 14 and permitted to flow out of passage 64 to flush out chamber 12.

In summary, this invention relates to improved apparatus for dispensing liquids from a chamber wherein the chamber contains a control means, such as a conduit extending inwardly from the chamber inlet, which prevents the chamber from being filled with liquid beyond a given level.

What is claimed is:

1. Apparatus for dispensing liquid under pressure generated by reaction between an effervescent tablet composition and a liquid, which apparatus comprises a container capable of storing a liquid and housing an inlet opening and an outlet opening, removable closure means for sealing said inlet opening, a conduit communicating with said outlet opening, dispensing valve means operatively connected to said dispensing conduit for control of fluid flow therethrough, said container having a normal storage and use position wherein said inlet opening faces generally horizontally and also having a liquid introduction position wherein the inlet opening faces upwardly, a control conduit within said container extending inwardly from said inlet opening and having a passage communicating directly with said inlet opening, and tablet supporting means within said control conduit, the length of the control conduit being such that when the container is in its said liquid introduction position and liquid is poured thereinto through said inlet opening and control conduit until no further liquid can be poured into said container through the inlet opening, a predetermined volume of gas is trapped in said container around said conduit, said trapped gas limiting to a predetermined volume the amount of liquid which can thus be introduced into said container, slight shaking of the container being effective, when said container holds said predetermined volume of liquid including that portion filling said control conduit and inlet opening, to permit some of the trapped gas to escape through the control conduit and out through the inlet opening, thereby causing simultaneous flow from said control conduit into said container of an amount of liquid at least sufficient to lower the level of the liquid in said conduit to below said tablet supporting means, such that an effervescent tablet can thereafter be supported on said tablet supporting means above the level of the liquid in said container when said container is in its said liquid introduction position and at least partially below the level of said liquid when said container is in its said normal storage and use position.

2. Apparatus according to claim 1 wherein said closure means has a sealing position within said inlet opening

wherein a portion thereof is spaced from said tablet supporting means a predetermined distance permitting a predetermined thickness of tablet to be disposed therebetween, said closure means portion being effective when more than said predetermined thickness of the effervescent tablet is placed on said supporting means to prevent said closure means from disposition in said sealing position.

3. Apparatus according to claim 1 wherein said container is provided with support means affording said container stable support in both said normal storage and use and said liquid introduction positions.

4. Apparatus according to claim 1 wherein said closure means has a sealing position within said inlet opening and said container and closure means are provided with cooperable shoulder means which permit movement of said closure means out of said sealing position to an intermediate pressure-releasing position within said inlet opening upon predetermined relative rotary movement, further relative rotary movement being required to effect disengagement of said shoulder means permitting removal of said closure means from said inlet opening.

5. Apparatus according to claim 1 wherein the length of the control conduit is selected so that the predetermined volume of liquid which can be introduced into said container is not substantially greater than about 60 volume percent of the container.

6. Apparatus for dispensing liquid under pressure generated by reaction between an effervescent tablet composition and said liquid which comprises container means defining a chamber capable of storing a liquid and having generally parallel top and bottom walls and a connecting side wall, with a chamber longitudinal axis extending from the center of the top wall to the center of the bottom wall and substantially normal to said top and bottom walls, an inlet opening located in said chamber side wall for the introduction of said liquid and said effervescent tablet composition to said chamber, a control conduit sealingly attached to the chamber side wall having a passage communicating directly with said chamber inlet and extending rectilinearly into said chamber in a direction normal to the longitudinal axis of said chamber, tablet supporting means within said control conduit, the cross-sectional area of said control conduit passage and the length of said control conduit being selected such that when the chamber is positioned with the control conduit and chamber inlet in an upright direction and liquid is poured into said chamber through said inlet and control conduit until no further liquid can be poured into said chamber through the inlet, a predetermined volume of gas will be trapped in said chamber around said control conduit, said trapped gas limiting the amount of liquid

which can be poured into said container to that resulting in a predetermined ratio of liquid volume to chamber volume, slight shaking of the container means being effective, when said container holds said limited amount of liquid including that portion filling said control conduit and inlet opening, to permit some of the trapped gas to escape through the control conduit and out through the inlet opening, thereby causing simultaneous flow from said control conduit into said chamber of an amount of liquid at least sufficient to lower the level of the liquid in said conduit to below said tablet supporting means, such that an effervescent tablet can thereafter be supported on said tablet supporting means prior to its contact and reaction with said liquid in said chamber, closure means threadably and removably positioned in said chamber inlet and in an outer portion of the control conduit having an operative position in which it sealingly closes said inlet, said closure having means adapted to be operable to prevent disposition of said closure in said operative position when more than a predetermined thickness of effervescent tablet is supported on said tablet supporting means, said threadably removable closure means in combination with said control conduit having means for releasing any chamber pressure prior to complete thread disengagement of said closure means from said control conduit, outlet means located in said chamber bottom wall, a dispensing conduit communicating with said outlet means, and dispensing valve means operationally connected to said dispensing conduit.

7. Apparatus according to claim 6 having longitudinal ribs externally located on the chamber side wall opposite from the inlet opening, said ribs capable of preventing rotation of the chamber when it is placed on a substantially horizontal surface with the inlet opening directed upwardly.

References Cited

UNITED STATES PATENTS

1,302,829	5/1919	Muir	222—399
2,684,784	7/1954	Fox	222—5
2,709,542	5/1955	Eller et al.	222—394 X
2,711,252	6/1955	Oliver	137—209
3,053,422	9/1962	Tenison et al.	222—399
3,163,315	12/1964	Wilson	220—44
3,194,436	7/1965	Jaynes	222—5
3,307,750	3/1967	Jeffries	222—399

ROBERT B. REEVES, Primary Examiner

N. L. STACK, Jr., Assistant Examiner

U.S. Cl. X.R.

9—323; 137—209