United States Patent [19]

Viehe

[11] **3,880,323**

[45] **Apr. 29, 1975**

[54] **SELF-PRESSURIZED CONTAINER FOR LIQUIDS**

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[52] **U.S. Cl.** **222/47**; 222/210; 222/215

[51] **Int. Cl.**..... **B65d 37/00**

[58] **Field of Search** 222/105, 215, 206, 47, 222/210

[56] **References Cited**

UNITED STATES PATENTS

2,735,589	2/1956	Milster et al.	222/386.5
3,158,296	11/1964	Corneuus	222/386.5

FOREIGN PATENTS OR APPLICATIONS

1,375,474	9/1964	France

Primary Examiner—Stanley H. Tollberg
Assistant Examiner—John P. Shannon
Attorney, Agent, or Firm—Jacob B. Burke

[57] **ABSTRACT**

A self-pressurized container for liquids includes a rigid concave base plate. The plate has a peripheral skirt. A circular elastic membrane with grooved peripheral wall is secured to the skirt of the base plate by a band held by an adjustable screw clamp. The membrane is tapered radially in thickness to expand to uniform thickness under pressure of liquid in the container. The plate has three legs to rest stably on irregular surfaces. Two cords engaged on a handle pass through a cord centering and holding member and are secured by clips to four spaced points on the skirt. A tape extends from the handle through a slot in the cord centering member to prevent the member and cords from twisting. The tape carries a scale calibrated to indicate the volume of liquids in the container. A flexible hose for filling and emptying the container is connected to a fitting at the center of the base plate. The fitting can be rotatable. The hose has a nozzle with special friction gripping means to engage a faucet for filling the container.

9 Claims, 10 Drawing Figures

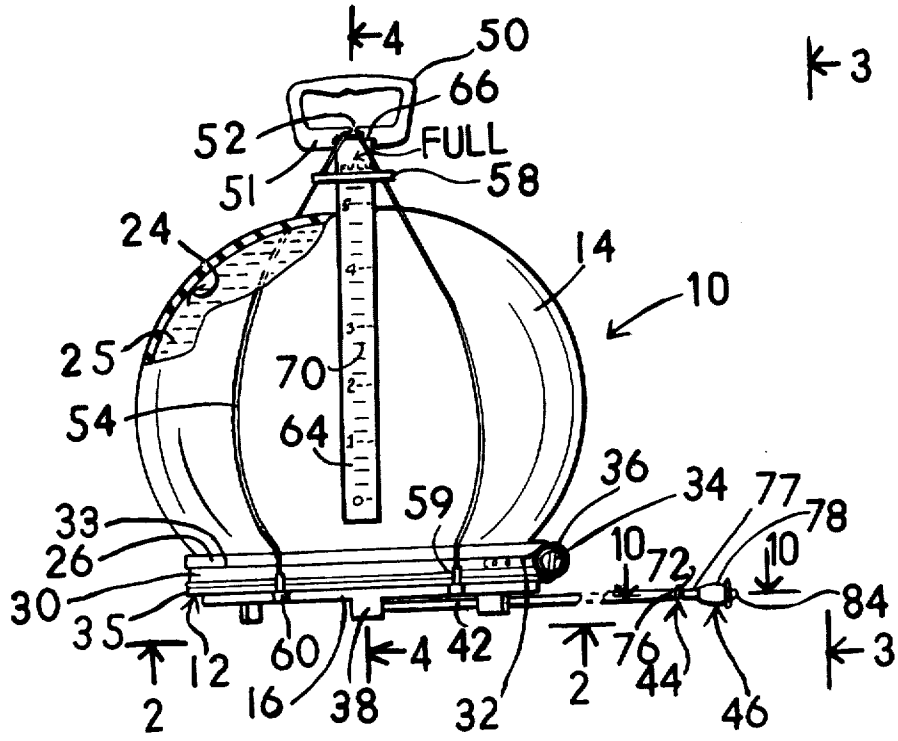
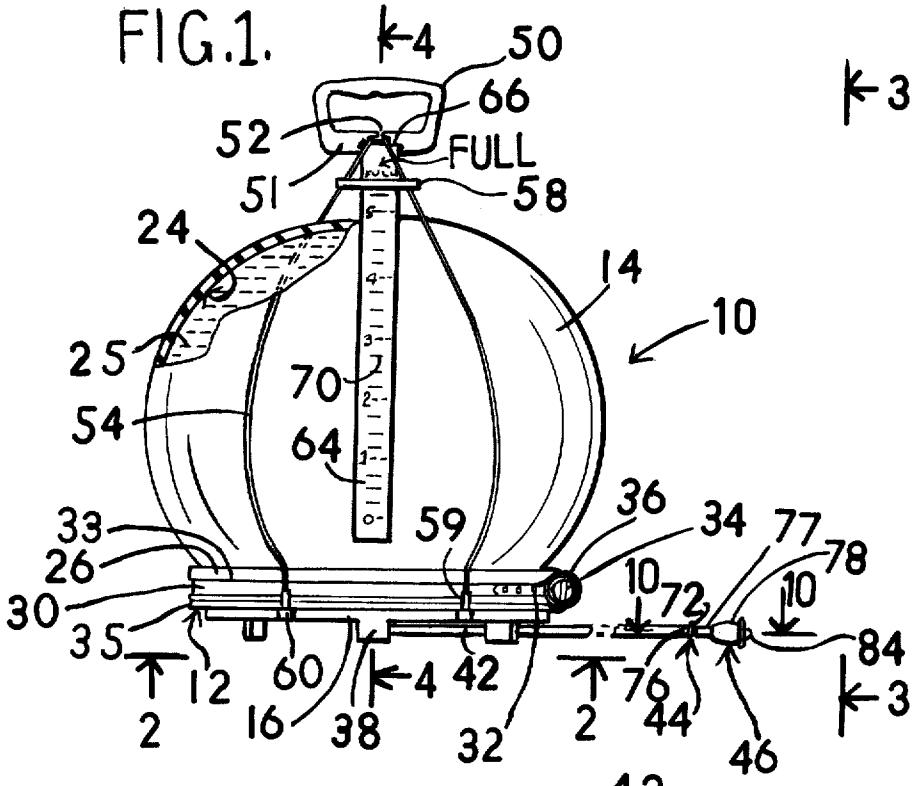


FIG. 1.


4
50
66
3
52
FULL
51
58
24
14
10
25
70
54
64
36
34
77
78
33
59
26
10
72
10
30
84
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4
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32
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44
46

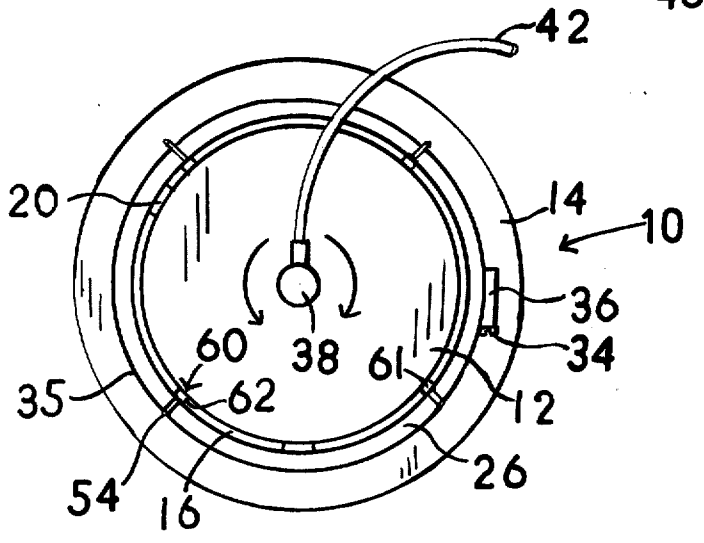

42
20
14
10
36
60
38
61
34
35
62
12
54
16
26

FIG. 2.

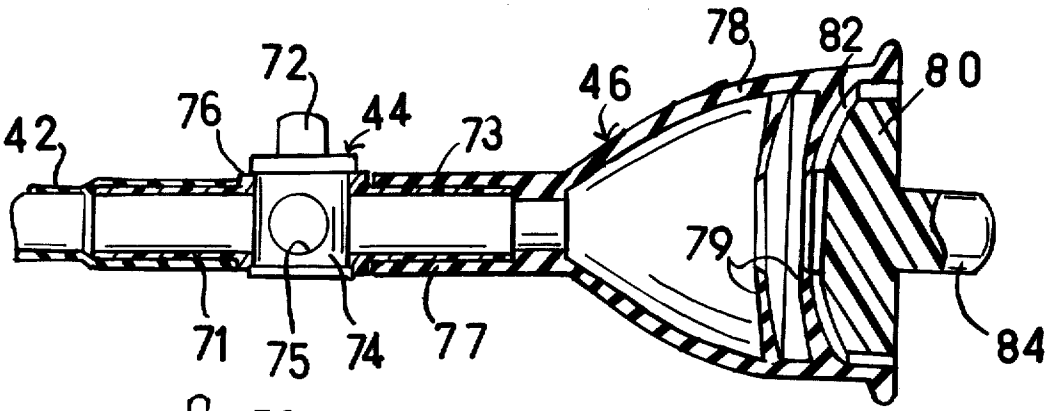


FIG. 10.

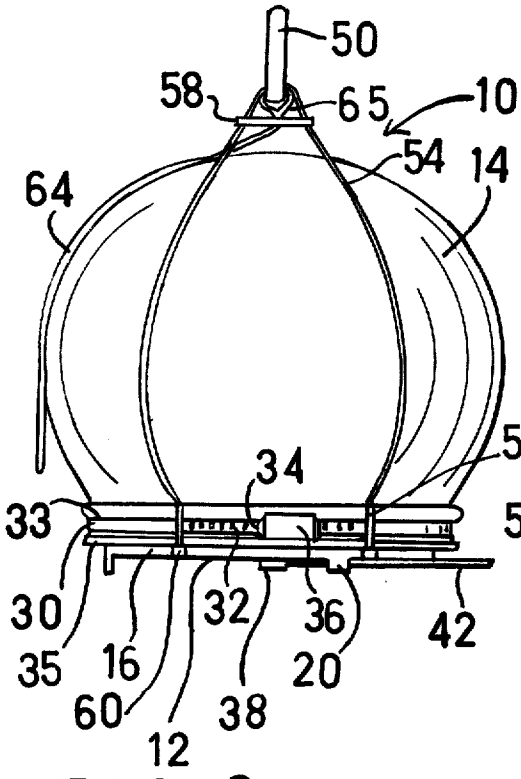


FIG. 3.

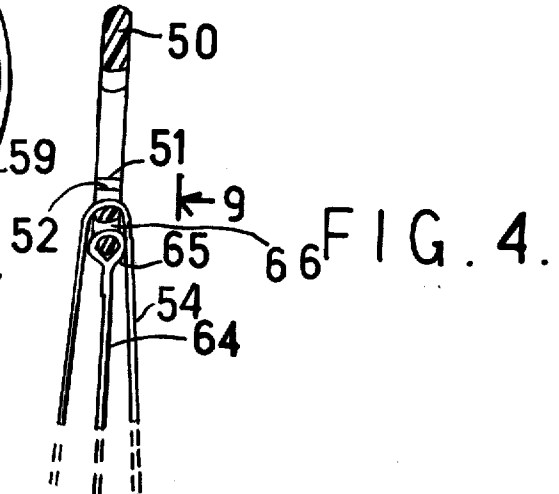
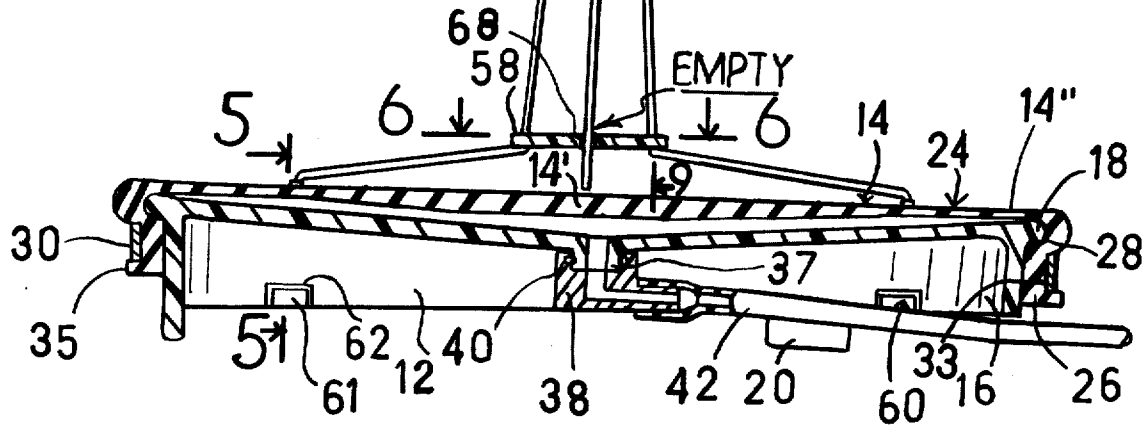


FIG. 4.



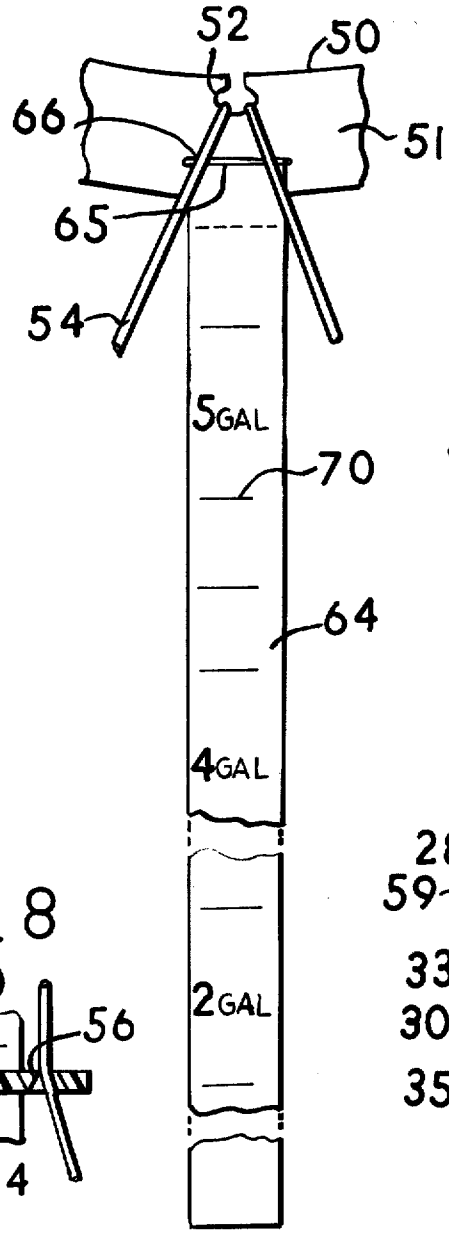
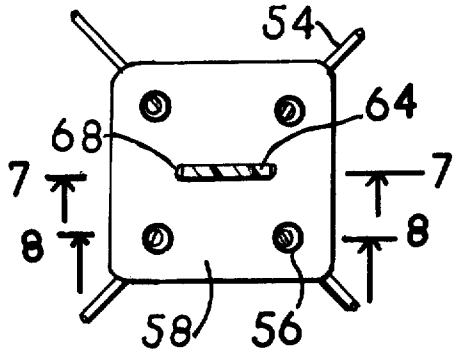


FIG. 6.



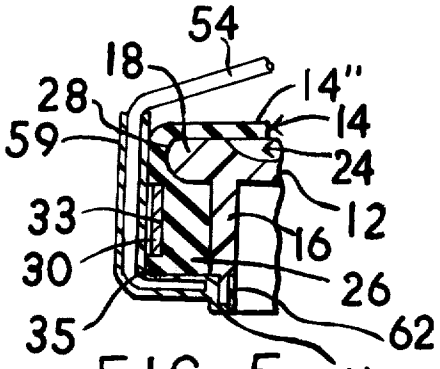
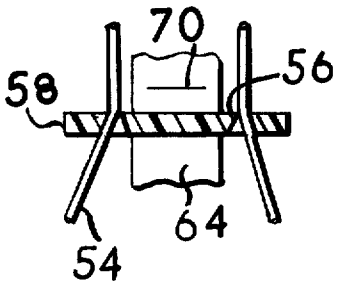


FIG. 5.

FIG. 8



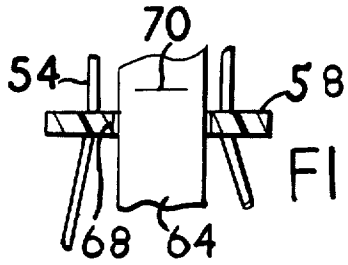


FIG. 7.

FIG. 9.

SELF-PRESSURIZED CONTAINER FOR LIQUIDS

This invention concerns an improved self-pressurized container for liquids.

The invention involves improvements over liquid containers of the type described in French Pat. No. 1,375,474 issued to Ib. Petersen on Sept. 7, 1964. In prior containers of this type an elastic membrane is secured by a band to the periphery of a round, flat, rigid base plate to define a closed chamber therewith for containing a liquid. A hose is connected to a fitting at one side of the base plate and opens into the chamber. The hose terminates in a nozzle and valve at its outer end. The chamber can be filled with a liquid under pressure through the hose. As the chamber is filled, the elastic membrane is stretched, expands and is tensioned. The liquid is dispensed from the container through the hose when the valve is opened. The tension in the stretched membrane provides the pressure for dispensing the liquid. A plurality of cords are attached to the base plate at spaced points and are secured to a handle used for carrying the container.

The prior self-pressurized containers have had limited utility due to a number of inherent deficiencies as follows:

1. In the process of filling the container, the flat base plate is forced to bend to concave shape under tension imposed by the stretched elastic membrane and by the liquid under pressure. After a number of such forced bendings, the rigid molded plastic base plate cracks rendering the container unusable. Often the base plate cracks when the encircling band holding the membrane is attached under high pressure during assembly of the container.

2. While the elastic membrane is stretched under tension it often slips off from the periphery of the base plate due to the smoothness of the inner side of the membrane. Tightening of the band to hold the membrane more securely often results in cracking the base plate.

3. When the elastic membrane is fully stretched and under maximum tension it often breaks, spraying the liquid contents around the surrounding area.

4. The supporting cords often twist and tangle, which is very inconvenient.

5. The bottom surface of the base plate is annular or formed with four legs. This construction causes the container to rock when placed upon an irregular surface.

6. The hose is attached to a fixed nipple at one side of the base plate. This limits hose movement and subjects it to kinking at the joint as the hose is moved around to connect it to a faucet, or to dispense the liquid from the nozzle. Frequently it is necessary to lift and reposition the container to avoid kinking the hose to permit filling or dispensing.

7. The prior nozzle employed a rigid ring which prevented the nozzle from fitting large, irregularly shaped faucets and which did not hold the nozzle well on tapered faucets while the container was being filled.

8. The prior self-pressurized containers have generally lacked any way of indicating or measuring the quantity of liquid in the container.

The present invention has as its principal object the provision of an improved self-pressurized container in which the above listed and other difficulties, deficiencies and disadvantages are overcome to render the container safer, more reliable, more convenient and easier to use.

Another object is to provide a self-pressurized container with improved, simplified construction to minimize manufacturing and assembly complexities and costs.

According to the invention, the present improved self-pressurized container has an elastic membrane or diaphragm which is non-uniform in thickness in unstretched condition. The membrane is thickest where stretching is greatest when the container is filled. This prevents bursting when the membrane is stretched and tensioned. Also the membrane has a peripheral cylindrical wall formed with an internal groove to engage an annular lip on the base plate. This prevents slippage and separation of the membrane from the base plate. The base plate has a bowed constriction with concave surface uppermost. This prevents cracking of the base plate under tension. An adjustably tensionable band held by a screw clamp holds the membrane on the base plate. The tension can be adjusted to hold the membrane without cracking the base plate due to excessive band pressure. Also the membrane has a circumferential lip which helps seat and hold the adjustable band.

The hose is attached to a fitting at the center of the base plate. This avoids prior constructions where the fitting is integral with a side of the base plate. This makes it possible to employ a simpler mold in fabricating the base plate. Also tension is equalized all around the plate when the container is filled. The fitting can be rotatable which prevents kinking and permits free rotatable movement of the hose. The center location of the fitting and inner end of the hose also enlarges the range of free movement of the hose with respect to the base plate. The base plate has three integral legs which support the container and accomodate it to any irregular supporting surface to hold the container stably.

A measuring tape calibrated in volume units is secured to the handle and reaches down to the membrane for indicating the volume of liquid in the container in all quantities between empty and full. The tape extends downwardly through a cord centering and guiding plate to keep the plate and cords from twisting.

Other and further objects, features and advantages of the invention will become apparent from the following detailed description taken together with the drawings, wherein:

FIG. 1 is a side elevational view of a self-pressurized container embodying the invention, the container being shown in filled condition with membrane stretched, parts being broken away to show internal construction.

FIG. 2 is a bottom plan view taken on line 2—2 of FIG. 1.

FIG. 3 is a side view of the container taken on line 3—3 of FIG. 1.

FIG. 4 is an enlarged sectional view taken on line 4—4 of FIG. 1, but with container empty; parts of the supporting cords, measuring tape and centering plate being omitted.

FIG. 5 is a further enlarged fragmentary vertical sectional view taken on line 5—5 of FIG. 4, through a side of the container.

FIG. 6 is a further enlarged fragmentary horizontal sectional view taken on line 6—6 of FIG. 4.

FIGS. 7 and 8 are fragmentary vertical sectional views taken on lines 7—7 and 8—8 respectively of FIG. 6.

FIG. 9 is a further enlarged fragmentary vertical sectional view, with parts omitted, taken on line 9—9 of FIG. 4.

FIG. 10 is an enlarged sectional view of the hose, nozzle and valve, taken on line 10—10 of FIG. 1.

Referring first to FIGS. 1–4, there is shown a container 10 including a rigid, circular base plate 12 to which is peripherally attached a circular elastic rubber membrane or diaphragm 14. The base plate is formed with an integral cylindrical depending axial skirt 16 located radially just inward of a peripheral annular lip 18. At the bottom edge of the skirt 16 are three projections spaced equally apart circumferentially and constituting three supporting legs 20. Plate 12 is radially bowed inwardly of lip 18 with concave side or surface 22 uppermost. The plate can be molded of a plastic material which is rigid when set.

Membrane 14 is shown stretched in FIGS. 1–3 and unstretched in FIG. 4. It can be molded of natural or artificial rubber. The membrane tapers in thickness inwardly so that its central portion 14' is thicker than its peripheral portion 14''. A closed chamber 24 is thus defined between the inner side of the membrane and the upper surface of plate 12 to contain liquid 25 shown in FIG. 1. This liquid can be water, oil or any other liquid desired to be stored in the container under pressure and to be dispensed under pressure therefrom. The membrane has a peripheral axially extending cylindrical wall 26 formed with an inner groove 28 and external bottom circumferential lip or ridge 35. Groove 28 snugly receives lip 18 of plate 12. A metal or plastic band 30 formed with spaced ridges, grooves or slots 32 near its outer free end, encircles wall 26 of the membrane and fits in another external groove 33 formed in wall 26. The band is adjustably closed by a screw clamp 36 secured to the inner end of the band. Screw 34 of the clamp engages ridges 32 and serves to tighten the band adjustably around wall 26 when screw 34 is turned. Groove 33 and lip 35 prevent axial slippage of the band on wall 26. By the arrangement described, membrane 14 is held securely on plate 12 and cannot work loose under internal pressure of the liquid and under conditions of repeated filling and emptying. A double liquid-tight seal is provided at contacting surfaces of lip 18 and wall 26, and at contacting surfaces of wall 26 and skirt 16. The membrane stretches while chamber 24 is being filled. The thicker central portion stretches more than the outer peripheral portion. Central portion 14' becomes somewhat thinner but never thinner than outer portion 14'' of the membrane. This construction insures that all portions of the membrane are equally tensioned when the container is filled. Since the tension is equally distributed there is no tendency of the membrane to burst. The unequal distribution of tension in the walls or prior containers leading to bursting under tension, has been avoided here.

The structure of plate 12 is strengthened by its bowed or curved shape taken diametrally of the plate. The plate remains rigid under the pressure of liquid 25 so that there is no tendency to crack as has been experienced with warped plates of prior containers. The provision of three supporting legs 20 makes it possible to rest the container on any flat or irregular surface without rocking and without imparting strains to the plate due to unbalance, so that a further prior cause of plate cracking is eliminated.

Plate 12 is provided with a central, depending axial nipple 37 opening into chamber 24; see FIG. 4. Attached to this nipple is a fitting 38. This fitting can be rotatable. A packing or sealing ring or gland 40 can be provided to insure a liquid-tight, leakproof joint. One end of a flexible hose 42 is attached to the fitting. The hose extends radially outward of the container underneath skirt 16 as clearly shown in FIG. 4. The hose is provided at its other end with a valve 44 and nozzle 46, described further below in connection with FIG. 10, to control filling and emptying the container. The rotatable fitting makes it possible to position the hose for filling and dispensing liquid without having to rotate or relocate the container.

For convenience in carrying the container, there is provided a handle 50 having a loop shape. In the lower portion 51 of the handle is a notch 52 which engages two cords 54; see FIG. 9. The cords extend through four corner holes 56 in a small plate 58 which guides, holds and centers the cords around and over the stretched membrane; see FIGS. 1,3,4,6 and 7. The cords terminate in crimped tubular ends 59 of metal clips 60 best shown in FIGS. 4 and 5. The clips have U-shaped lower portions 61 respectively engaged in notches 62 formed in lower portions of skirt 16. The notches are equally spaced circumferentially of the skirt so that the container is supported at four points by cords 54. A flexible metal or plastic tape 64 is formed with a sealed, closed loop 65 at its upper end secured in a slot 66 located just below notch 52 in the handle. This tape extends downward through a central slot 68 in plate 58 as best shown in FIGS. 6 and 7. The tape is flexible but resists twisting, so that it tends to prevent twisting of plate 58 and cords 54, and thus it minimizes any tendency of the cords to tangle. On the tape is inscribed a scale 70 calibrated in terms of volume of liquid in chamber 24; see FIG. 9. When membrane 14 is fully expanded as shown in FIGS. 1–3, cords 54 extend snugly around the membrane. Plate 58 is then located up near handle 50. At this position scale 70 reads "FULL". When the container is partially full, plate 58 will be moved downward as far as it will go to tighten the cords around the membrane. At the same time plate 58 is lowered along tape 64 until the plate stops at a mark on scale 70 indicating the volume of liquid in the container. When the container is empty as shown in FIG. 4, plate 58 can be moved down to the "0" or "EMPTY" mark of scale 70.

Hose 42 is connected to nipple 71 of valve 44 which has a rotatable operating handle 72; see FIG. 10. Valve core 74 is cylindrical and has a diametral bore 75. The valve core rotates in housing 76 formed with axially aligned nipples 71 and 73. The narrow end 77 of nozzle 46 is engaged on nipple 73. This nozzle has a flared funnel-like end 78 formed with a pair of axially spaced, internal flexible annular ribs 79, which engage on the end of a faucet or filling pipe (not shown) for filling the container with liquid under pressure. The valve can be adjustably opened to align bore 75 more or less with the passages in nipples 71, 73 to regulate the rate of liquid flow into or out of the container. In order to form a spray when liquid is dispensed, there may be provided a removable plug 80 having circumferentially spaced exterior grooves. This plug can be inserted in the wide end 78 of the nozzle. Other shaped plugs can be pro-

vided for producing various forms of fine and coarse sprays. Stud **84** at the center of plug **80** extends axially outward and facilitates insertion and removal of the plug. The plug will of course be removed while the container is being filled.

It will be apparent from the foregoing description that significant improvements have been effected over prior self-pressurized containers. These improvements make the container safer and more reliable for general usage. Tendencies of membranes and base plates of prior containers to rupture under pressure have been effectively eliminated. The molding of base plate **12** has been simplified since nipple **37** is located at the center rather than at the side of the base plate. Skirt **16** has a uniform thickness circumferentially of plate **12** which equalizes strain and resists pressure better, in addition to rendering the plate easier and cheaper to manufacture. Provision of screw clamp **36** for band **30** holding membrane **14**, makes it possible to avoid cracking the base plate, heretofore experienced when the band was secured by a nonadjustable fixed joint at high pressure. Grooves in wall **26** of the membrane hold the band and engage the lip of plate **12** more securely than heretofore. Use of clips for the cord ends makes it easier to attach and remove the cords from the skirt of plate **12**. In prior constructions, hand tied knots were used, and skirt **16** had to be provided with holes to receive the cords. The notches in skirt **16** makes such holes and knots unnecessary. Measuring tape **64** effectively prevents twisting of the cords by preventing plate **58** from twisting. Tape **64** also provides indications of the quantity of liquid in the container, which is a feature not found in prior containers of the self-pressurized type, which expand or contract depending on the direction of liquid flow into or out of them. Various parts of the container can be made of relatively inexpensive molded materials such as plastic and artificial rubber; or they can be made of metal where suitable, fabricated at low cost by mass production metal working machines.

While a preferred embodiment of the invention has been described and illustrated it will be apparent that many changes and modifications are possible without departing from the invention which is defined in the appended claims.

What is claimed is:

1. A self-pressurized container for liquid, comprising:

a circular base plate having an axially extending, depending, cylindrical skirt with radially extending peripheral rim:

a circular elastic membrane having an axially extending, depending, cylindrical wall surrounding said skirt, said membrane having an inner circumferential recess receiving and engaging the rim of the base plate so that the membrane overlays the plate and defines a closed chamber therewith;

a band encircling the wall of the membrane;

a clamp adjustably securing the band around the wall to hold the membrane in place on the plate;

means for filling and emptying the chamber opening into said chamber through the axial center of said base plate;

a handle for use in carrying the container

a plurality of cords engaged with said handle and depending therefrom:

attachment means securing ends of the cords to said skirt at circumferentially spaced points;

a guiding and centering member for the cords positioned over the membrane and under the handle, said member having a plurality of spaced holes and a slot between the holes, said cords extending through said holes respectively, so the cords extend tautly around the membrane in circumferentially spaced positions when the membrane is stretched; and

a tape secured to the handle and extending slidably through said slot and between the cords to prevent twisting of said member and tangling of the cords.

2. A self-pressurized container as defined in claim **1**, wherein said plate is rigid and bowed with an upper concave surface to resist bending and cracking when the membrane is stretched under pressure of liquid in said chamber.

3. A self-pressurized container as defined in claim **2**, wherein said membrane in an unstretched condition is thicker at its center than at its periphery to resist bursting under pressure when stretched by liquid under pressure in said chamber.

4. A self-pressurized container as defined in claim **1**, wherein said tape carries a scale with markings calibrated to indicate liquid volumes, the quantity of liquid in said chamber being indicated on the scale by the guide member at all positions thereof along the tape when the cords are taut around the stretched membrane.

5. A self-pressurized container as defined in claim **4**, wherein said skirt of the base plate has three depending legs to support the container stably on irregular surfaces.

6. A self-pressurized container as defined in claim **5**, wherein said skirt has a plurality of circumferentially spaced notches, said attachment means for the cords comprising clips engaged respectively in said notches.

7. A self-pressurized container as defined in claim **6**, wherein the means for filling and emptying the chamber comprises a flexible hose extending radially outward of the base plate between said legs;

valve means on the hose near its outer end for controlling flow of liquid therethrough; and

a flared nozzle at the outer end of the hose for engaging on a faucet to fill said chamber with liquid, said nozzle having internal, flexible gripping means for frictionally gripping the faucet while filling the chamber with liquid under pressure.

8. A self-pressurized container as defined in claim **7**, wherein said means for filling and emptying the chamber comprises a fitting secured to the plate axially thereof, the inner other end of said hose being secured to said fitting.

9. A self-pressurized container as defined in claim **8**, further comprising a leakproof joint rotatably securing said fitting to the plate to facilitate rotating the hose to different positions.

* * * * *