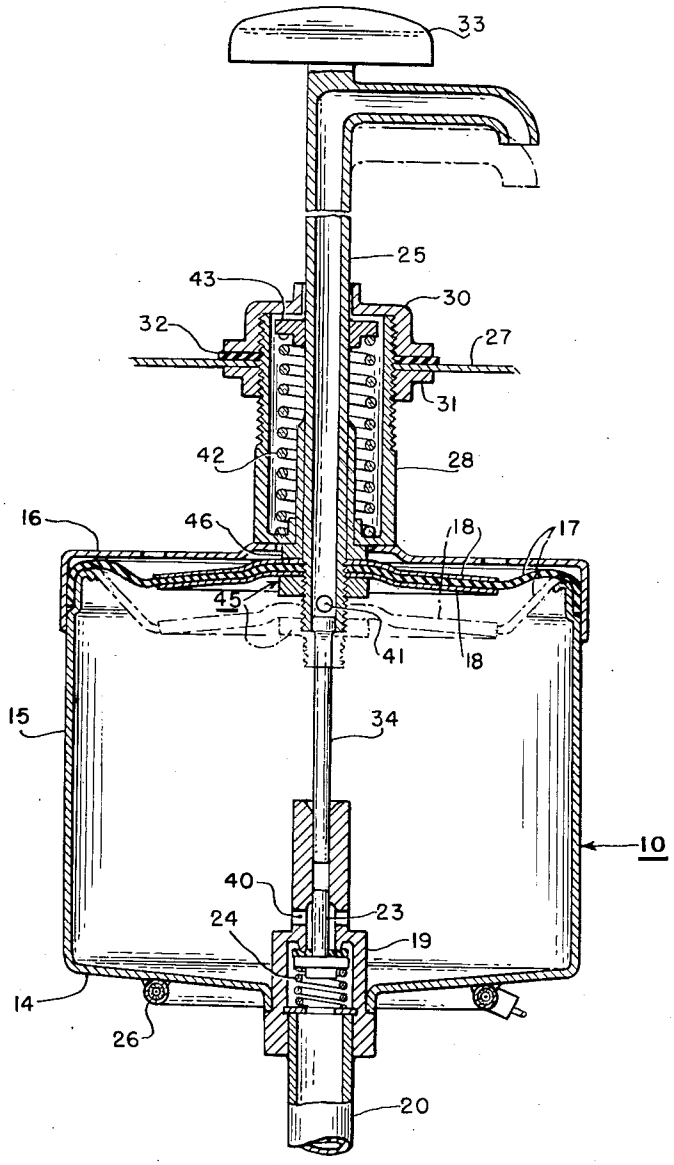
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HOT LIQUID DISPENSING APPARATUS

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HOT LIQUID DISPENSING APPARATUS

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This invention relates to dispensing apparatus, and more particularly to hot liquid dispensers.

A number of hot liquid dispensers are now commercially available. These usually comprise a liquid storage tank, means for heating the stored liquid, an inlet valve for the tank connected to a source of pressurized liquid, and a tank outlet through which the hot liquid is discharged. The tank is vented to the atmosphere, preferably through the outlet, so that expensive pressure vessel construction of the tank is not required. In some dispensers provision is also made to increase the volume of the tank after a flow period in order to allow room for the stored liquid to expand as it is heated, so that hot water will not drip from the outlet.

One prior construction eliminates dripping from the outlet by providing a movable or flexible diaphragm which is adjustably extendable into the tank to decrease the volume thereof during the dispensing operation and to increase the volume of the tank at other times. It is this type of dispenser to which the present invention is applicable. More particularly, the invention provides a dispenser capable of simple and economical manufacture, and which requires simple mechanical parts rather than electrical apparatus to control the flow of fresh liquid into the tank.

According to the present invention, there is provided a liquid storage tank having rigid and flexible wall portions, the latter being adjustably extendable into the tank to change the bounding configuration, or the volumetric capacity thereof. The tank is provided with an inlet normally closed by an inlet valve and connectable to a source of pressurized liquid, and means for heating the liquid in the tank. The flexible wall portion of the tank has a tubular outlet and an inlet valve actuator, both of which are movable with the flexible wall portion as changes in the volumetric capacity of the tank are effected. The inlet valve is mechanically actuated by the valve actuator in such a manner that the inlet valve opens after the flexible wall portion has moved to decrease the volumetric capacity of the tank, and also so that the volumetric capacity of the tank increases after the inlet valve has been closed.

The various objects, features and advantages of the invention as will be apparent from the following description and claims taken in connection with the accompanying drawing; forming a part of this application, in which the single figure in the drawing is a vertical sectional view of dispensing apparatus constructed and arranged according to the invention.

The hot liquid dispenser, as shown, includes a cylindrical, metal tank **10** having a bottom wall **14**, a tubular wall **15**, and a cover **16**. Interiorly of the tank **10**, and extending across an upper region thereof, is a circular flexible diaphragm **17** for changing the volumetric capacity of the tank. A circumferential edge of the diaphragm **17** is clamped between the cover **16** and the tubular wall **15**; and a central region of the diaphragm is sandwiched between circular reinforcing plates **18**.

The bottom wall **14**, in a central portion thereof, is provided with an inlet and an inlet valve **19** connected to a pipe **20** through which pressurized liquid is supplied to the tank. The valve **19** has a stem **23** extending upwardly into the tank **10**. In order to open the valve **19**, the stem **23** must be moved downwardly against the bias of a helical spring **24** which keeps the valve normally closed.

Liquid is discharged from the tank **10** through a goose-neck outlet tube **25** which extends upwardly therefrom, through the diaphragm **17** and its reinforcing plates **18**, through a central region of the cover **16**, and terminates in a reversely bent, downwardly directed, discharge end. Then tank **10** is vented to the atmosphere through the outlet tube **25**.

As shown, the liquid in the tank **10** is heated by means of a heating element **26** which is suitably joined to the bottom wall **14**, as by soldering or welding, but other arrangements and heating devices fall within the scope of the invention; and, although not shown, the operation of the heating element may be automatically controlled to regulate the temperature of the stored liquid by means of a suitable thermostat device.

The tank **10** is suspended from a sink **27** by means of a sleeve **28**, and the discharge end of the tube **25** is disposed above the sink **27** a sufficient distance to accommodate a drinking cup thereunder. The sleeve **28** is joined at its lower end to the exterior of the cover **16** in any suitable manner, such as by welding, and includes cylindrical wall structure surrounding portions of the tube **25** intermediate its ends. The upper portion of the sleeve **28** extends partly through an opening in the sink and is joined to the sink **27** by means of upper and lower clamping rings **30** and **31**, respectively. Each of the rings **30** and **31** is internally threaded and arranged to cooperate with threads on the sleeve **28**. A suitable washer **32** is disposed between the sink **27** and one of the clamping rings.

The upper clamping ring **30** also serves as a guide for an intermediate portion of the outlet tube **25** which is vertically movable for controlling the flow of water into and from the tank **10**. The tube **25** has a knob, or pad, **33** secured to the top thereof and a valve actuating rod **34** extending downwardly therefrom toward the inlet valve stem **23**. The lower end of rod **34** terminates in spaced relation to the upper end of the valve stem. A downward push on the knob **33** unitarily moves the tube **25** and the rod **34** downwardly until the latter engages the inlet valve stem **23**. Lost motion of the rod **34** is thus provided, and continued downward movement of the rod **34** is necessary to move the stem **23** downwardly and open the valve **19**. The reason for providing the lost motion connection is explained hereinafter.

When the valve **19** is opened, liquid flows therethrough, out through a valve passageway **40**, and into the tank **10**, thereby pressurizing the stored liquid and forcing it into the tube **25** through an opening **41** near the lower end thereof. Preferably, the opening **41** is located where the stored liquid is hottest, i.e., the highest liquid level in the tank, so that the hottest liquid therein will be dispensed.

Coiled about the outlet tube **25** and disposed within the sleeve **28** is a helical spring **42** which is compressed between the base of the sleeve and an annular flange **43** secured to the exterior surface of the tube **25**. The spring **42** yieldingly holds tube **25** and rod **34** in their uppermost positions between dispensing operations and forces their return to that position from a lower position when the handle **33** is released at the end of a dispensing operation.

Immediately following the closing of the inlet valve **19** and the return of the outlet tube **25** and the actuating

rod 34 to upper position, it is desirable to increase the volumetric capacity of the tank 10 so that expansion space will be provided for the stored liquid being heated between dispensing operations. This feature prevents objectionable dripping of hot liquid from the outlet tube 25. It is also desirable to eliminate the expansion space in the tank immediately before the inlet valve 19 is opened to dispense hot liquid; otherwise, a large quantity of fresh cool water must be admitted for pressurizing the hot liquid. To this end, the marginal portion of the diaphragm 17 surrounding its centrally located aperture is clamped to the outlet tube 25 by means of a threaded clamping connection which is carried on the tube 25 and designated as a whole by the numeral 45. A flange-like shoulder 46 of the clamping connection 45 also serves to limit the upward movement of the tube 25 by engaging the base of the sleeve 28.

With the initial downward movement of the tube 25 and the rod 34, the diaphragm 17 is moved from the maximum volume position shown in the drawing by solid lines toward the decreased volume position shown in phantom. After the gap between the rod 34 and the stem 23 has been closed, continued downward movement of the rod 34 opens the inlet valve 19 as the desired decrease in volumetric tank capacity is fully attained. At the termination of a dispensing operation, the lost motion of the rod 34 with respect to the valve stem 23 allows the valve 19 to close with the initial upward movement of the rod 34 and thereafter permits the tube 25 and the diaphragm 17 to move upwardly to increase the volumetric capacity of the tank 10 and create the desired expansion space after the valve is closed.

While the invention has been shown in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications without departing from the spirit thereof.

What is claimed is:

1. In a hot liquid dispenser, a liquid storage tank including a first wall portion movable inwardly and outwardly to decrease and restore, respectively, the volumetric capacity of said tank, said tank having a second wall portion provided with an inlet, a normally closed inlet valve connected between said tank inlet and a source of pressurized liquid and movable to an open position, means for heating the liquid in said tank, said first wall portion being provided with a tubular outlet member movable with said first wall portion, and means including a valve actuator disposed in said tank and connected to said outlet member so as to be moved thereby for opening said inlet valve after said first wall portion is moved inwardly and for closing said inlet valve before the volumetric capacity of the tank is restored.

2. In a hot liquid dispenser, a liquid storage tank having a wall portion movable inwardly and outwardly to decrease and restore, respectively, the volumetric capacity of said tank, said tank having a stationary wall portion, a normally closed inlet valve connectable to a source of pressurized liquid and the interior of said tank, said movable wall portion being provided with a tubular outlet member movable with said wall portion, a valve actuating member disposed in said tank and connected to said outlet member so as to be moved thereby in one direction toward said stationary wall portion when the movable wall portion is moved inwardly, said actuating member being movable in another direction away from said stationary wall portion when the movable wall portion is moved outwardly, said inlet valve being movable to open position by said actuating member after the latter is moved in said one direction and to closed position when the actuating member is moved in said other direction but before the volumetric capacity of said tank is restored.

3. In a hot liquid dispenser, a liquid storage tank having a flexible wall portion movable in first and second directions to decrease and restore, respectively, the volumetric capacity of said tank, said tank having another wall portion provided with an inlet, a normally closed inlet valve in said inlet connectable to a source of pressurized liquid and movable to open position in which liquid is admitted to the tank, said flexible wall portion being provided with a tubular outlet through which liquid is dispensed from the tank and by which forces for moving said wall portion are transmitted thereto, said tubular outlet having a valve actuator connected thereto and movable therewith, and means including said valve actuator disposed in said tank for opening said valve after said wall portion is moved inwardly and for closing said valve before the volumetric capacity of the tank is restored.

4. In a hot liquid dispenser, a liquid storage tank including a flexible top wall member and a rigid lower wall member, an inlet valve in said rigid wall member connected to a source of pressurized liquid, an outlet tube connected to said flexible wall member and providing communication betwen the exterior and interior of said tank, means for biasing said tube upwardly, said flexible wall member being movable downwardly by said tube to decrease the volumetric capacity of said tank when the tube is moved downwardly against the bias of said biasing means, said flexible member being movable upwardly with said tube to restore the volumetric capacity of said tank when the tube is moved upwardly by said biasing means, said inlet valve being normally closed and movable to open position, and valve actuating means connected to said tube and movable in response to movement of said tube, said valve being opened by said valve actuating means only during final downward movement of said flexible wall portion and during initial upward movement of said flexible wall portion.

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