Jan. 7, 1958 H. R. KARLEN 2,819,376

HOT WATER DISPENSER

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Fig. 1.

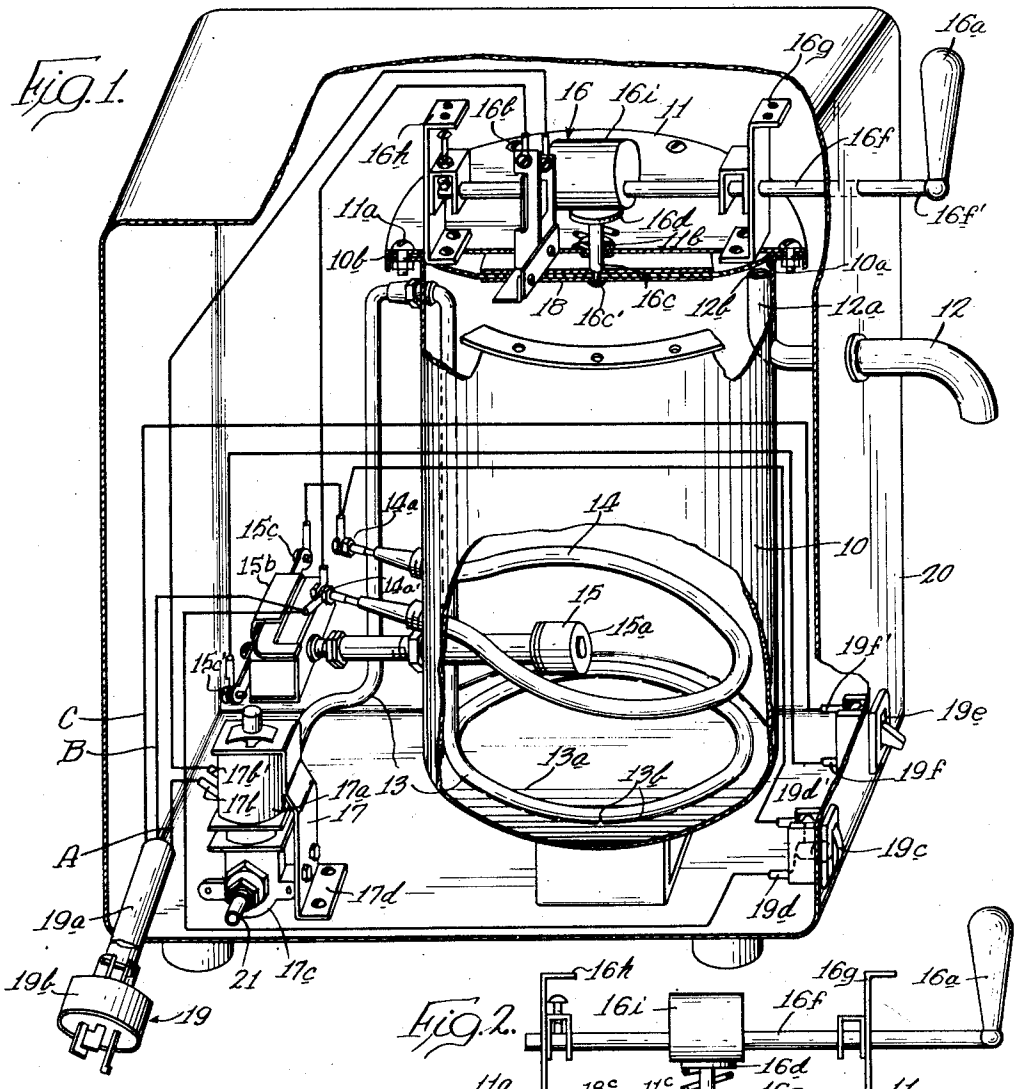


Fig. 2.

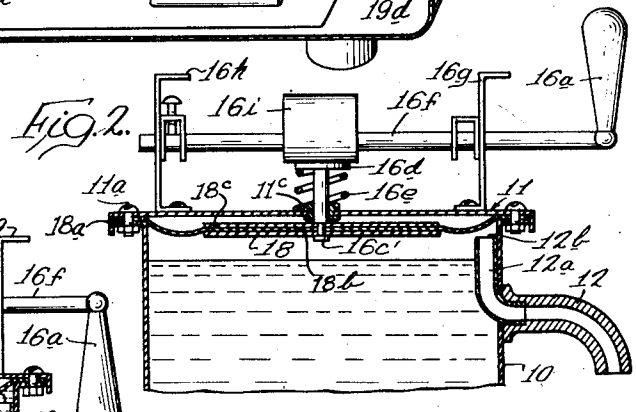
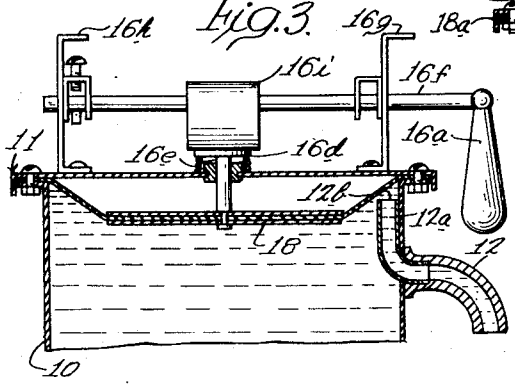


Fig. 3.



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HOT WATER DISPENSER

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6 Claims. (Cl. 219—38)

This invention relates to a hot water dispenser and in particular to a hot water dispenser of the open to atmosphere type.

In devices for heating liquids, such as water, it has been found desirable to utilize tanks which are vented to the atmosphere to preclude the possibility of an explosion or excessive pressure due to overheating the liquid therein. A serious difficulty, however, arises in the dispensers now found in the art of the open to atmosphere type, in that undesired dripping of the liquid often occurs due to the change in the volume of the liquid during the heating process.

The principal object of this invention is to provide a new and improved hot water dispenser.

A further object is to provide a hot water dispenser of the open to atmosphere type which is non-dripping.

Another object of the invention is to provide such a non-dripping hot water dispenser wherein expansion space is automatically provided for the increased volume of the heated liquid whenever flow from the tank is stopped.

Still another object is to provide a hot water dispenser with a tank having an outlet at the top and an inlet at the bottom, and means for increasing the total volume of the tank below the outlet whenever liquid is not being admitted through the inlet into the tank, with the increased volume being sufficient to accommodate any expansion of the liquid in the tank due to the heating thereof.

A yet further object is to provide such a hot water dispenser wherein the volume increasing means comprises a diaphragm sealingly carried across an opening in the top of the tank and means for extending the diaphragm downwardly into the tank to below the outlet whenever flow through the inlet is allowed.

Other features and advantages of this invention will be apparent from the following description taken in connection with the accompanying drawings, wherein:

Figure 1 is an isometric elevational view of a hot water dispenser embodying the invention, with parts thereof broken away and with the electrical wiring shown diagrammatically;

Figure 2 is a reduced, fragmentary sectional view of the upper portion of the tank and the control means in the "off" position; and

Figure 3 is a fragmentary, sectional view similar to Figure 2 but with the parts thereof in the "on" position.

In the exemplary embodiment of the invention as disclosed in the drawings, a hot water dispenser is seen to comprise a generally cylindrical tank **10** having a cover **11** and an outlet **12** through the tank immediately below the cover. Extending into the tank **10** superjacent its bottom is a cold water inlet **13**, and a heating coil **14** disposed a small distance above inlet **13** and adapted to heat water in tank **10** to the desired temperature. For automatically controlling coil **14** to obtain the desired temperature, a thermostat **15** is provided extending into tank **10** between coil **14** and inlet **13**. Means for controlling the flow of water through tank **10** are provided including an operating mechanism **16** carried on cover **11** and having manually operable handle **16***a*. Mechanism **16** further includes an electric switch **16***b* for electrically controlling the coil **17***a* of a solenoid operated valve **17** for regulating the flow of water into inlet **13**. Thus, by regulating the liquid flow into the tank while maintaining outlet **12** open at all times, the dispenser of this invention is made to be vented to atmosphere at all times.

Operably associated with mechanism **16** is means for adjustably varying the internal volume of tank **10**, comprising, in the illustrative embodiment of the drawings, a flexible diaphragm **18** carried in tank **10** by cover **11** and arranged to be extended downwardly when desired by operating mechanism **16** whenever mechanism **16** is in the "on" position allowing flow of water through tank **10** from inlet **13** and out of outlet **12**. Means **19** are provided for interconnecting the electrical components of the hot water dispenser and to connect them to a suitable electrical power source (not shown). A housing **20** may be provided for protectively enclosing the mechanisms of the hot water dispenser and for providing an esthetic appearance to the device.

Tank **10** is provided at its open upper end **10***a* with a radially outwardly extending flange **10***b* which is adapted to support peripherally the disc shaped cover **11** with screw means **11***a* fixedly securing the cover thereto.

Outlet **12** is preferably provided with a longitudinally extending inner portion **12***a* having its inner open end **12***b* very close to cover **11**, but at all times being spaced from diaphragm **18** so that tank **10** is always open to the atmosphere.

Inlet **13** comprises a tubular flow conducting member having an annular inner end **13***a* provided with a plurality of downwardly extending orifices **13***b* adapted to effect a non-turbulent, easy ejectment of the water into the bottom of the tank **10**. Heating coil **14**, which may be of any suitable construction for use in submerged liquid applications, is generally U-shaped and is arranged to extend in a plane generally parallel to the plane of inlet end **13***a* so that water passing into the bottom of tank **10** and moving upwardly therethrough will be uniformly heated in passing coil **14**. Extending outwardly from tank **10** are the heating coil terminals **14***a* and **14***a'*.

Thermostat **15** may be of any construction suitable for use in submerged applications and has its sensing element **15***a* disposed centrally of tank **10** and intermediate inlet end **13***a* and heating coil **14**. The switch element **15***b* of thermostat **15** is disposed exteriorly of tank **10** and is provided with suitable terminals **15***c* and **15***c'*.

Solenoid valve **17** is of typical construction comprising coil **17***a* having suitable terminals **17***b* and **17***b'* and valve element **17***c* which is adapted to regulate the flow of water from a supply line **21** into inlet **13**. A bracket **17***d* may be provided to secure the solenoid valve **17** to housing **20**.

Electrical connections **19** comprise a three wire lead-in cord **19***a* having a plug **19***b* adapted to be electrically and mechanically connected to a suitable power supply receptacle (not shown). Lead-in wire A is connected to terminal **17***b* of the solenoid coil **17***a*. Terminal **17***b'* of coil **17***a* is connected to incoming line B through switch **16***b* so that the potential between lines A and B is applied to coil **17***a* whenever switch **16***b* is closed. Incoming line B is further electrically connected to terminals **14***a'* of heating coil **14** and to terminal **19***d* of a signal light **19***c* provided in housing **20** for indicating the application of electrical potential across the heating coil **14**. Terminal **14***a* of heating coil **14** and terminal **19***d'* of the signal light are interconnected thereby connected

the signal light in parallel across the heating coil; heating coil terminal 14*a* is further connected electrically to terminal 15*c* of the thermostat 15 and terminal 15*c'* of the thermostat is connected to one terminal 19*f* of a single throw switch 19*e* having its opposite terminal 19*f'* connected electrically to line C of cord 19*a*. Thus, coil 14 and signal light 19*c* are connected mutually in parallel and in series with the thermostat switch element 15*b* and control switch 19*e* across lines B and C, switch 19*e* being mounted in housing 20 adjacent signal light 19*c* for manual control of the electrical heating coil circuit.

Diaphragm 18 comprises a flexible sheet extending across the tank upper end 10*a*. The circumferential edge 18*a* of diaphragm 18 is clamped between flange 10*b* and cover 11 thereby securely holding it directly below cover 11. Centrally located in cover 11 is an opening 11*b* in which is received an annular sealing gasket 11*c* through which extends for adjustable longitudinal positioning a cylindrical operating rod 16*c* having its inner end 16*c'* fixedly secured to the center portion of diaphragm 18. The outer end of rod 16*c* is enlarged at 16*d* and a spring 16*e* is mounted on the rod to extend outwardly from cover 11 against enlarged end 16*d* to urge the rod outwardly of the tank and the diaphragm upwardly toward cover 11.

Operating mechanism 16 further includes a shaft 16*f* disposed laterally above cover 11 and rotatably carried thereon by a fixed support 16*g* and an adjustable support 16*h*. One end 16*f'* of shaft 16*f* extends through housing 20 and handle 16*a* is secured fast thereto. Intermediate supports 16*g* and 16*h*, shaft 16*f* is provided with an eccentric cam 16*i*, fixedly secured thereto, and adapted to cooperate with enlarged rod end 16*d* to effect longitudinal movement of rod 16*c* by rotation of shaft 16*f*. By adjusting support 16*h*, the extent of the rod movement downwardly may be accurately controlled. Cam 16*i* is further arranged to close the switch 16*b* whenever rod end 16*d* is positioned to extend diaphragm 18 downwardly into tank 10.

When diaphragm 18 is extended downwardly into tank 10, diaphragm central portion 18*b*, which may be reinforced with suitable rigid plates 18*c*, preferably made of metal, is disposed somewhat below the level of outlet end 12*b*, thereby displacing water in the tank below outlet end 12*b* while allowing flow through the outlet 12.

In utilizing the hot water dispenser of the invention, tank 10 is first completely filled with water by rotating shaft 16*f* to the position where cam 16*i* closes the contacts of switch 16*b* and applies potential across solenoid coil 17*a* to open valve element 17*c* and allow water to flow from supply line 21 into inlet 13. Water flows outwardly through orifices 13*b* into the lower portion of tank 10 in a smooth non-turbulent manner to fill the tank up to the level of the outlet opening 12*b* through which the water may discharge from the tank. With operating mechanism 16 in the position, as above described, cam 16*i* also acts to extend diaphragm 18 downwardly into tank 10, as best seen in Figure 3. Flow of water into tank 10 is discontinued by manually operating handle 16*a* to rotate shaft 16*f* and cam 16*i* thereon to a position where switch 16*b* is opened and concurrently diaphragm 18 is moved by action of spring 16*e* to a position directly subjacent cover 11 of Figure 2. In the inserted position of Figure 3, diaphragm 18 acts to displace a volume of tank 10 below the level of outlet opening 12*b*; upon stopping the flow of water into the tank and withdrawing the diaphragm from below opening 12*b*, the level of water in the tank recedes to a point below the outlet opening 12*b* thereby positively preventing any leakage of water from the outlet although the tank is vented to atmosphere continuously. The amount of displacement effected by the insertion of diaphragm 18 into the tank below the outlet opening level is preferably made great enough to accommodate any expansion of the water in the tank due to the heating thereof. I have found that a displacement

of a volume sufficient to accommodate approximately five ounces of water is sufficient to accommodate the expansion of nine pints of water when heated from 32° F. to 212° F., so that for example, in a tank 10 designed to heat nine pints of water, a displacement of slightly more than five ounces of water by diaphragm 18 when fully inserted into the tank, completely prevents any undesired discharge of water from outlet 12.

Heating of the water in tank 10 is effected by closing switch 19*e* which, as the thermostat switch element 15*b* is normally closed, allows the potential between incoming lines B and C to be applied across the heating coil 14. As signal light 19*c* is connected in parallel with the heating coil 14, it is simultaneously lighted, acting as an indication that the coil 14 is heating the water in the tank. When the temperature of the water reaches the point for which the sensing element 15*a* of the thermostat 15 is set, thermostat switch element 15*b* opens thereby opening the circuit to the coil 14 and discontinuing heating of the water in the tank. At the same time, signal light 19*c* is extinguished, indicating to the operator of the dispenser that the water has reached the desired temperature. As indicated above, the expansion of the water due to the heating thereof, is accommodated in the upper portion of the tank 10 by the removal of diaphragm 18 so that the level of the heated water will remain below the level of outlet inner end 12*b*.

To obtain a discharge of heated water from outlet 12, handle 16*a* is rotated so as to again cause cam 16*i* to close switch 16*b* and, by opening solenoid valve 17, introduce additional water into the bottom of tank 10 through inlet 13. The introduction of additional water into tank 10 causes the heated water at the top thereof to be discharged through inner end 12*b* and outwardly from outlet 12. When a sufficient quantity of water is discharged, handle 16*a* is moved to the "off" position where switch 16*b* is opened and diaphragm 18 is withdrawn from the extended position. Where the greater bulk of the water in the tank 10 is at an elevated temperature prior to the withdrawal of diaphragm 18, a correspondingly less expansion occurs during the subsequent heating. As this is the normal condition in using the tank, the water level ordinarily is considerably below the outlet end 12*b*.

While I have shown and described certain embodiments of my invention, it is to be understood that it is capable of many modifications. Changes, therefore, in the construction and arrangement may be made without departing from the spirit and scope of the invention as defined in the appended claims.

I claim:

1. A hot liquid dispenser comprising: a tank having an upper end; an outlet from the tank near said upper end; means for admitting liquid into the tank below said upper end; means for heating liquid in the tank; and means defining a bounding portion of the tank and extendable into the interior of the tank for displacing a volume of liquid in the tank below said outlet.

2. A hot liquid dispenser comprising: a tank having an upper end with an opening therethrough; an outlet from the tank proximate said upper end; a diaphragm sealingly across said opening; means for admitting liquid into the tank below the top; means for heating liquid in the tank; and means for extending said diaphragm into said tank to below said outlet.

3. A hot water dispenser comprising: a tank having a bottom and an upper end; an outlet near said upper end; an inlet tube at said tank bottom having a plurality of inlet orifices, and means for connecting said tube to a cold water supply line; a valve for controlling flow of cold water to said inlet tube; a heating coil adjacent said tube; a thermostat adjacent said heating coil for controlling said heating coil; a displacement element; and manually operable means disposed substantially completely exteriorly of the tank for concurrently inserting said dis-

placement element into the tank below said outlet and actuating said valve to permit flow of cold water into said tank.

4. A liquid dispenser comprising: a tank having an inlet, and an outlet above said inlet and venting said tank continuously to atmosphere; and a diaphragm adjustably extendable into said tank below said outlet to alter the bounding configuration of the tank, thereby to displace a volume of liquid in said tank.

5. A hot water dispenser comprising: a tank having an inlet, and an outlet above said inlet; a solenoid valve for regulating flow of water through said inlet; means for heating water in the tank; a diaphragm above said outlet; and an operating mechanism outside said tank having a switch and a diaphragm engaging member arranged simultaneously to actuate said valve to admit water to the tank and extend said diaphragm to below said outlet.

6. A drip proof water dispenser comprising: a tank having an open top, an open outlet near the top, and an inlet below the outlet; a flexible diaphragm across the top; a cover over the diaphragm and secured to the tank, said cover having a peripheral portion sealingly clamping the diaphragm to the tank; and means on the cover for extending the diaphragm into the tank to below the outlet whenever water is delivered to the tank through the inlet.

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