United States Patent [19]

Arzberger

[11] **3,730,144**

[45] **May 1, 1973**

[54] HOT WATER TANK

[75] Inventor: **William A. Arzberger,** Medfield, Mass.

[73] Assignee: **Jet Spray Cooler, Inc.,** Waltham, Mass.

[22] Filed: **Feb. 17, 1972**

[21] Appl. No.: **227,495**

[52] **U.S. Cl.** .....**122/13 A,** 126/361, 220/82 R

[51] **Int. Cl.**.....**F22b 5/00**

[58] **Field of Search** .....122/13 A, 13 R, 14, 122/19; 126/361, 362; 220/82 R

[56] **References Cited**

UNITED STATES PATENTS

2,718,583	9/1955	Noland et al.	126/361 X
3,189,225	6/1965	Maxwell	126/362 X
3,223,492	12/1965	Geitz	220/82 X
3,565,045	2/1971	Knox, Jr.	122/13

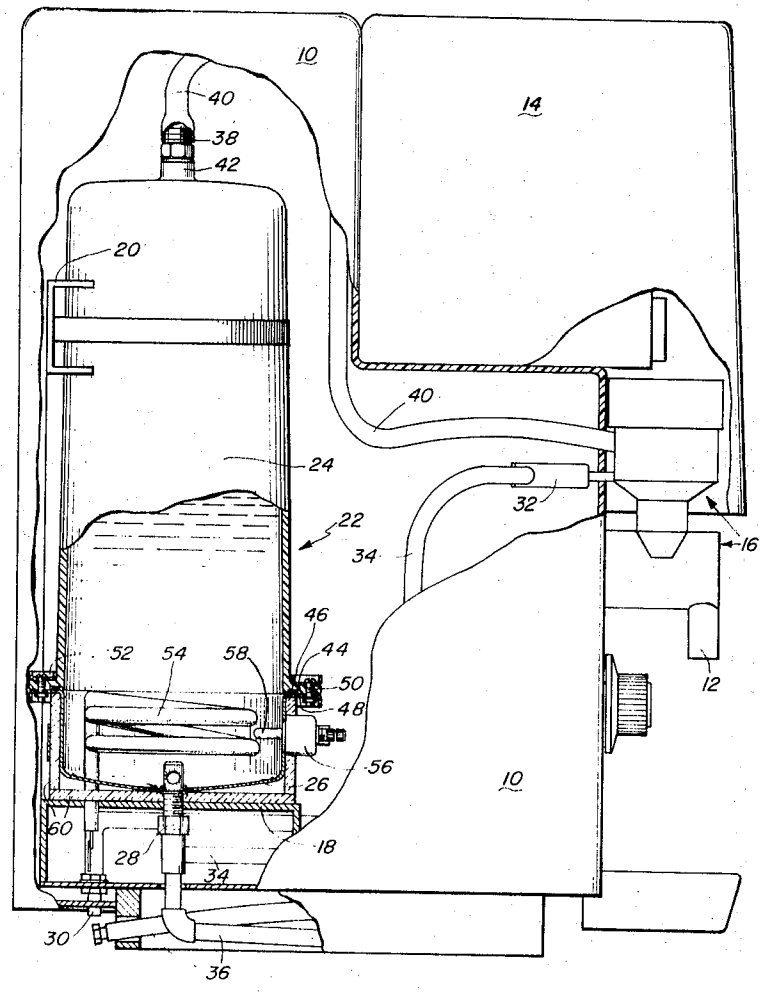
Primary Examiner—Kenneth W. Sprague

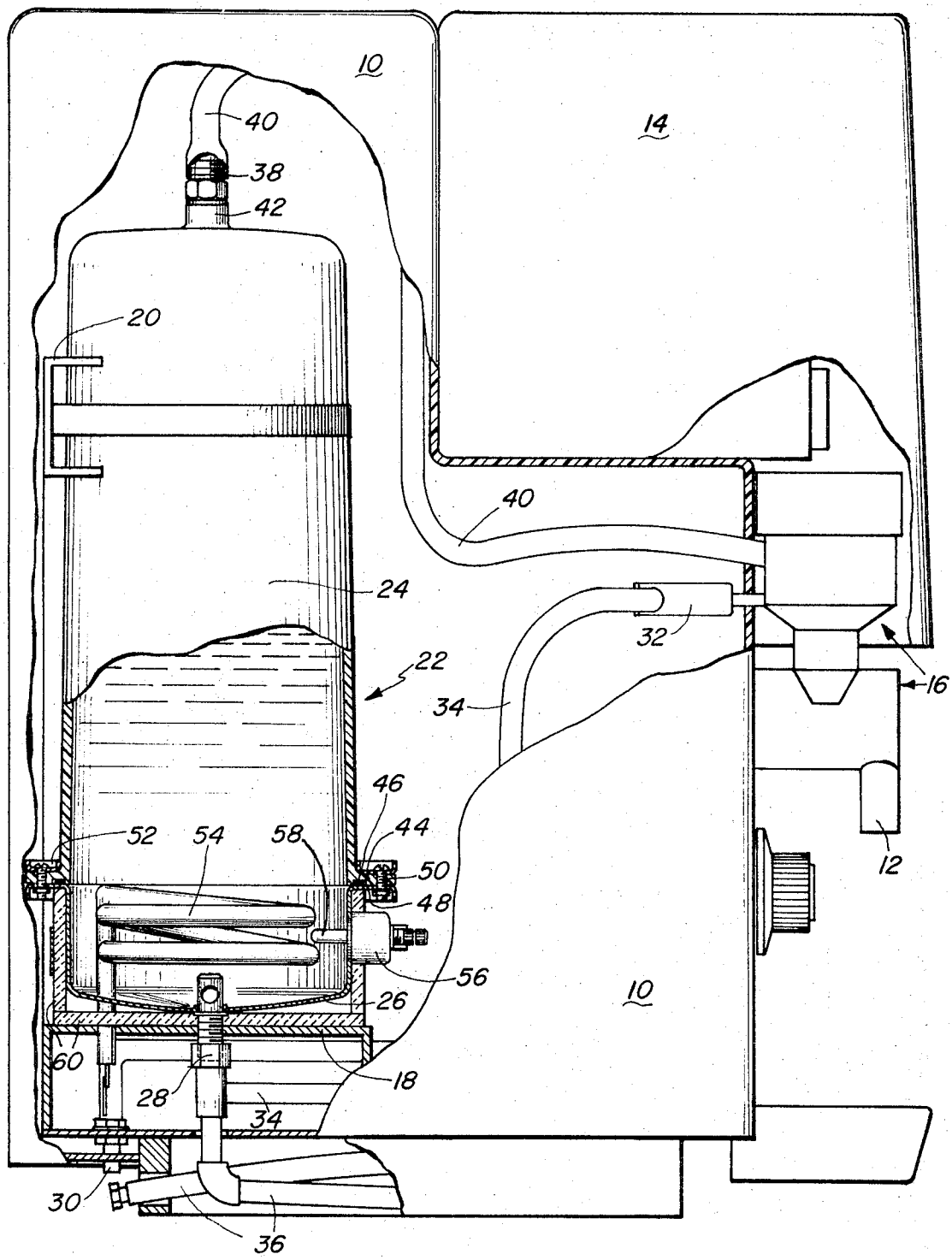
Attorney—Arthur Z. Bookstein

[57] **ABSTRACT**

A hot beverage dispenser is provided with an improved tank for storing water and for maintaining the water at the proper hot temperature. The tank is formed in a pair of separable components including a metallic bottom section and a transparent upper plastic section. An internal heating element is disposed within the bottom section together with an adjacent thermostatic control. The bottom metal tank section is insulated.

6 Claims, 1 Drawing Figure




10
14
40
38
42
20
40
24
32
22
16
34
46
44
52
54
58
50
48
12
56
10
26
60
18
28
34
30
36

HOT WATER TANK

BACKGROUND OF THE INVENTION

This invention relates to improvements in water tank construction, and particularly to hot water tanks of the type used in dispensers for hot liquids such as hot chocolate and the like. For example, the hot water tank may be employed in dispensing apparatus of the type shown in U.S. Pat. No. 3,568,887 to Jacobs et al.

Typical prior hot water tanks as used in beveraged dispensers have been made from a non-corroding metal such as stainless steel, brass, copper or from porcelain lined tanks. In addition to the relatively high cost of material and manufacturing of such prior tanks, their use has not been free from difficulty. For example, all such tanks tend to develop scale formations on their inner surface resulting from the impurities in the water. Scale formation causes numerous problems which will be readily apparent to those familiar with the art. In the prior water tank construction, it is extremely difficult to clean effectively the inside of the tank to remove the built up scale. Access to the interior of the tank generally is extremely poor. Additionally, there is no way to easily and effectively inspect the interior of such prior tanks. As a result, the hot water tanks often would not be cleaned at all and would be used until the scale formation eventually caused failure of the tank to function properly, at which time the entire tank would be replaced, long before its possible use for life had expired.

The complete unitary metallic construction also tends to cause difficulties regarding the heating unit and control for operating the heating unit to maintain the water at the desired temperature. Prior tanks have employed either an internal heater which is permanently brazed into the tank or an external heater wrapped about the metallic tank to transmit heat to the water through the heat conductive tank wall. It was necessary to insulate fully the entire water tank with an appropriate surrounding insulative material. In those prior tanks which employ an internal heater, access to the heater element itself is relatively poor for the same reasons as is access to the inner surface of the tank for cleaning purposes. With the external heaters, the insulation required is considerably increased. In instances where the tanks may inadvertently empty itself, the response by the thermostatic control necessarily lags the temperature of the heater element. Repetitive "dry" operation of the heater element accellerates its oxidation and results in premature failure. It is among primary objects of the invention to provide an improved tank construction which avoids the foregoing difficulties.

SUMMARY OF THE INVENTION

In brief, my improved hot water tank is fabricated from a pair of separable sections including an upper plastic section and a lower metallic section. The upper plastic section is considerably longer than the lower metallic section so that the greater proportion of the tank is of the plastic construction. The top and bottom sections are detachably connectable so that the inner surfaces of both may be exposed fully for easy cleaning. Additionally, the upper plastic section preferably is transparent to permit inspection of the condition of the interior of the tank without disassembling any of the tank elements.

The tank includes an internal heater element mounted to and within the lower metallic section and a bimetallic thermostatic control is also mounted to the lower metallic section by means of a mount which extends into the tank, so that its bimetallic element is located in heat transfer proximity to the heater element. The heater and thermostatic control mount are disposed within the bottom section so that when the tank is disassembled the heater is readily exposed and easily accessible.

The tank also includes a specially formed seal between the mating plastic and metallic sections which also permits the different rates of expansion of the metal and plastic without disrupting the seal.

Among the objects of the invention is to provide an improved construction for a hot water tank for a hot beverage dispenser.

Another object of the invention is to provide a hot water tank in which the condition of the interior may be inspected readily and easily.

A further object of the invention is to provide a hot water tank which may be disassembled and cleaned easily.

Another object of the invention is to provide a hot water tank, a heating element and thermostatic control element which are arranged so that the thermostatic control may shut off the heater element promptly in the event that the tank runs dry.

Another object of the invention is to provide a hot water tank which requires relatively little supplemental insulation.

Still another object of the invention is to provide a hot water tank which is inexpensive to manufacture.

DESCRIPTION OF THE DRAWINGS

The foregoing and other objects and advantages of the invention will be understood more fully from the following detailed description thereof, with reference to the accompanying drawing in which

FIG. 1 shows a hot beverage dispenser employing the tank of the invention, with the tank being broken away to show its construction clearly.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The invention is illustrated as used in a hot beverage dispenser of the type shown in the aforementioned U.S. patent. As described more fully in that patent, the dispenser arrangement includes a housing **10**, discharge nozzle **12** and a hood **14** which houses an arrangement for dispensing the beverage mix, such as hot chocolate, into a mixing device **16**. Mounted rearwardly within the housing on a base **18** and appropriate bracket **20** is the hot water storage tank **22**.

As described more fully below, the tank **22** is formed in two sections, an upper plastic section **24** and a lower metal section **26**. Water is admitted into the tank through the lower section **26** by the fitting **28**. The water is supplied to the machine through an inlet fitting **30** which directs the water to a needle valve flow control **32** through appropriate tubing and then from the flow control valve **32** through tubing **34** to the fitting **28**. Valve means are located along this flow path to control operation of the device as described more fully in the aforementioned patent. The fitting **28** also includes a drain tube **36** to enable the entire tank to be drained if desired.

The upper end of the tank includes an outlet fitting which directs the heated water through the tubing **40** into the mixing device **16**. The hot water is fed through the tube **40** as fresh water is introduced, in a measured volume, into the inlet of the tank through the fitting **28**.

As described above, the upper section **24** of the tank is formed from an appropriate plastic suitable for use with hot water having a temperature normally approximating 180°F. The upper tank section **24** defines the substantially greater portion of the tank with the lower metallic section **26** defining a relatively small portion of the total tank volume. The upper tank section **24** preferably is transparent to enable the interior of the entire tank to be inspected without disassembling the tank. The upper tank section may be fabricated according to well known injection molding techniques to include a neck **42** at its upper end for fastening to the outlet fitting **38**. The lower end of the upper tank section **24** is formed to define an outwardly extending circumferential flange **44**. A circumferential groove is formed in the underside of the flange **44** to receive an O-ring seal **46** as described below.

The bottom section **26** of the tank is formed from a corrosion resistant metal such as stainless steel. The bottom section **26** is formed with an outwardly extending circumferential flange **48** which is adapted to mate abuttingly with the flange **44** on the upper tank section **24**. The outer end of the flange **48** may be downturned as shown. The flanges are secured together by circumferentially spaced bolts **50**. Preferably, a metal backing ring **52** surrounds the upper tank section **24** against the flange **44** to distribute the clamping force of the bolts **50** fully about the plastic flange **44**. The O-ring **46** is disposed so that it bears firmly against the upwardly facing surface of the flange **48** of the lower tank section **26**. From the foregoing it will be apparent that the interior of the tank may be inspected without disassembling any of the tank parts. If access to the interior of the tank is desired, as for cleaning scale deposits, the tank sections may be separated easily to expose the inner surfaces of the tank sections **24**, **26** through the enlarged openings at their mating ends.

In the illustrative embodiment, the tank includes the electric resistance heater **54** mounted within the lower section **26**. The heater **54** may be supported firmly in the lower section **26** by brazing it at the juncture of the heating element and the wall of the lower section **26**. In the preferred embodiment, the heater **54** is contained, in its entirety, within the lower metallic section and does not extend into the plastic upper section **24** of the tank. This minimizes likelihood of excessive heat from the heater damaging the plastic upper section **24** in the event of heater malfunction.

In order to further reduce likelihood of damage to the heater **54** or any of the other elements of the tank in the event that the tank inadvertently runs "dry" with the heater continuing to operate, a bimetallic thermostat **56** is mounted to the lower tank section **26**. The bimetallic thermostat **56** is mounted to the tank by a mount **58** secured to the tank. The mount **58** has a portion disposed interiorally of the tank in proximity to the heater **54** to receive heat and conduct heat to the bimetallic thermostatic element **56**. The element **56** is in heat conductive relation to the mount **58**. Heat is received by bimetallic thermostat both from the walls of tank section **26** and from the mount **58**. The thermostat **56** may be selected from any of a number of commercially available devices in which the temperature sensitive bimetallic element may be mounted as described above. In the event that the tank did run dry, inadvertently, the excess heat developed by the heating coil **54** would be sensed in a relatively short time by the mount stem **58** so that the thermostatic control **56** may shut off the power to the coil **54**. The heater **54** and bimetal thermostatic control device **56** preferably should be selected so that the heater **54** is shut off in no more than approximately 2 minutes of "dry" operation.

In order to insulate the tank and the hot water contained therein, only the lower section **26** need be provided with external, supplemental insulation. As shown in the drawing, an appropriate wall arrangement **60** formed from any of a number of readily available insulative materials surrounds the sidewall and bottom of the lower section **26**. The upper tank section **24** is self insulative by reason of its plastic construction. For this purpose, the plastic material from which the upper section **24** is fabricated also should have satisfactory heat transfer characteristics. Selection of an appropriate plastic material is considered to be a matter of choice and the techniques for proper selection will be readily apparent to those skilled in the art.

It should be understood that the foregoing description of the invention is intended merely to be illustrative thereof and that other embodiments and modifications may be apparent to those skilled in the art without departing from its spirit.

Having thus described the invention what I desire to claim and secure by Letters Patent is:

1. A hot water tank comprising:
- an upper plastic tank section having an outlet formed at its upper end;
- a lower metal tank section having an inlet formed at its lower end;
- means for detachably connecting said lower end of said upper tank section to said upper end of said lower tank section to define said complete tank volume, said upper tank section being larger than said lower tank section and defining a larger proportion of total tank volume;
- sealing means for sealing said connected ends of said upper and lower tank sections; and
- heat transfer means disposed within said lower tank section.

2. A water tank as defined in claim **1** wherein said heat transfer means comprises heating means.

3. A water tank as defined in claim **1** wherein said upper tank section is formed from a transparent plastic thereby to enable the interior of said tank to be inspected without disassembly thereof.

4. A water tank as defined in claim **2** further comprising:
- means encasing said lower section of said tank within an insulative shell.

5. A water tank as defined in claim **1** further comprising:
- temperature sensing means mounted to said lower tank section, so that the responsive sensing element thereof is disposed in heat conducting proximity to said heat transfer means thereby to control operation of said heat transfer means within a minimum time after said heat transfer means has begun operation beyond predetermined limits.

6. A water tank as defined in claim 1 wherein said means connecting said upper and lower tank sections to each other comprises:

the mating ends of each of said upper and lower tank sections having an outwardly extending circumferential collar formed integrally therewith;

means for supporting a sealing O-ring between said collars when said tank sections are brought together at said collars; and

means for securing said flanges together.

* * * * *