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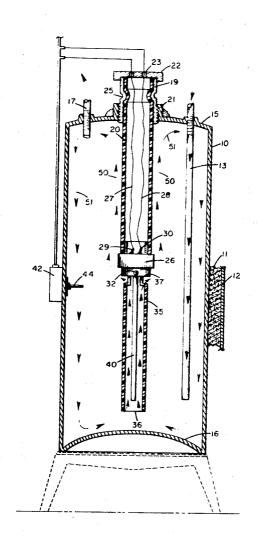
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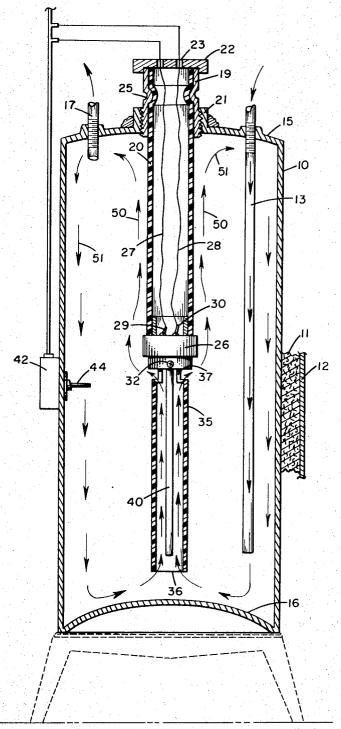
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ABSTRACT: In accordance with this invention there is provided an electric water heater and storage tank wherein only a single electric heating element is vertically mounted near the bottom of the tank and is surrounded by a spaced-apart tube which is a good thermal insulator, such as a plastic tube. The insulator tube is open at the bottom for cold water inlet and has openings at the top for hot water outlet near the middle of the tank, forming a circulating system within the tank to cause cooler water to sweep across the surface of the electric heating element for economy and to greatly reduce stratification of the hot water within the tank.



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ELECTRIC WATER HEATER

BACKGROUND OF THE INVENTION

In the past, electric water heaters have used multiple heater elements in conjunction with multiple thermostats to rapidly heat water in storage tanks. When the demand for hot water was great both heater elements were energized, and when demand was less only one element, usually the lower one, was energized. The heater elements were inserted horizontally into the storage tank, necessitating more plumbing fixtures for the tank with consequent increased cost, and requiring increased cost for the heater elements, thermostats and wiring. Also, because the upper element was energized less of the time and was positioned in the area of the hot water, increased burn-out of the lower element took place. The two-heater element, horizontal mounting caused stratification of the hot water.

It is an object of the present invention to provide an electric water heater and storage tank system which is less expensive to manufacture, less expensive to operate, and less expensive 20

It is another object of the invention to provide an electric water heater and storage tank system wherein only a single heater element is used, the element being vertically mounted and shielded in such a manner as to increase circulation of the 25 outside of the tank. water being heated, thereby to greatly reduce stratification of the water within the tank.

Another object of the invention is to provide an electric water heater and storage tank system wherein a single, vertically mounted heater element promotes circulation of cooler 30 water past its surface, thereby to more efficiently transfer heat from the element to the water with consequent longer element life, better water circulation within the storage tank, and reduced consumption of electric current for amount of heated water delivered.

Still another object of the invention is to provide an electric water heater and storage tank system which is easier to service due to only a single heater element being used, and due to only a single thermostat being employed.

Still a further object of the invention is to provide an electric water heater and storage tank wherein less electricity is consumed to heat a given amount of water to a fixed temperature, thereby reducing the amount of scale which is formed in the tank with consequent reduced corrosion.

It is also an object of the invention to provide a system wherein the circulation within the tank due to the electric element heating the water is enhanced by the circulation set up by the use of hot water and the flow of incoming cold water.

For a better understanding of the present invention, 50 together with other and further objects thereof, reference is had to the following description taken in connection with the accompanying drawings, and its scope will be pointed out in the appended claims.

With reference to the drawing the FIGURE shows a cross- 55 sectional view of a water heater and storage tank utilizing electric current as the energy source.

Reference character 10 indicated a metal water storage tank having an insulator 11 (only partly shown) around its outside surface, and with an outside cover 12 around the insulation, as is known in the art. A cold water inlet pipe 13 extends downwardly through the top 15 of the tank to a location near the bottom 16 of the tank, and a hot water outlet pipe 17 extends through the top 15 and into the tank only a short distance so that it draws water out of the tank only from near 65 the top where the water is hottest.

A plastic dry well tube or a plastic-covered metal tube 20 extends down through the top 15 of the tank to a location very near, but spaced from, the bottom 16. The dry well tube 20 includes a short metal pipe 19 which is secured to the top of the 70 tank 10 by a threaded section 21, and it is enclosed by cover 22 which has one or more holes 23 through which wires extend. The dry well tube 20 is secured to the short metal pipe 19 by a rolled connection 25, or other such connection, which is leak-proof to prevent water from entering the dry well 20. 75 heating element connected to said dry well and extending ver-

The dry well 20 extends down into the storage tank approximately half the height of the tank, where it terminates in a heating element adapter 26. The heating element adapter 26 is small enough that it will pass through the opening at the top of the tank when the metal pipe 19 is unscrewed therefrom, thereby facilitating the exchange of a new heating element for an old one if service becomes necessary. Wires 27,28 from an outside source of electric current are connected to terminals 29,30 mounted on the heating element adapter 26, and of course may be enclosed in a manner to prevent water from contacting them in the event of a leak in the dry well pipe 20.

Extending downwardly from the heating element adapter 26, and connected to it by suitable means such as one or more set screws 32 is a plastic tube 35 which is open at its bottom end 36, and which has a plurality of openings 37 at its top end. The plastic pipe 35 surrounds and is spaced from a single, vertically mounted, electric heating element 40 which is secured to the adapter 26 by suitable means, not shown. The heating element 40 is electrically connected to the wires 27,28 for energization thereby, and a thermostat 41 is mounted through the wall of the tank 10 and by switch 42 controls the energization of the single heating element 40, as is known in the art. Alternatively, the thermostat may be surface mounted on the

Assume that the tank 10 is full of cold water. The inside of the dry well 20 is devoid of water, and water fills the space between the heater element 40 and the plastic tube 35. The thermostat 41 calls for heat causing switch 42 to close, thereby energizing the heater element 40. As the very limited quantity of water within tube 35 is quickly heated it rises and flows out of the openings 37 at the top of the tube, and is replaced by cooler water flowing in at the opening 36 at the bottom. The heated water rises as is shown by arrows 50 displacing cooler water toward the bottom of the tank as shown by arrows 51. Thus, circulation of water is quickly established and is maintained within the tank, hot water rising to the top and cooler water falling toward the bottom. This circulation greatly reduces stratification of the water in the tank into hotter and cooler regions as is usual in conventional tanks of the horizontally mounted two-element type.

When hot water is withdrawn from tank 10 through pipe 17 it is replaced by cold water through pipe 13 whose outlet is near the bottom 16 of the tank. Thus no cold water enters at a location where it can mix directly with hot water at the top of the tank, and the circulation of water within the tank is aided by the flow of hot water out and cold water into the tank.

Because of the plastic tube 35 around, but spaced from, the heating element 40 there is a continuous and generous flow of water up the tube 35 at all times while the element 40 is energized. This maintains the element at a somewhat lower temperature due to the flow of cooler bottom water across its surface, leading to longer element life for several reasons; the lower operating temperature of the element, less scale on the element, less corrosion, and less electrolysis due to the shielding effect of the plastic pipe.

While there has been described what is at present considered to be the preferred embodiment of this invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention, and it is aimed, therefore, in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What is claimed and desired to be secured by United States Letters Patent is:

1. An electric water heater and storage tank system comprising, in combination; a vertical-type storage tank having an opening at its top, means for connecting a hot water withdrawal pipe into the tank near the top thereof, means for connecting a cold water inlet pipe through the wall of the tank, the inlet pipe terminating near the bottom of the tank, a dry well mounted through the opening at the top of the tank and extending into the tank, only a single elongated electric tically into said tank for engagement with water therein, electric wiring means connected to said heating element and extending into said dry well and out of the tank at said opening at the top of the tank, heat-insulating pipe means connected to said dry well and surrounding but spaced from said heating element, said insulating pipe being open at its bottom end and having an opening at its top end where it is connected to said dry well for flow of water therethrough and in contact with the said heating element, and thermostatic means mounted on said tank and connected electrically with said electric wiring means for controlling the energization of said heating element.

2. An electric water heater and storage tank comprising, in combination: a vertical-type storage tank having an opening at its top, means for connecting a hot water withdrawal pipe near the top of the tank, means for connecting a cold water inlet pipe through the wall of the tank, the inlet pipe terminating

near the bottom of the tank, a dry well through the said opening at the top of the tank and extending into the tank to a location about the middle of the tank, a heating element adapter connected to the bottom of the dry well, an elongated electric heating element connected electrically and mechanically to said adapter and holding said element vertically within said tank, heat-insulating pipe means connected to said dry well and surrounding but spaced from said heater element, said pipe means having openings at its top and having an open bottom near the bottom of the tank, electric wires extending from the outside of said tank down through said dry well to said adapter and to said heating element, and thermostat means mounted on said tank and connected to said electric wires for sensing the temperature of the water therein and for controlling the energization of said heater element.