Aug. 18, 1953 K. L. WOODMAN 2,649,532

WATER HEATER APPARATUS

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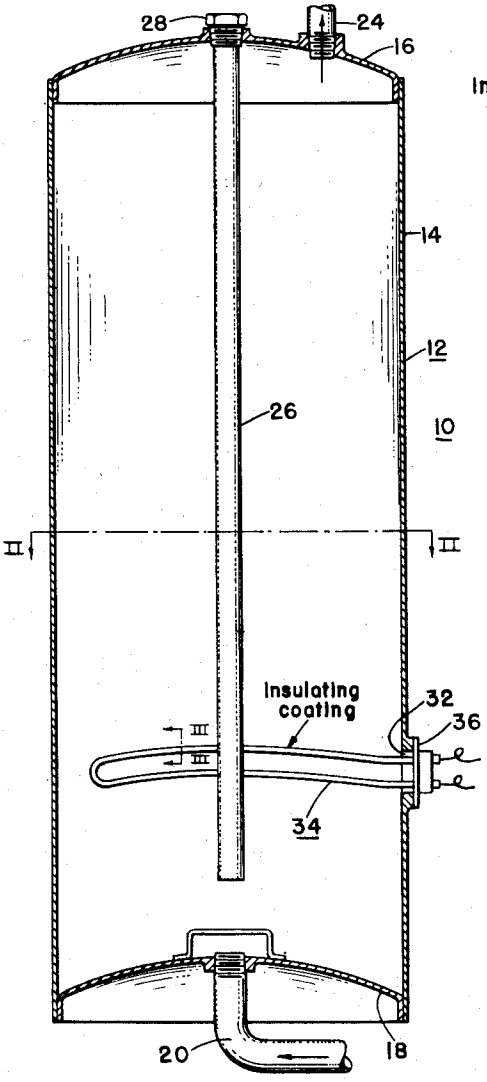


FIG. 1.

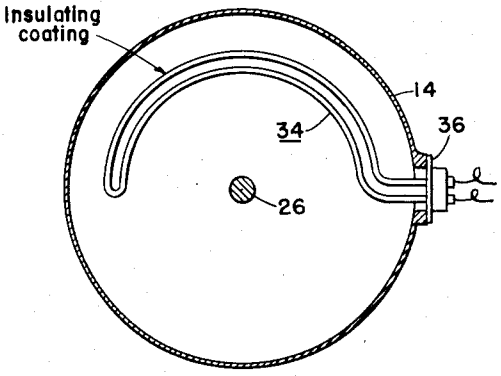


FIG. 2.

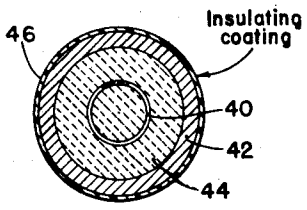


FIG. 3.

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WATER HEATER APPARATUS

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This invention relates to electrically heated water heaters, particularly electrical water heaters having an immersion heating unit mounted therein and an anode for protecting the walls of the tank from corrosion.

It is an object of the invention to provide a water heater in which the anode is more efficiently utilized to protect the tank walls from corrosion.

It is a further object of the invention to provide, in a water heater having an anode for protecting the tank, a sheathed heating unit of the immersion type which will not affect the protective current to the tank wall.

A still further object is to provide a water heater having an anode in which the protective current from the anode is utilized in a most efficient manner to protect the tank, and currents from the anode to the immersion heating unit are reduced to a minimum.

I have found that, in water heaters having an immersion heating unit for heating the water and an anode for protecting the walls of the tank from the effects of electrolysis, current from the anode, in the vicinity of the immersion heating unit, is attracted to the latter instead of to the walls of the tank. This effect reduces the protective action of the anode on the tank wall in the vicinity of the heating unit.

In accordance with the above objects, I propose coating the entire surface of the immersion heating unit sheath exposed to contact with the water, with an electrical insulating coating. This coating may be in the nature of a varnish which may be applied to the external surface of the sheath by spraying, dipping or brushing. The varnish may be of any well-known type, such as, for example, those varnishes now on the market under the following trade names: Micarta, Permolite or Heresite. With such a coating on the immersion heating unit, current from the anode through the heating unit is substantially eliminated. Instead, the current which has been heretofore diverted through the heating unit will flow to the tank wall in the area of the heating unit and serve to protect the former in the same manner as the other portions of the tank walls.

The above and the objects are effected by my invention as will be apparent from the following description taken in connection with the accompanying drawings, forming a part of this application, in which:

Fig. 1 is a vertical section of a water heater having my invention incorporated therein;

Fig. 2 is a section taken on line II—II of Fig. 1; and

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Fig. 3 is a section of the heating unit, on a much larger scale, taken on line III—III of Fig. 1.

Referring to the drawings, especially Fig. 1, there is shown a water heater, generally designated 10, having a tank 12 comprising a tubular vertical wall 14 and upper and lower end walls 16 and 18, respectively. The tank 12 is provided with an influent water pipe 20 which is received in threaded engagement with an opening in the lower end wall 18. The upper end wall 16 is provided with an effluent water pipe 24 which serves to carry off the heated water in a manner which is well understood. The upper end wall 16 is further provided with a centrally disposed threaded opening through which is inserted an anode rod 26. The anode 26 extends downwardly into the tank to within a short distance of the lower end wall 18 and is fastened at its upper end to a support member 28 which is screw-threaded to the upper end wall 16. The anode 26 may be of the sacrificial type, made of any metal which is higher in the electro chemical series than the material of which the tank walls are made, and is in good electrical contact with the end wall 16 through the support member 28. For example, if the tank walls are made of steel, the anode may be composed of magnesium, zinc, aluminum or other similar metals. As is well understood in the art, current will flow from the anode 26, through the water in the tank to the inner surfaces of the tank walls 14, 16 and 18, respectively, thereby preventing corrosion of the tank wall by electrolysis.

The tank wall 14 is provided with an opening 32 through which extends a sheathed immersion heating unit 34, which is preferably though not necessarily of substantially hairpin shape in vertical aspect and curved in horizontal aspect, as shown in Fig. 2. The heating unit 34 is fastened to the tank wall adjacent the opening 32 by a mounting plate 36, which plate also serves to close the opening 32.

As best shown in Fig. 3, the sheathed heating unit 34 comprises a helically wound resistor wire 40 disposed centrally of a metallic tubular sheath 42 and insulatedly spaced therefrom by a highly compacted refractory powder 44, as is well understood in the art. Thus, the resistor 40 is insulated from the sheath 42 and is sealed against entrance of water contained in the tank. The sheath 42 may be made of any desirable metal; however, the general practice is to utilize copper for sheathed heaters of this type, since the copper is immune to attack by electrolytic action and also is a very good conductor of heat.

As shown in Fig. 2, the distance between the

anode and the sheathed heating unit 34 is less than the distance between the anode and the tubular wall 14 of the tank. Thus, as thus far described, current from the anode, seeking the shortest route to ground, will pass through the sheath 42 of the heating unit in preference to the tank wall in the area adjacent the heater, minimizing the desired protective action of the anode on the tank wall. To minimize the diversion of current described, the sheath 42 is coated with an electrical insulating varnish 46 which will withstand the effects of hot water. The varnish 46 may be of any well-known type such as, for example, those varnishes now appearing on the market under the following trade names: Micarta, Permolite, Heresite, etc.

The heating unit 34, although in direct contact with the water in the tank, is insulated against electrical contact therewith by the insulating varnish 46. Although heat given off by the resistor 40 is readily transmitted to the water in the tank, current from the anode cannot flow through the sheath 42 because of the insulation provided thereon by the varnish 46. In actual production there may be some instances where the insulating coating 46 is broken by minute pinholes. However, current flowing through such pinholes to the sheath would be so minute that it is negligible. It will now be seen that the current from the anode which had heretofore been diverted from the tank wall is permitted to flow entirely to the tank wall, thereby providing the utmost protection to the inner surface of the tank walls. Since the current from a sacrificial anode is a limited one, this effect is advantageous in imparting a longer useful life to the tank.

Although the invention has been described in connection with a water heater having a steel tank, it is also advantageous when utilized with a tank having an inner protective lining composed of zinc or glass of the type now commonly used. Although, in theory, tanks having a protective inner surface of the above-mentioned substances are immune to electrolytic corrosion, in actual practice it has been found that a smooth unbroken surface in the coating is very difficult to attain. For example, in zinc-lined tanks, bare spots or thin spots formed in the zinc coating during manufacture of the tank render the tank wall vulnerable at these points to localized electrolytic currents. In glass-lined tanks, the surface is often broken by small pinholes or cracks which create vulnerable spots in the tank wall. In view of the above, water heaters are usually provided with anodes, regardless of whether the tank is unlined or lined with a protective coating.

Also, although the invention has been described in connection with a water heater having an anode of the sacrificial type, it is not limited thereto and may be utilized with a water heater having an anode of the permanent type. Permanent type anodes are well known in the art and are connected to a low voltage current supply.

Regardless of the type of anode employed, more complete protection may be obtained by coating the immersion heater with the insulating coating heretofore described. The insulating coating will not waste away since it is not affected by the action of the anode or of the water contained in the tank. Hence, the increased efficiency imparted to the anode is substantially a permanent one and is limited only by the life of the anode and of the immersion heating unit.

While I have shown my invention 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 I claim is:

1. An immersion heating unit for a water heater, comprising a metallic tubular sheath, a heating element disposed within said sheath, electrical insulating material spacing said heating element from said sheath, and an electrical insulating coating on the outer surface of said sheath, said insulating coating being resistant to hot water and serving to electrically insulate the outer surface of said sheath.

2. In combination, a water heater comprising a tank, an anode disposed within said tank, an immersion heating unit passing through an opening in said tank and being fastened to the wall of the tank, said heater having a metallic tubular sheath, a heating element disposed within said sheath and electrically insulated from the sheath, and an electrically insulating coating disposed on the outer surface of said sheath and serving to electrically insulate the sheath from water contained in said tank.

3. In combination, a water heater comprising a tank having a tubular wall and end walls, an anode disposed in said tank, said anode being fastened at one end to said end wall, said tubular wall having an opening, an immersion heating unit passing through said opening and having a mounting plate for closing said opening, said heating unit having a tubular sheath, a heating element disposed within said sheath and electrically insulated therefrom, and an electrically insulating coating on said sheath, said coating covering that portion of said sheath disposed within said tank and serving to electrically insulate the sheath from water within the tank, whereby protective current flowing from the anode to the tank wall will not be diverted through said sheath.

4. In combination, a water heater comprising a metallic tank having a tubular wall and end walls, an anode disposed in said tank, said anode comprising a member composed of a metal higher in the electro-chemical series than the material comprising said tank walls, said anode being fastened to one of said walls in good electrical contact therewith, whereby an electrical circuit is set up from said anode to said tank walls to protect the interior surface of said tank walls from corrosion, said tubular wall having an opening, an immersion heating unit passing through said opening and having a mounting plate for closing said opening, said heating unit having a metallic tubular sheath, a heating element disposed within said sheath and electrically insulated therefrom, an electrically insulating coating on said sheath, said coating covering that portion of said sheath disposed within said tank and serving to electrically insulate the sheath from water within the tank, whereby protective current flowing from the anode to the tank walls will not be diverted to said sheath.

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