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DOMESTIC ELECTRIC APPLIANCE

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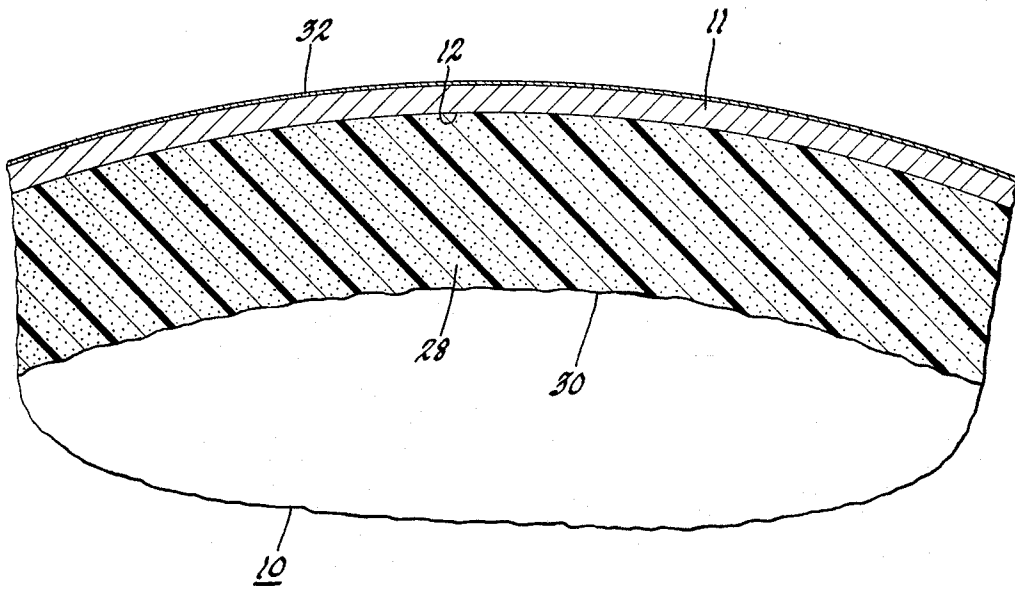


Fig. 2

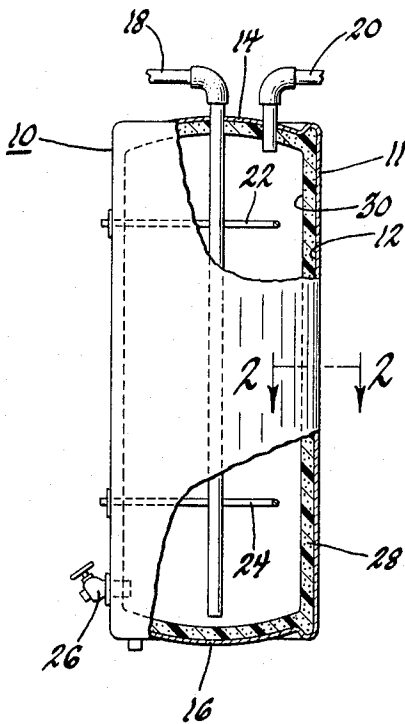


Fig. 1

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DOMESTIC ELECTRIC APPLIANCE

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7 Claims. (Cl. 219—312)

This invention relates to a domestic appliance and more particularly to an improved water heater tank structure.

In the prior art it has been conventional to form water heaters as double wall structures with an inner tank capable of resisting pressures normally encountered in domestic water heating plus an outer decorative shell spaced from the inner tank. The space between the inner tank and outer shell is filled with insulation and the inside of the inner tank is provided with some form of anti-corrosion finish, such as porcelain or the like. One disadvantage of such structure—unwanted standby heat loss—results from bolts or spacers extending between the inner tank and shell as the means for spacing the two. These bolts or the like provide a good heat leak between the inner tank and the outside atmosphere. Another disadvantage is that insulation used between the tank and shell tends to settle in shipping with the result that an uninsulated void occurs near the top of the water heater. This invention is directed to a single wall water heater structure of improved design for overcoming these and other disadvantages.

Accordingly it is an object of this invention to provide an improved insulated water heater tank structure.

Another object of this invention is the provision of a single wall tank structure having improved structural strength and resistance to leakage and good corrosion resistant and insulating qualities.

More particularly, it is an object of this invention to provide means which combines structural strength, corrosion and/or leak protection and thermal insulation in a water heater through the application of a layer of foam insulation to the interior of a single wall tank.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred embodiment of the present invention is clearly shown.

In the drawings:

FIGURE 1 is a side elevational view with parts broken away of a domestic water heater; and

FIGURE 2 is a fragmentary sectional view taken along line 2—2 in FIGURE 1.

In accordance with this invention and with reference to FIGURE 1 a domestic water heater 10 is illustrated. The water heater is comprised of a single walled tank 11 of sheet metal or other suitable material having a cylindrical side wall surface 12, a top wall 14 and a bottom wall 16. Suitable piping 18 is provided for supplying cold water to the water heater 10 and outlet piping 20 is provided for removing heated water from the tank. Suitable immersion type electrical heating means 22, 24 may extend through the tank wall 12 into the tank for heating the water therein. A suitable drain valve 26 may also be provided. The inside of the tank 11 is coated with a layer of cellular plastic foam 28 of a type capable of forming a strong bond with the material used for the tank 11 and with the plumbing and heating fittings. Further, the foam 28 should have good insulating qualities and, after being foamed in place, should have an impervious skin 30 on the side thereof exposed to the inside of the tank, thereby to form a barrier to prevent the penetration of water in the tank into corroding contact with the tank

itself. Preferably, the foaming should be done with the plumbing and electrical fittings in place (or at least some attachment fittings therefor) so the adherence of the foam thereto will not only support the fittings but will also seal around them in a manner to prevent leaks. As a last step the tank 11 may be decoratively finished on the outside thereof with a coat 32 of paint or porcelain.

One method of practicing this invention will be described next following. A metal tank 11 is formed with a process hole therein or a hole may be subsequently cut in either the top wall 14 or the bottom wall 16. A foaming mechanism is inserted through the hole and moved longitudinally of the tank while spraying foam compounds on the inner wall surfaces thereof. One suitable foam flinger is taught in the copending application to Preotle, Serial No. 220,725, filed August 31, 1962, and assigned to the same assignee as this invention.

Another method is to centrifugally cast the foam on the inner wall surfaces of the tank. For instances, the tank 11 may be rotated slowly while the foaming ingredients are being distributed over the inner wall surfaces of the tank; and then the tank may be rotated somewhat faster to evenly distribute the mixture as the foaming proceeds in situ along the wall surfaces of the tank. It is recognized that the end walls 14 and 16 will require special handling if the tank is to be spun. For instance, the start of foaming on the end walls could be allowed to slightly precede that on the side wall so that the end wall foam would have an initial set to resist any tendency to centrifuge. Another procedure is to form the end walls with a particular shape to resist the effects of centrifuging, i.e. as hemispheres.

A superior insulating foam should be used in coating the interior of the tank—a Freon-filled foam having the desired qualities of adhesion, insulation and structural rigidity. Such a foam is taught in the copending application of John C. Rill, Jr., Serial No. 809,702, filed April 29, 1959, and assigned to the same assignee as this invention. Any insulating foam is suitable so long as the foam develops an exposed skin or surface which will prevent the penetration of water into rusting or corroding contact with the wall of the tank.

Installation of the plumbing fittings 18, 20 and 26 and the electrical heating elements 22 and 24 may be accomplished by cutting out the foam in the tank wall after the foaming is completed. However, it is the preferred concept of this invention to foam the tank with electrical and plumbing wall fittings in place thereby providing a co-extensive bond between the fittings and the foam which will act as a seal against water leakage from the tank.

It should now be seen that an improved single wall tank structure has been provided wherein foaming on the inside thereof effects added structural rigidity, corrosion protection, thermal insulation and leak prevention—all characteristics which are especially useful in the construction of domestic water heaters.

While the embodiment of the present invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. A water heater tank structure having good structural strength and good corrosion resistant and insulating qualities consisting of a relatively thin, flexible, preformed metal sheet, said sheet forming wall surfaces normally movable relative to each other and capable of forming a strong bond with polyurethanes, and a heat insulating material consisting of a substantially rigid closed cell closely cross linked polyurethane foam of improved strength having the cells thereof containing essentially only a permanently retained fluorohalogenated saturated aliphatic hydrocarbon substantially insoluble in the foam,

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the walls of said cells having an improved seal for permanently retaining said fluorohalogenated hydrocarbon, said metal sheet and polyurethane foam forming a strong coextensive permanent bond in situ throughout their areas of contact to form a unitary structure wherein said foam provides substantial rigidifying support for said sheet, and said polyurethane foam on the side thereof opposite said areas of contact with said metal sheet forming a barrier to prevent the penetration of water in said tank into corroding contact with said metal sheet.

2. A tank structure adapted for containing heated fluid and having good structural strength and good corrosion resistant and insulating qualities consisting of a relatively thin, flexible, preformed sheet of a material normally subject to corrosion by contact with said fluid, said sheet forming wall surfaces normally movable relative to each other, and a heat insulating material consisting of a substantially rigid cellular foam of improved strength capable of forming a strong bond with said sheet, said sheet and foam forming a strong coextensive permanent bond in situ throughout their areas of contact to form a unitary structure wherein said foam provides substantial rigidifying support for said sheet, and said foam on the side thereof opposite said areas of contact with said sheet forming a barrier to prevent the penetration of fluid in said tank into corroding contact with said sheet.

3. An electric water heater tank structure having good structural strength and good corrosion resistant and insulating qualities consisting of a relatively thin, flexible, preformed metal sheet, said sheet forming wall surfaces normally movable relative to each other and capable of forming a strong bond with polyurethanes, a heat insulating material consisting of a substantially rigid closed cell closely cross linked polyurethane foam of improved strength having the cells thereof containing essentially only a permanently retained fluorohalogenated saturated aliphatic hydrocarbon substantially insoluble in the foam, the walls of said cells having an improved seal for permanently retaining said fluorohalogenated hydrocarbon, said metal sheet and polyurethane foam forming a strong coextensive permanent bond in situ throughout their areas of contact to form a unitary structure wherein said foam provides substantial rigidifying support for said sheet, means extending through the sheet for supplying water to and from the tank, and means extending through the sheet for heating water in the tank, said polyurethane foam and said means for supplying water and said means for heating said water forming a strong coextensive permanent sealing bond in situ throughout their areas of contact to prevent the leakage of water from said tank, and said polyurethane foam on the side thereof opposite said areas of contact with said metal sheet forming a barrier to prevent the penetration of water in said tank into corroding contact with said metal sheet.

4. An electric water heater tank structure having good structural strength and good corrosion resistant and insulating qualities consisting of a relatively thin, flexible, preformed metal sheet, said sheet forming wall surfaces normally movable relative to each other, a heat insulating material consisting of a substantially rigid cellular foam of improved strength having the cells thereof containing essentially only a heat insulating fluid substantially insoluble in the foam, said metal sheet and foam forming a strong coextensive permanent bond in situ throughout their areas of contact to form a unitary structure wherein said foam provides substantial rigidifying support for said sheet, means extending through the sheet for supplying water to and from the tank, and means extending through the sheet for heating water in the tank, said foam and said

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means for supplying water and said means for heating said water forming a strong coextensive permanent sealing bond in situ throughout their areas of contact to prevent the leakage of water from said tank, and said foam on the side thereof opposite said areas of contact with said metal sheet forming a barrier to prevent the penetration of water in said tank into corroding contact with said metal sheet.

5. A water heater tank structure having good structural strength and good corrosion resistant and insulating qualities consisting of a preformed metal sheet, said sheet forming wall surfaces capable of forming a strong bond with polyurethanes, and a heat insulating material consisting of a substantially rigid closed cell closely cross linked polyurethane foam of improved strength having the cells thereof containing essentially only a heat insulating fluid, said metal sheet and polyurethane foam forming a strong coextensive permanent bond in situ throughout their areas of contact to form a unitary structure wherein said foam provides substantial rigidifying support for said sheet, and said polyurethane foam on the side thereof opposite said areas of contact with said metal sheet forming a barrier to prevent the penetration of water in said tank into corrosion effecting contact with said metal sheet.

6. A water heater tank structure having good structural strength and good corrosion resistant and insulating qualities consisting of a preformed metal sheet, said sheet forming wall surfaces capable of forming a strong bond with polyurethanes, and a heat insulating material consisting of a substantially rigid closed cell closely cross linked polyurethane foam of improved strength having the cells thereof containing essentially only a permanently retained fluorohalogenated saturated aliphatic hydrocarbon substantially insoluble in the foam, the walls of said cells having an improved seal for permanently retaining said fluorohalogenated hydrocarbon, said metal sheet and polyurethane foam forming a strong coextensive permanent bond in situ throughout their areas of contact to form a unitary structure wherein said foam provides substantial rigidifying support for said sheet, and said polyurethane foam on the side thereof opposite said areas of contact with said metal sheet forming a barrier to prevent the penetration of water in said tank into corrosion effecting contact with said metal sheet.

7. A single wall tank structure adapted for containing fluid and having good structural strength and good corrosion resistant, leak resistant and insulating qualities consisting of a preformed sheet of a material normally subject to corrosion by contact with said fluid, and a heat insulating material consisting of a substantially rigid cellular foam of improved strength capable of forming a strong bond with said sheet, said sheet and foam forming a strong coextensive permanent bond in situ throughout their areas of contact to form a unitary structure wherein said foam provides substantial rigidifying support for said sheet, and said foam on the side thereof opposite said areas of contact with said sheet forming a barrier to prevent the penetration of fluid in said tank into corroding or leaking contact with said sheet.

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