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HOT WATER TANK CONSTRUCTION

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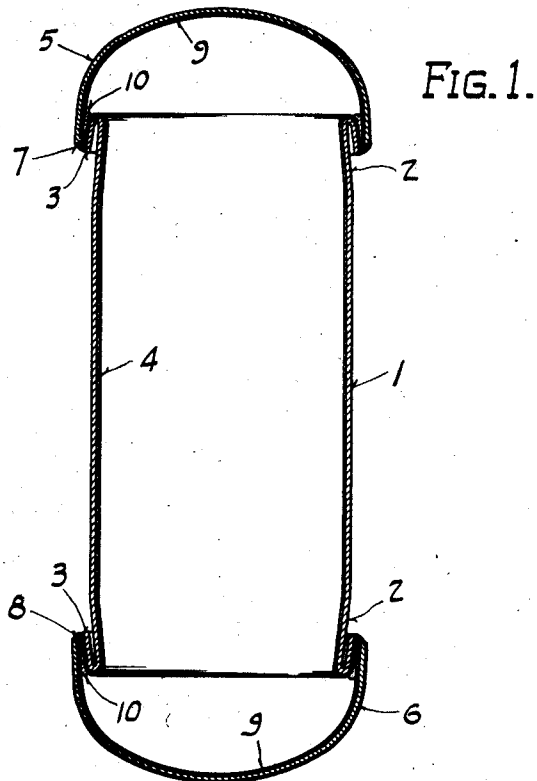


FIG. 2.

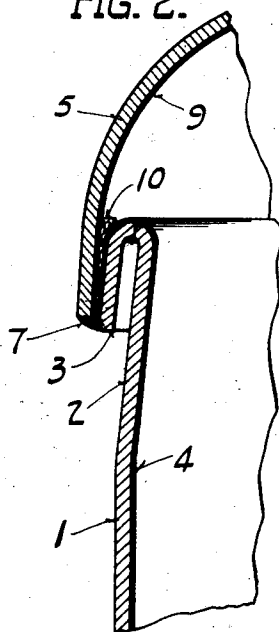
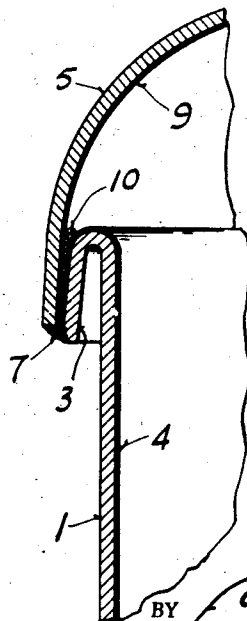


FIG. 3.



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HOT WATER TANK CONSTRUCTION

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3 Claims. (Cl. 220-67)

This invention relates to tanks of the type employed in domestic water storage heaters and the like, and more particularly to tanks in which the shell and heads are lined as with ceramic enamel prior to assembly to protect the same from corrosion in service. A tank of this general nature is described in the application of Otto E. Uecker, Serial No. 215,651, filed June 24, 1938, and issued to Patent No. 2,263,021 on November 18, 1941.

The principal object of the present invention is to provide an improved welded joint between a head and the shell of the tank which will enable the employment of a lighter weight head and give greater volume to the tank.

Other objects will become apparent from the accompanying drawing and following description illustrating an embodiment of the invention.

In the drawing:

Figure 1 is a longitudinal section through a hot water tank;

Fig. 2 is an enlarged section through a joint between the upper head and body of the tank; and

Fig. 3 is a section similar to Fig. 2 of a modified form.

Referring to the drawing which illustrates a hot water storage tank, the shell 1 of generally cylindrical shape preferably flares inwardly at its end areas as at 2 and has end portions 3 that flare outwardly in a reverse bend. Instead of flaring inwardly as at 2 the shell may be straight to the ends as shown in Fig. 3.

The shell 1 is made of steel or other suitable metal adapted to resist the pressure of the fluid contained within the tank and the interior surfaces of the shell including the end portions 3 thereof are completely covered with the lining 4 to protect these surfaces from the corrosive action of the fluid contained within the tank. This lining is preferably of a ceramic enamel material specifically adapted to resist the corrosive action of hot water.

The heads 5 and 6 are preferably convex with the outer skirt portion of larger diameter than the shell so that the heads slip over the ends of the shell and nest on the flared portions 3 of the shell. The heads are welded to the shell by annular welds 7 and 8 joining the circumferential edges of the respective heads with the edge portion of the flared sections 3 of the shell. The nested flared portions of the shell and head overlap each other for a substantial distance to distribute the assembly pressure and more effectively seal the approach to the weld and thereby prevent

hot water from circulating in contact with exposed metal at the weld.

The description hereafter is of the head 5 and the shell 1 and the manner of joining them together, it being understood that the description applies equally as well to the attachment of the head 6 to the shell 1.

The head 5 is constructed from relatively light metal as its outward spherical shape naturally tends to resist the pressure of the fluid contained within the tank to a greater extent than heads of other shapes or forms.

The lining 9, preferably of ceramic enamel material, covers the entire interior surface of the head 5. This lining is similar to the lining 4 of the shell 1 and is provided to protect the interior surface of the head from the corrosive action of fluids contained within the tank.

The circumferential edges of the head 5 may be disposed adjacent the edges of the reverse bend of the end portion 3 of the shell 1, or the edges of the reverse bend may extend downwardly a greater distance than the circumferential edges of the head to form an angular seat for the deposit of weld metal.

Any suitable openings not shown, may be provided in the shell or heads for pipe connections or other fittings.

Upon assembly of the tank, the lining 9 of the head 5 may be in direct contact with the lining 4 of the shell 1 in the region where the circumferential edges of the head overlap the reverse bend end portion 3 of the shell 1. Where a ceramic lining is employed it is preferred that a thin annular gasket 10 of asbestos or other suitable material such as glass fiber be inserted between the linings of the head and shell at their circumferential overlapping areas slightly removed from the edges.

This gasket is heat and corrosion resistant and of a pliable nature. The gasket is preferably applied to the outer surface of the reverse bend of the end portion 3 and the head 5 is slipped over it and forced into position.

The gasket 10 prevents injury to the lining during the assembly of the tank and also prevents any circulation of water in the joint between the overlapping portions of the head and shell of the tank.

The head 5 is joined to the shell 1 by the weld metal 7 which is deposited at the circumferentially extending joint between the head and shell by electric arc welding.

In the area provided between the end of asbestos gasket 10 and the end of shell 1, the ce-

ramic linings of the shell and head may be fused together by the heat of the weld and thus provide a continuous protective lining for the shell, head and weld. Where a fusible gasket 10 is used its edge may also fuse with the lining.

In manufacturing the hot water storage tank illustrated and described the cylindrical shell 1 is formed from suitable metal with the longitudinally extending seam thereof welded preferably by electric resistance flash welding. After this operation the areas of approach to the end portions of the shell are preferably inwardly flared and the end portions are outwardly flared in a reverse bend with relation to the cylindrical wall of the shell.

The heads are of convex shape and being in tension to internal stresses permit the employment of thin sheet metal suitable to the pressure in the tank. Where shear stresses develop, due to other shapes of heads which are not in direct tension relatively thick sheet metal would be required to prevent rupture of the enamel lining. The diameter of the heads at their circumferential edges conforms to the diameter of the reverse bend end portions of the shell.

After the heads and shell are formed their interior surfaces are sprayed with a ceramic enamel material and then fired to fuse the material into a non-corrosive lining. The lining is next examined to ascertain any defects.

Upon completion of this inspection the heads and shell are ready for assembly. In this operation protective heat resistant gaskets are held against the outer surfaces of the circumferential bends of the shell as the heads are forced into position onto the shell with their circumferential edges slipping over the reverse bend end portions of the shell.

The reverse bend end portions of the shell provide large area surfaces of slight taper for engagement with the inner surfaces of the circumferential edges of the head over a substantial overlapping area. Where gaskets are used, as in enamel lined tanks, the engagement provides a considerable area of overlap which is substantially sealed to prevent circulation of fluid at the welded joint. If the gaskets are not employed the overlapping joint likewise provides a considerable expanse in which the linings of the heads and shell meet to prevent circulation of fluid to the welds.

Sufficient pressure is next applied to the heads to force them into tightly fitting position with respect to the shell. The gaskets protect the enamel from injury during the application of this pressure. While the pressure is maintained on the heads weld metal is deposited by electric arc welding at the joints between the heads and shell to join the shell and heads into an integral structure.

The heat from the weld metal tends to fuse together the ceramic lining of the tank adjacent to the welds. Where fusible gaskets are used the outer end portions of the gaskets also are fused with the lining. The integral lining provides complete protection of the shell, heads and welds from corrosive action of the fluid in the tank.

It will be understood that although this description has been confined to the assembly of convex heads and shells of hot water tanks, it is not intended to limit the invention thereto as it may be utilized in any boiler or container construction where convex parts are employed and

where it is necessary to protect joints from the corrosive action of fluids contained therein.

The invention also may be employed with convex concave heads and with any containers having galvanized linings and the like. If the invention is used with galvanized tanks it is not necessary to provide the gaskets between the overlapping surfaces as a very tight fit may be obtained between galvanized surfaces of the head and shell.

A tank manufactured and assembled in the manner described has very desirable tight fitting joints and provides greater volume than those previously made when the per unit weight of metal employed is compared.

Various embodiments of the invention may be made within the scope of the accompanying claims.

The invention is claimed as follows:

1. In a hot water storage tank and the like, a cylindrical shell having a protective lining therefor and having an end portion gradually reduced inwardly in diameter and curved outwardly on a substantial radius to provide a reverse outward bend having an outer surface of gradually increasing diameter to the circumferential edge thereof, said protective lining extending over the outer surface of said reverse bend, a head having a protective lining and having its marginal circumferential portion extending complementary to said outer surface of the reverse bend of the shell, and a weld joining the circumferential edge of said head to said reverse bend of said shell, said protective linings of the head and shell being sealed for a substantial distance from the weld to prevent contact of corrosive medium with metal at the joint.
2. In a hot water storage tank and the like, a cylindrical shell having a protective lining therefor and having an end portion curved outwardly on a substantial radius to provide a reverse bend having an outer surface of gradually increasing diameter to the circumferential edge thereof, said protective lining extending over the outer surface of said reverse bend, a head having a protective lining and having its marginal circumferential portion extending complementary to said outer surface of the reverse bend of the shell, and a weld joining the circumferential edge of said head to said reverse bend of said shell, said protective linings of the head and shell being sealed for a substantial distance from the weld to prevent contact of corrosive medium with metal at the joint.
3. In a hot water storage tank and the like, a cylindrical metal shell having a ceramic enamel lining therefor and having an end portion curved outwardly on a substantially large radius to provide a reverse bend having an outer surface of gradually increasing diameter toward the circumferential edge thereof and with the lining extending continuously over the outer surface of said curved end portion and reverse bend, a dome shaped head having a similar ceramic enamel lining and having its marginal circumferential portion extending complementary to said outer surface of the reverse bend of the shell and fitting tightly thereon, and a weld spaced from the body of the shell and joining the circumferential edge of said head to said reverse bend of the shell.

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