Aug. 14, 1956 P. S. DOUGHERTY 2,758,367

SHEET METAL FLUID PRESSURE STORAGE VESSEL AND METHOD OF FORMING THE SAME

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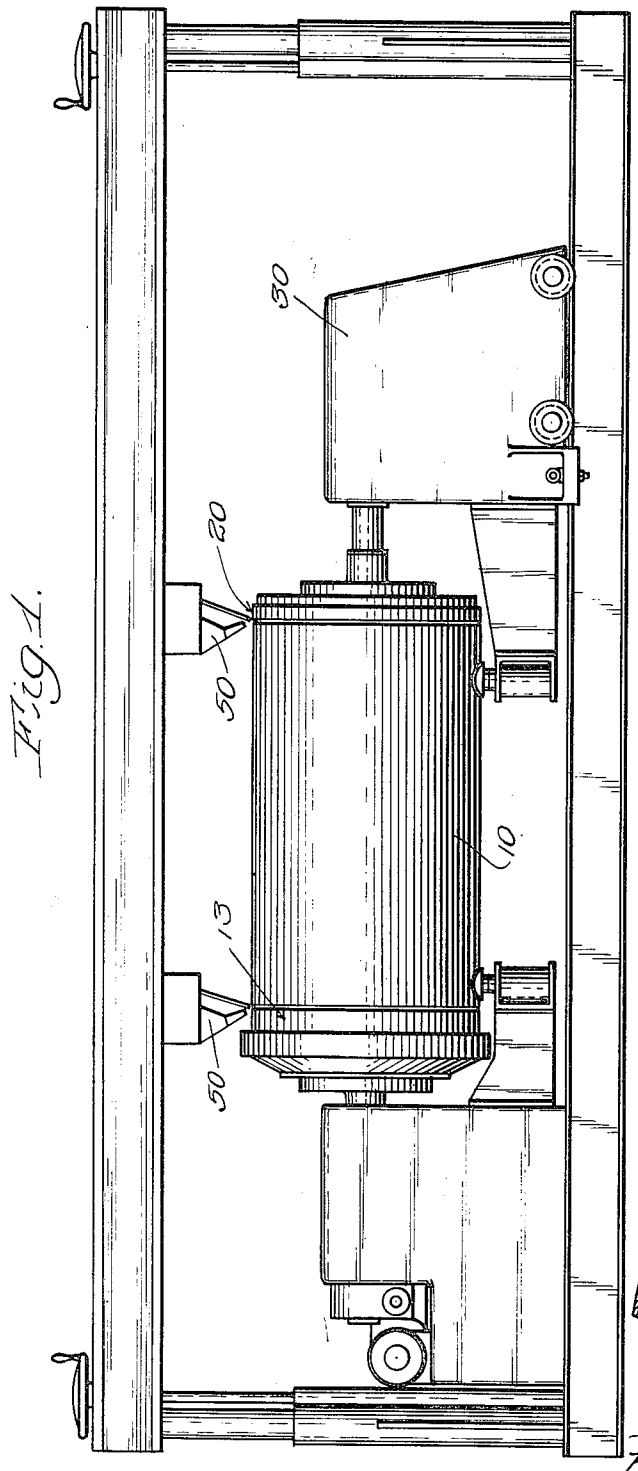


Fig. 1.

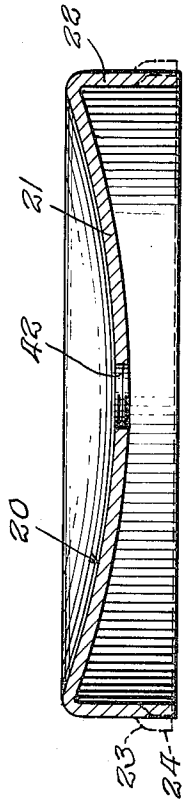


Fig. 8.

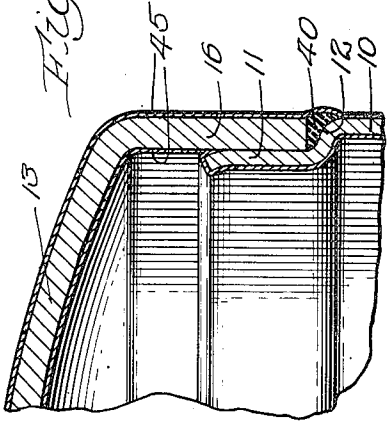


Fig. 7.

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Fig. 2.

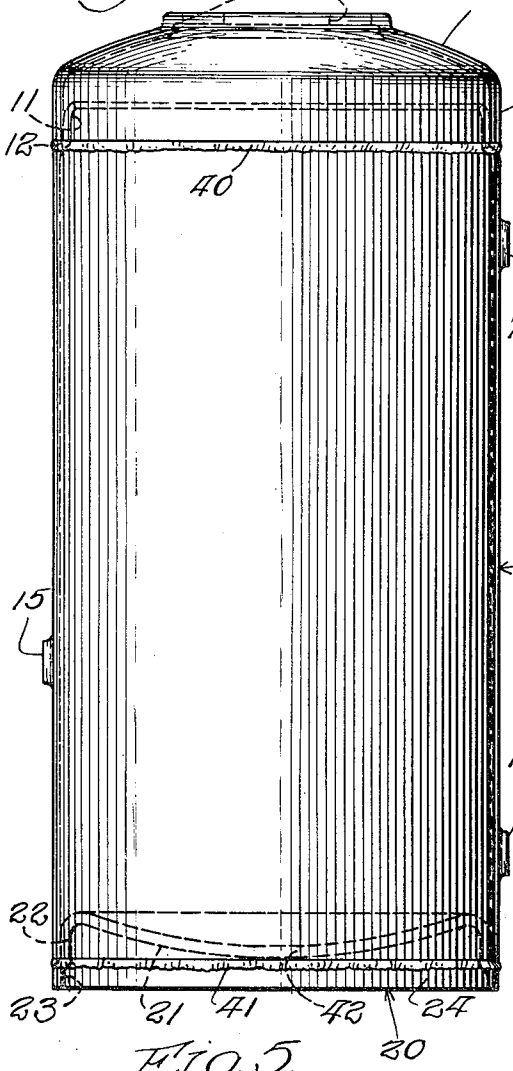


Fig. 3.

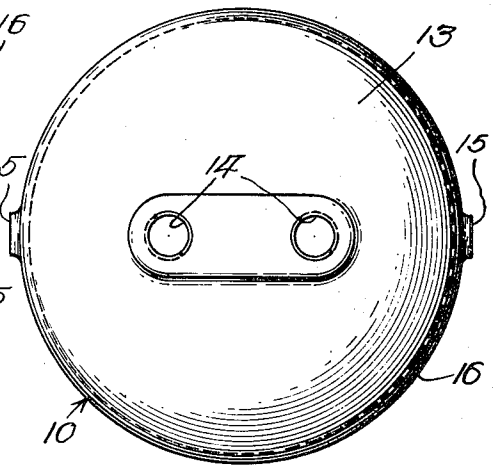


Fig. 4.

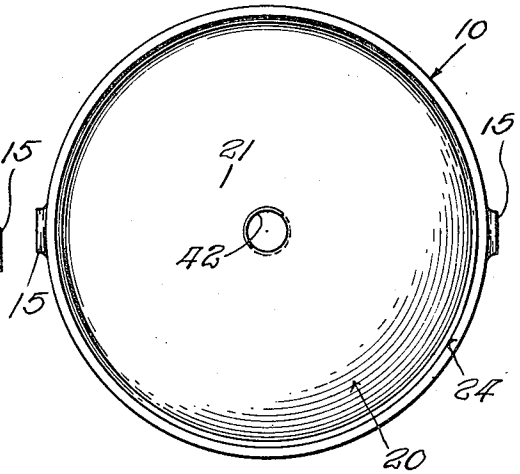
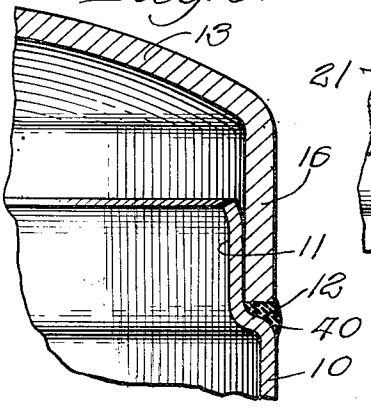


Fig. 5.



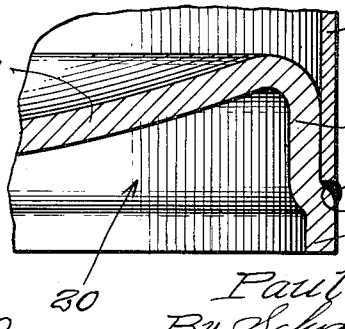


Fig. 6.

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SHEET METAL FLUID PRESSURE STORAGE VESSEL AND METHOD OF FORMING THE SAME

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Application August 1, 1952, Serial No. 302,189

1 Claim. (Cl. 29—446)

This invention relates to a sheet metal fluid pressure storage vessel and method of assembling the same and more particularly to household water tanks and the like.

The vessels to which the present invention is primarily related are made up of sheet metal, usually sheet iron. In the case of water storage tanks, the guage of the metal is usually 8 to 9. In high pressure vessels, the gauge may be as low as 3 (5/16 inch) and in some cases the gauge may be as high as 12.

In the case of water storage vessels, the steel is normally galvanized and the present invention is well adapted to hot galvanizing after assembly of the vessel.

The usual storage vessel of this type is generally cylindrical and is composed of a generally cylindrical shell, a head and a bottom. In the previous constructions, the head and bottom have been of smaller diameter than the shell and nest inside it. It is obvious that a tight fit is necessary and with the gauges employed the metal is so rigid that the insertion of the heads and bottoms requires a great deal of manual labor and even then the fits secured are such that after welding it has heretofore been considered normal to have a very large proportion of leaking tanks which have to be mended before use.

The vessel is adapted to be assembled on automatic hydraulic machinery upon which it may be welded while held in position. I have found assembly may be made very easy, providing shell and bottom are offset to provide a shoulder upon each which serves as an automatic stop upon pressure assembly of the vessel and likewise provides an area of definition for a circular weld automatically performed while held in pressed relationship.

The invention is illustrated in the drawings in which:

Figure 1 is a diagrammatic illustration of the assembled vessel held in pressure relationship in a hydraulic apparatus wherein it may be welded;

Figure 2 is a side elevation of the pressure storage vessel;

Figure 3 is a plan view of the top;

Figure 4 is a plan view of the bottom;

Figure 5 is a detailed fragmentary vertical sectional view of the head construction;

Figure 6 is a similar view of the detail of the bottom construction;

Figure 7 is a fragmentary vertical sectional elevation after galvanization and welding; and

Figure 8 is a vertical sectional view of a bottom before formation of the shoulder.

As shown in the drawings, the vessel comprises a generally cylindrical sheet metal shell 10, which is provided with a relatively small crimped area which forms the flange 11 at the top which provides a shoulder 12. The depth of the shoulder 12 is approximately the thickness of the metal in the head 13. The head 13 is a domed sheet metal cap whose exterior diameter is substantially that of the shell 10 and whose interior diameter is the same as the outer diameter of the flange 11.

The head is provided with openings 14 which may serve as pipe connections. The shell is likewise provided with

a suitable number of openings 15 which serve for suitable pipe connections.

The bottom 20 comprises a sheet metal structure of substantially the same thickness as the head of the vessel. It has a web portion 21 and a short, downwardly depending flange 22. The web is usually dished inwardly or outwardly. At the bottom this flange is flared outwardly forming a shoulder of about the same depth as the thickness of the shell 10. A terminal flange 24 extends downwardly from the shoulder 23. It is, of course, obvious that this flange may be eliminated if desired or may be cut off after formation of the vessel. Normally, it is preferred not to do so.

The formation of the bottom is important. It has not been found satisfactory to produce a cylindrical bottom and then crimp the upper portion thereof to provide the shoulder 23. Efforts have been made to do this over a long period completely without success. I have found, however, that the bottom may very simply be produced in the manner shown. Figure 8 shows the bottom before formation of the shoulder and indicates in dotted line its shape after formation. This is produced by use of an upsetting die by which the shoulder 23 and the flange 24 are offset outwardly from the main body of the metal.

After the bottoms have been formed as indicated in Figure 8, the top, shell, and bottom are aligned in the hydraulic machine 30 and pressure is applied so that the elements are telescoped together to take the form shown in Figure 2. In this operation, the bottom of the flange 16 of the top is brought against the shoulder 12 which serves as a stop as well as an aligning means so that the top is properly and evenly aligned with the shell. Similarly, the bottom of the shell is brought against the shoulder 23 which serves as a stop and aligning device for bringing the bottom and shell into proper relationship.

When the assembly has been completed, the elements are welded together while held in the machine, the elements being rotatable therein and the two welds being applied by automatic means operating simultaneously while so held and rotated. The preferred welding is by submerged arc. The welds are indicated at 40 and 41 in the groove or valley formed between the ends of the top and bottom and their respective shoulders engaged thereby as clearly shown in Figures 5 and 6.

After the welding has been completed, the vessel is galvanized by the hot method. The entire vessel is submerged in the molten zinc bath, submergence being through a portion of the bath which has a layer of molten flux on its surface. The flux enters the openings 14 in the top of the vessel and also the drain plug opening 42 in the bottom as well as the openings 15 in the shell. After immersion, the vessel is withdrawn and drained, preferably while being held in upside down position so that the surplus molten metal will be exhausted through the various openings and particularly through the openings 14. The enlarged view of Figure 7 shows a layer of galvanizing 45 on both the inside and outside of the tank at the juncture of the head 13 and shell 10.

It is important that the flanges 22 and 11 of the bottom and shell respectively be tapered and that the outermost portion of the taper in each case be slightly more than the internal diameter of the shell. In this way, a tight fit is secured all the way around and air pockets are avoided which might cause difficulty in the welding. It is also important that the slope and length of this flange be identical in all cases so that the position of successive pressure vessels on the hydraulic machine shall be identical; otherwise, it is necessary to adjust one or more of the welding heads.

It will be noted in Figure 1 that the welding heads 50 may be mounted in permanent adjustable position above

the vessel. The heads may be moved for work on different sized vessels and once set, will need very little further adjustment.

In carrying out the welding operation, the grooves between the head and the shell and between the shell and the bottom are utilized as the fillet grooves for the welding operation, thus avoiding the necessity of grinding or otherwise forming these grooves.

In assembling the device in the hydraulic machine, a pressure of several tons may be employed to bring the portions of the assembly into proper alignment. This pressure is maintained during the entire welding operation and avoids the distortion or skewing which normally takes place in the welding of such vessels.

The foregoing detailed description has been given for clearness of understanding only and no unnecessary limitations should be understood therefrom as modifications will be obvious to those skilled in the art.

I claim:

The method of assembling a sheet metal pressure storage vessel composed of a shell, a head, and a bottom constructed to fit together telescopically which comprises the steps of, reducing one end of a metal cylindrical shell to provide an annular shoulder and an end portion having an outside diameter approximately that of the inside diameter of the shell, forming a cap-like head having an inside diameter equal to the outside diameter of the reduced end of the shell and an outside diameter equal to the outside diameter of the major portion of the shell, forming a bottom with a circular web portion and an annular depending flange having an outside diameter substantially equal to the inside diameter of said shell, upsetting said flange to provide an annular shoulder and a further depending flange having an outside diameter equal to the outside diameter of the major portion of the shell, positioning said head, shell and bottom in disassembled aligned relationship in the order in which they fit together, applying pressure axially of the elements to telescope them together a predetermined distance to said shoulders and to their final positions, and simultaneously rotating and welding the head and bottom to the shell while maintaining the axial assembling pressure.

References Cited in the file of this patent

UNITED STATES PATENTS

150,922	Wieesbrock	May 12, 1874
489,644	Tripp	Jan. 10, 1893
621,540	Reynolds	Mar. 21, 1899
1,097,744	Avery et al.	May 28, 1914
1,921,241	Priebe	Aug. 8, 1933
2,313,393	Mitchell	Mar. 9, 1943
2,350,720	Brodie	June 6, 1944
2,459,954	Morgan	Jan. 25, 1949
2,517,853	Eickmeyer	Aug. 8, 1950
2,551,484	Branning	May 1, 1951
2,613,015	Keating	Oct. 7, 1952

FOREIGN PATENTS

43,457	Austria	Aug. 10, 1910
677,974	Great Britain	Mar. 12, 1952