Feb. 24, 1942. E. R. BARRETT 2,274,519

HYDRAULIC CYLINDER CONSTRUCTION

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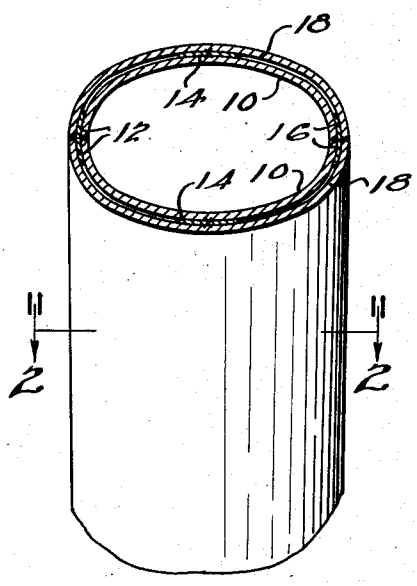

FIG. 1.

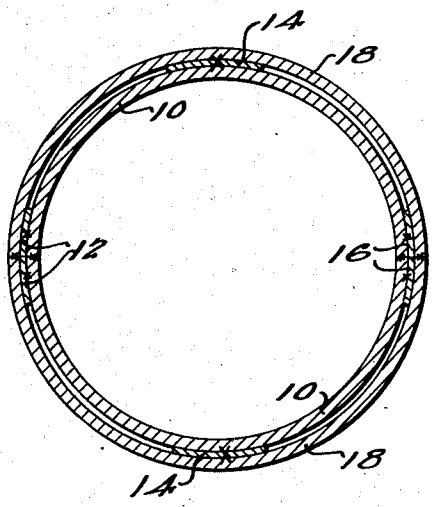

FIG. 2.

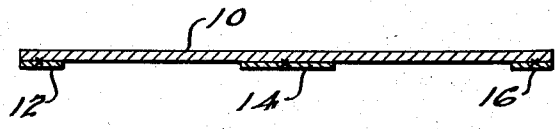

FIG. 3.

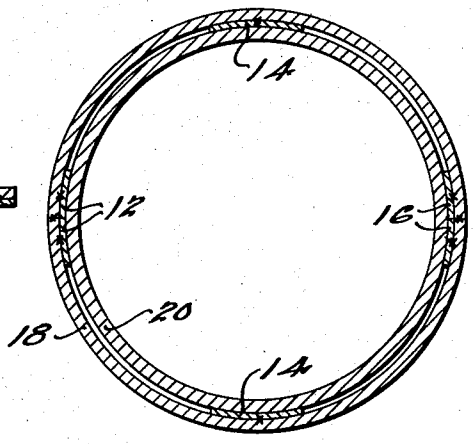

FIG. 5.

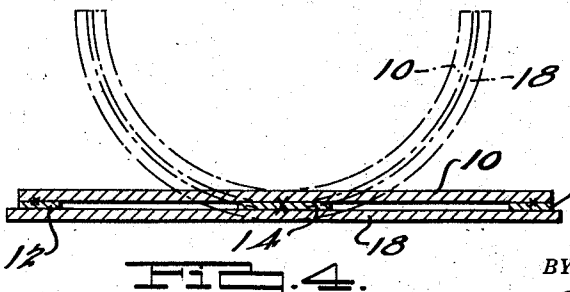

FIG. 4.

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HYDRAULIC CYLINDER CONSTRUCTION

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4 Claims. (Cl. 29—156.4)

This invention relates to the construction of double walled hydraulic cylinders.

The main objects of this invention are to provide an improved method and process for fabricating a double walled hydraulic cylinder, and to provide a construction of double walled hydraulic cylinder of materially lower cost than has heretofore been possible.

An illustrative embodiment of this invention is shown in the accompanying drawing, in which:

Fig. 1 is a fragmentary view in perspective of a double walled cylinder formed in accordance with this invention;

Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1 looking in the direction indicated by the arrows.

Fig. 3 is an edge sectional view of one of the plates from which the cylinder is formed during the first step of its fabrication, and showing spacer strips welded thereto;

Fig. 4 is a similar view showing two plates one interposed upon the other in full lines and in dotted lines the form given to the two plates during a further step of fabrication; and,

Fig. 5 is a sectional view of a modified form of a double walled cylinder in which the inner cylinder is seamless.

In certain arts and industries, such as in the manufacture of hydraulic jacks, it is some times desirable to fabricate and provide a cylinder used as a piston which is of double walled construction with a space between the walls which provides a fluid passageway so that fluid may be conducted from one end of the cylinder or piston to the other through this inner passageway.

Heretofore in the art it has been customary to form these double walled pistons by taking two seamless steel tubes, one of which has a lesser outside diameter than the inside diameter of the other, placing these tubes one within the other, and providing suitable means for holding them in rigidly spaced relation.

Now in the construction of seamless steel tubing, the wall thickness varies in substantially all instances. That is to say the tube at one side will have a certain wall thickness and at a point opposite or at other points it will have a different wall thickness. This is true, of course, of both the inner and outer tubes, and when placed together, it is extremely difficult to have the outer wall of the outer tube concentric to the inner wall of the inner tube without a very considerable amount of machine work being done on the inner or outer surfaces, or both. Furthermore, the space between the two tubes will vary to a great extent due to the varying thickness of the tube walls. Furthermore, seamless steel tubing made with any reasonable degree of accuracy is relatively expensive with the result that when a double wall hydraulic piston is made from two seamless steel tubes which in and of themselves are expensive in the first instance, and then added to that the cost of considerable machining to bring their respective inner and outer surfaces into concentricity, the result is that the finished article is very high priced as compared to a single wall piston.

The high cost of manufacture of double walled pistons when made from two seamless steel tubes has been a big obstacle and drawback to the utilization of hydraulic jacks employing double wall piston, and in some instances the cost has been really prohibitive from a commercial standpoint.

On the other hand, there are certain installations of hydraulic jacks, particularly in connection with some types of motor truck dump bodies, wherein it is most desirable and nearly necessary that the hydraulic jacks be of what is generally known as the telescoping type and which employ the double walled pistons in order to vent the fluid back to the low pressure side of the hydraulic pump when the multiple pistons have been extended to a predetermined point.

It is understood, of course, that in the use of hydraulic jacks of this character, it is customary for the operator to start the hydraulic pump and turn his valve so that the fluid under pressure is delivered to the hydraulic jacks and that it would be extremely difficult and well nigh impossible for him to shut off the pump at the exact moment the pistons reach their fully extended position. Some pumps, of course, have been provided with by-passes so that when pressures reach a certain determined amount, the fluid will not wreck the hydraulic system, but will be by-passed within the pump, but this means that the pressures must go up to an extremely high point, otherwise the pumps will not perform their desired function when the truck bodies are heavily loaded. The usual and desirable way to have this arranged is for the hydraulic jacks to uncover a passageway when they have extended to a predetermined point which will allow the fluid to flow back into the low pressure side of the system.

In Figs. 1, 2 and 4 of the drawing, the double walled cylinder is formed from flat rolled rectangular shaped plates, that is to say, from

standard rolling stock. A plate 10 of suitable dimensions and preferably rectangular in shape has three spacer strips 12, 14 and 16 welded thereto. The strips 12 and 16 being positioned along opposite marginal edges, and the strip 14 being secured along substantially the medial portion of the plate. These strips are preferably of the same length as the plate 10, although a series of spaced strips of shorter length may be used with spaces between, if desired.

The plate 10, with the spacer strips welded thereto, is then superimposed upon a plate 18 which is preferably of slightly greater width than the plate 10, as shown in Fig. 4 of the drawing. The plate 18 is then welded to the medial spacer strip 14, and then both plates are formed to semi-cylindrical shape, as shown in dotted lines in Fig. 4. Due to the slightly greater width of the plate 18, when the two plates are formed into semi-cylindrical shape, the axially extending side edges are substantially radial with respect to the center of curvature, and at this time the opposite marginal edges of the plate 18 may be welded to the spacer strips 12 and 16.

Two such formed shells are then abutted with their axial side edges in registry, as shown in Fig. 2 of the drawing, at which time they are welded together, thereby forming a double wall cylinder with axially extending spaces between the walls thereof. In instances where the spacing strips are of extremely short length, the space between the two walls is substantially angular and continuous except for the slight interruptions of the spacer locks.

After the two semi-cylindrical shells have been welded together to form a complete double walled cylinder, then the inner and outer surfaces at the points of weld may be ground off flush with the inner and outer surfaces of the tubes, which operation is readily done and relatively inexpensive.

In the modification shown in Fig. 5 of the drawing the inner wall of the double walled cylinder is formed of a length of seamless steel tubing 20 to which is welded two plates of the kind shown in Fig. 3. That is to say, two plates, such as shown in Fig. 3, after having the spacing strips 12, 14 and 16 welded thereto, are then formed in semi-cylindrical shape, and two of such semi-cylindrical shells are abutted edge to edge and welded to each other and to the inner seamless steel tubing 20.

In the use of double wall cylinders in hydraulic systems of this character, it is immaterial whether the spacer strips 12, 14 or 16 are of continuous character and extend the full length of the cylinder, or are of shorter length with spaces therebetween. Suitable capacity may be provided between the inner and outer cylinder walls by varying the thickness of these spacer strips, and by varying their width so that ample communication for the passage of fluid may be had depending upon the requirement of the particular installation.

As will be readily seen from the foregoing, a tube such as shown in Fig. 2 of the drawing, may be made entirely from rolled flat strip stock, and with very little forming and a minimum of machining to finish the job, a double walled cylinder may be constructed of relatively low cost materials and with low cost of fabrication. The result is a double walled cylinder having a total low cost, and which compares in cost most favorably with a single wall seamless steel tube.

In the modification shown in Fig. 5, the cost is slightly greater due to the fact that the inner wall comprises a seamless steel tube which is of relatively greater cost in the first instance.

One of the important advantages secured by utilizing the present invention is that rolled plate stock is extremely accurate as to dimension of thickness with the result that when the double walled cylinder is formed, as in Fig. 2, concentricity is automatically secured between the inner wall of the inner tube and the outer wall of the outer tube which thereby eliminates expensive machine work to secure the necessary concentricity between these inner and outer wall surfaces. This is an extremely advantageous feature of utilizing rolled stock which is of very uniform and precise thickness throughout its length and breadth so that cylinders of substantial length may be made by this method, and which are truly concentric as to their inner and outer wall surfaces with a minimum of machine work.

Although but two specific embodiments of the present invention have been described, it will be appreciated that various changes in the form, number and arrangement of parts may be made within the spirit and scope thereof.

What is claimed is:

1. The method of forming a double wall cylinder which comprises the welding of longitudinally extending spacer strips to one side of a rectangular metal plate, superimposing a second rectangular metal plate upon said first plate in contact with said spacer strips, providing a free space between said plates, welding said second plate to at least one of said strips, forming said attached plates into a semi-cylindrical double wall shell, welding said second plate to the other of said spacer strips, placing two such shells with their axially extending edges in abutting relation and welding said abutting edges to form a double wall cylinder.

2. The method of forming a double wall cylinder which comprises the welding of at least three longitudinally extending spacer strips to one side of a rectangular metal plate, one of said strips being positioned substantially along the longitudinal center line and the other two strips being positioned adjacent the longitudinal edges of said plate, superimposing a second rectangular plate upon said first plate in contact with said strips, providing a free space between said plates, welding said second plate to the medial spacer strip, forming said attached strips into a semi-cylindrical double wall shell, welding said second plate to the other of said spacer strips, placing two such shells with their axially extending edges in abutting relation and then welding said abutting edges to form a double wall cylinder.

3. The method of forming a double wall cylinder which comprises the welding of at least three longitudinally extending spacer strips to one side of a rectangular metal plate, one of said strips being positioned substantially along the longitudinal center line and the other two strips being positioned adjacent the longitudinal edges of said plate, superimposing a second rectangular plate of slightly different width upon said first plate in contact with said strips, providing a free space between said plates, welding said second plate to the medial spacer strip, forming said attached strips into a semi-cylindrical double wall shell, welding said second plate to the other of said spacer strips, placing two such shells with

their axially extending edges in abutting relation and then welding said abutting edges to form a double wall cylinder.

4. The method of forming a double wall cylinder which comprises the welding of spacer pieces to a plate, placing another plate upon said spacer pieces and welding said second plate to at least one of said spacer pieces, providing a free space between said plates, forming said attached plates into semi-cylindrical shape, welding said second plate to the other of said spacer pieces, placing two of such formed double plates together and welding their abutting edges to form a double wall cylinder.

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