Feb. 2, 1937. C. B. CUSHWA 2,069,198

APPARATUS FOR MAKING DISHED HEADS

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Fig. 1.

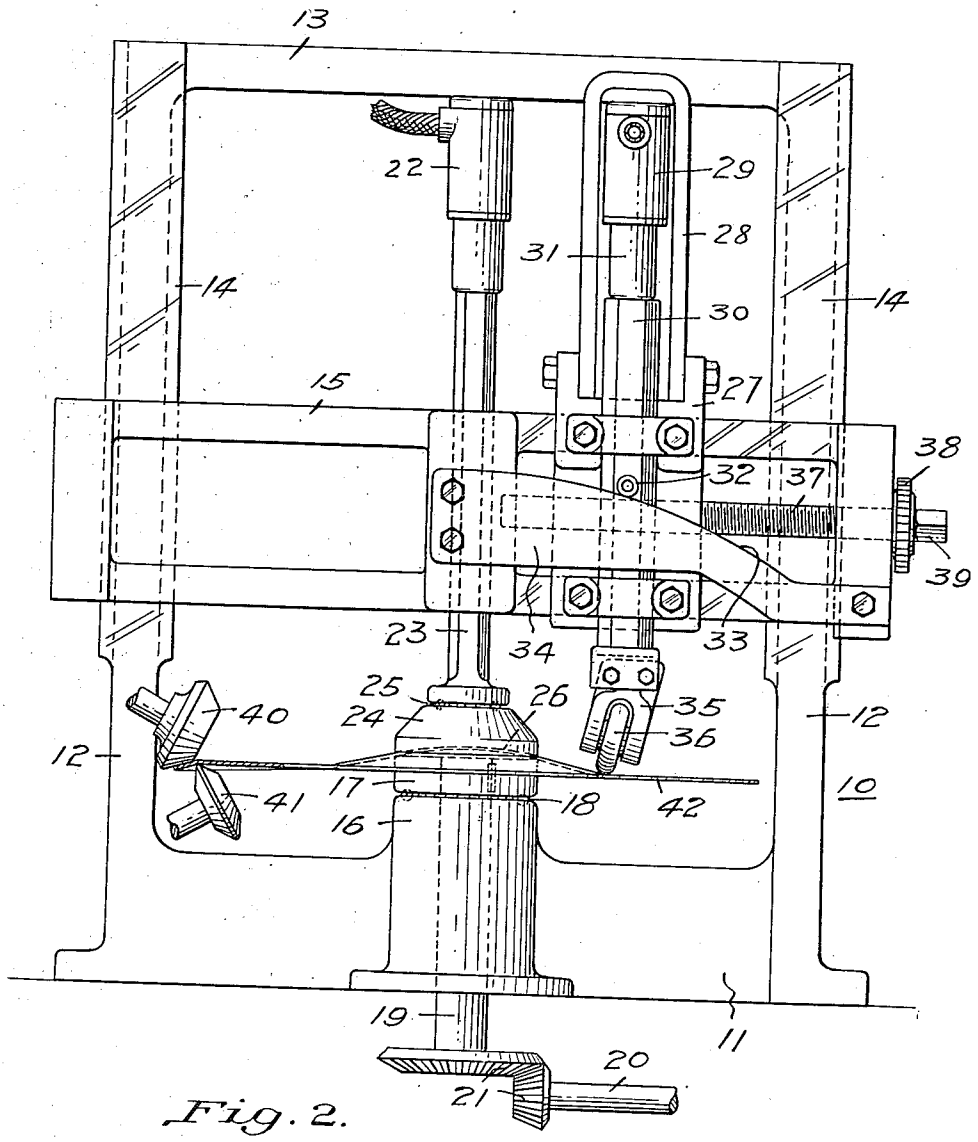


Fig. 2.



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Fig. 3.

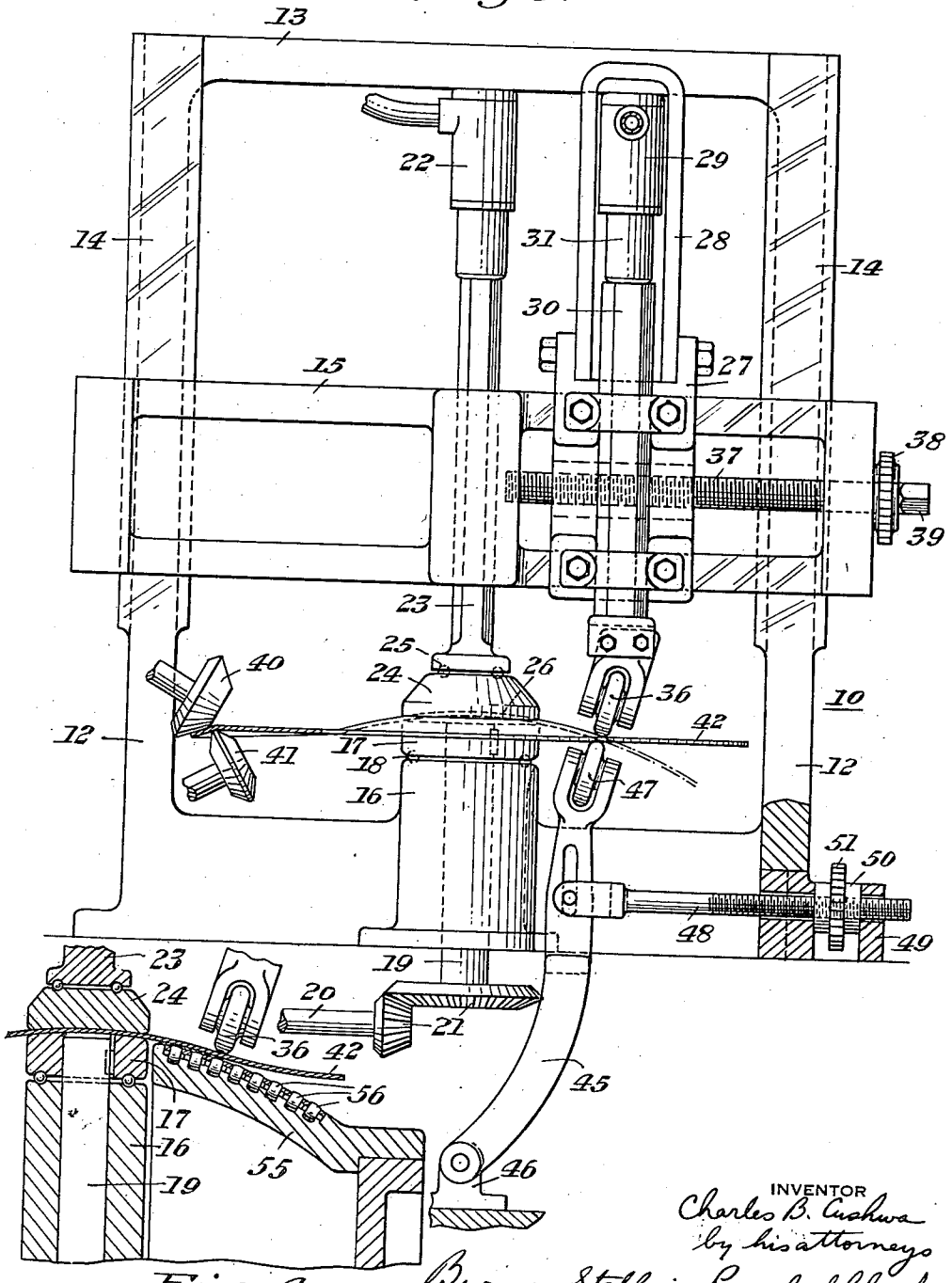


Fig. 4.

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APPARATUS FOR MAKING DISHED HEADS

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Application October 19, 1933, Serial No. 694,256

3 Claims. (Cl. 113—52)

My invention relates to the manufacture of so-called dished heads such as are employed for closing the ends of metallic cylinders to form tanks and the like.

The present practice of manufacturing dished heads includes the punching of a circular metallic plate and the spinning thereof over a form to give it the required degree of curvature. This practice is objectionable for several reasons and, principally, because of the cost of the forms. It will be apparent that a separate form is required for every size of head and for all the different degrees of curvature so that the stock of forms necessary to enable a manufacturer to produce even a moderate range of sizes and shapes of dished heads represents a considerable investment.

In accordance with my invention, I manufacture dished heads by spinning a flat metal plate without the use of a supporting or shaping form of the usual character. I provide means for suitably clamping the plates in a rotatable support and subjecting it to the action of spinning rollers, guiding the travel of the rollers to impart the desired shape to the head. In this way, the cost of the usual supporting form is entirely eliminated and a marked reduction in the cost of producing dished heads is effected.

In accordance with my method of manufacturing heads, a metallic plate, usually square, is taken from stock and has its corners clipped so that it presents a roughly rounded outline. The plate is then centered in the rotating support and clamped therein. The support is then driven and a cutting tool is brought into engagement with the edge of the spinning plate to round it accurately. On completion of the trimming operation, the edge of the now circular plate is subjected to the action of flanging rolls to produce a flanged edge on the head. The body portion of the plate is then subjected to the action of a dishing roll to impart the desired degree of curvature thereto. The path of the dishing roll is determined in conformity with the desired degree of curvature in the finished head and I find that a satisfactory product may be made without the use of the usual type of forms.

For a complete understanding of the invention, reference is made to the accompanying drawings illustrating a present preferred embodiment of apparatus for carrying out the method of the invention. In the drawings:

Figure 1 is a side elevation of an apparatus for performing the method of this invention;

Figure 2 is a sectional view taken along a diameter of a finished head;

Figure 3 is a view similar to Figure 1 showing a modified form of the invention; and

Figure 4 is a partial sectional view showing a further modified form of the invention.

Referring now in detail to the drawings, the preferred form of apparatus embodying the invention and effective to perform the method thereof comprises a frame 10 including a base 11, columns 12 and a head piece 13 connecting the columns. The columns 12 are provided with guides 14 and a cross head 15 is vertically slidable thereon. The cross-head may be held in adjusted position by any suitable means.

The base 11 carries a fixed abutment 16. A supporting member 17 is rotatably mounted on the abutment 16 above a thrust bearing 18. A vertical drive shaft 19 is journaled in the abutment 16 and is keyed to the support 17. Any suitable means, such as a shaft 20 with bevel gearing 21, may be provided for driving the shaft 19.

A fluid cylinder 22 is supported on the head piece 13 and is provided with an extensible piston 23. The piston 23 is adapted to exert a downward pressure on a rotatable clamping member 24 through a thrust bearing 25. The lower face of the clamp 24 is slightly concave, as at 26.

The cross-head 15 is provided with a transversely movable carriage 27. A yoke 28 supported on the carriage is provided with a fluid cylinder 29. A post 30 is slidable vertically in the carriage 27 and is adapted to be actuated by a piston 31 reciprocable in the cylinder 29. The post 30 has a roller 32 engaging a curved surface 33 of a guide plate 34 removably attached to the cross-head 15, for example, by bolting to pads adjacent the middle and one end thereof. The post 30 is provided with a bearing 35 adjacent the lower end thereof for a spinning roller 36.

An adjusting screw 37 extends longitudinally of the cross-head 15 and is suitable journaled therein. The screw has threaded engagement with the carriage 27 and, upon rotation, is effective for adjusting the carriage laterally of the cross-head 15. The screw 37 may be actuated by any convenient means, as an example of which I have shown a gear 38 and a squared end 39 adapted to receive a crank eye.

Flanging rolls 40 and 41 are shown diagrammatically and may be adjustably supported by any convenient means, not shown.

In the operation of the apparatus described to perform the method herein contemplated, the pistons 23 and 31 are both retracted and the carriage 27 is positioned as closely as possible to the center of the cross-head 15. The flat plate indicated at 42, which has preferably been roughly rounded, is placed on the support 17 and centered thereon, the post 30 being raised sufficiently to cause the roller 36 to clear the plate. The clamp 24 is then placed on the plate 42 and the post 23 of the cylinder 22 extended by the application of fluid pressure to the latter. The plate is thus securely clamped but is rotatable about

its approximate center. The clamped plate is then spun by driving the shaft 19 and a cutting tool is advanced into engaging relation with the edge of the plate to trim the latter to a truly circular disc. The cutting tool may be supported and operated by any convenient means, the numerous examples of which are so well known that no detailed description thereof will be necessary here.

The rolls 40 and 41 are next brought into operative engagement with the edge of the rounded plate. The roll 40 bends down the outer edge of the plate to form a flange, while the roll 41 supports the metal of the plate along the line of bend between the flange and the remainder of the plate. The next step is the application of fluid pressure to the cylinder 29 to extend the piston 31 and force the post 30 into engagement with the plate 42. The downward movement of the post 30, of course, is limited by the engagement of the roller 32 with the curved surface 33 of the guide plate 34. The effect of the engagement of the roller 36 with the plate 42 is to impart a decided dish to the latter, in accordance with the well known practice of spinning.

The screw 37 is turned at a suitable rate to cause traversing movement of the carriage 27 along the cross head 15. The spinning roller 36 thus moves radially of the plate 42 and completes the dishing operation. As the carriage 27 moves, the roller 32 rides down the surface 33 and the roller 36 thus moves in a curve determined by the shape of the surface 33. The curvature of the finished head thus conforms to that of the surface 33, as will be apparent from Figure 2 showing a finished head.

When the spinning has been completed, the finished head will appear as shown in Figure 2 and may be readily removed from the apparatus by releasing the pressure in the cylinder 22. On retraction of the piston 23, the clamp 24 may be lifted off and the finished head removed from the support 17. The carriage 27 is then returned to its substantially central position and the apparatus is ready for the next operation.

The modified form of the invention shown in Figure 3 is similar in many respects to that of Figure 1 and corresponding parts are designated by the same reference numerals. The chief distinguishing feature is the means for guiding the roller 36. In the modification of Figure 2, this means takes the form of an arm 45 pivoted in fixed bearing 46. The upper end of the arm 45 carries a roller 47 adapted to cooperate with the roller 36 to form the plate 42 to the desired curvature. The movement of the arm 45 is controlled by a screw shaft 48 journaled in one of the columns 12. A platform 49 at the foot of the column 12 provides a seat for a nut 50 threaded on the shaft 48. The nut 50 is actuated by a gear wheel or sprocket 51 mounted thereon which may be driven by any convenient means, such as gearing or a chain, at a speed proportional to that at which the screw shaft 37 is driven. The movements of the rollers 36 and 47 are thus properly coordinated and they cooperate at all times to effect the desired shaping of the plate. It will be apparent that the length of the arm 45 determines the radius of the curvature imparted to the plate. The arm thus replaces the guide plate 34 of the modification of Figure 1, for controlling the shape of the finished head. Obviously, different degrees of curvature may be produced by suitably proportioning the length of the arm 45.

Figure 4 shows a further modification which is somewhat similar to that of Figure 3 except that I utilize a fixed anvil 55 for cooperation with the roller 36 to form the plate. The anvil is fixed and is provided with a series of rolls 56 having their axes extending longitudinally thereof. The rolls 56 define a curve to which the plate is shaped by the roller 36 on rotation of the support 17. A different anvil will be used for each different radius of curvature of the finished head as desired, or the rolls 56 may be adjustable on the anvil 55. The rolls prevent any friction between plate and anvil and also avoid marking of the plate.

It will be apparent from the foregoing description that the invention provides an apparatus and method for manufacturing dished heads at relatively low cost and avoids the necessity of providing a costly stock of spinning forms of various shapes and sizes. It is obvious that a guide plate of the character of that shown at 34 can be produced quickly and cheaply for use in the manufacture of a head of almost any shape and size within the limits of the design of the apparatus. In addition to being much less expensive than the forms previously used, the guide plates are also much less bulky and can, therefore, be stored much more easily and efficiently.

The invention described is obviously susceptible of numerous variations and modifications. The edge flanging operation, for example, instead of being effected prior to the dishing of the head, may just as well follow the dishing operation. Although I have illustrated and described herein but one specific embodiment of the apparatus and one example of the method which may be conveniently performed thereby, the invention may be otherwise practiced without departing from the spirit thereof or the scope of the appended claims.

I claim:

1. Apparatus for making dished heads comprising a frame, a rotatable support in the frame, a hydraulic jack on the frame for clamping a plate on the support, a cross-head extending transversely of the frame, a carriage movable along the cross-head, a tool post adjustable vertically on the cross-head, a hydraulic jack normally exerting a force longitudinally of said tool post, and a pivoted arm for controlling vertical movement of the tool on lateral movement of the carriage.

2. In an apparatus for forming dished heads, a frame, a transversely movable carriage, a post reciprocable in said carriage and having a dishing roll thereon, a fluid cylinder and piston for urging said post in one direction, and an arm pivoted for movement in the same plane as the carriage, effective on lateral movement of said carriage for retaining the post at progressively changing elevations.

3. Apparatus for forming comprising a rotating work support, a forming roll, means for guiding said roll for transverse and vertical movement relative to the work, an arm pivoted for transverse swinging movement in the same plane as said roll, a cooperating forming roll journaled on said arm effective to support and determine the vertical position of the first-mentioned forming roll, and means for moving both rolls transversely.

CHARLES B. CUSHWA.