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1,760,558

METHOD OF MAKING CYLINDRICAL ARTICLES FROM FLAT BLANKS

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Fig.1.

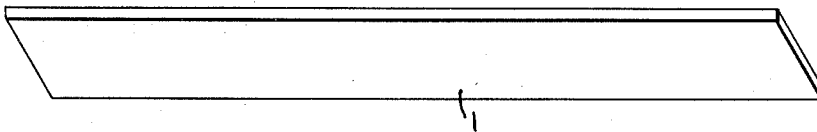


Fig.2.

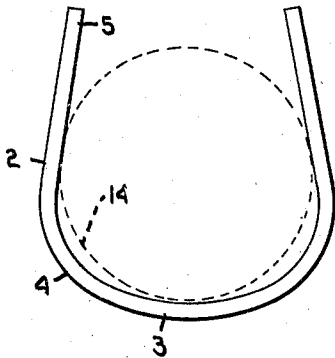


Fig.3.

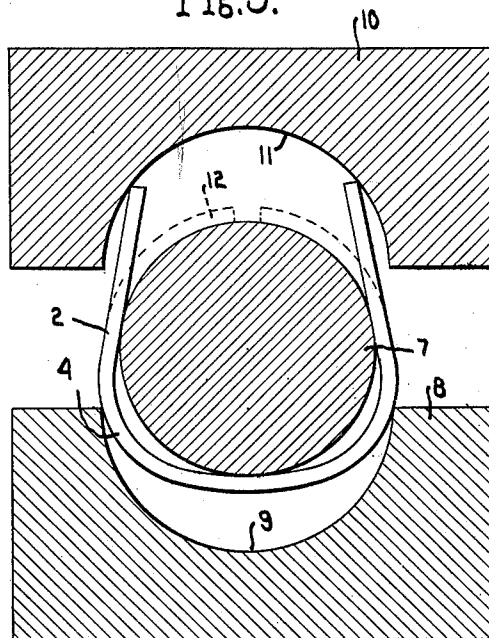


Fig.5.

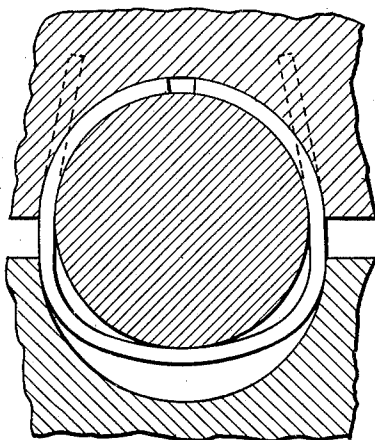
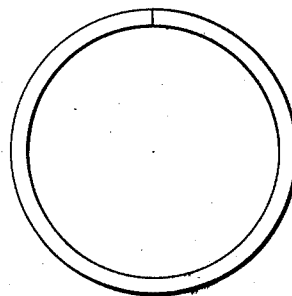


Fig.4.



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METHOD OF MAKING CYLINDRICAL ARTICLES FROM FLAT BLANKS

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The present invention, relating, as indicated, to a method of making bearings, is particularly directed to an improved method of forming flat strips into cylindrical bearings or other articles and to producing a finished cylindrical article in this general manner which shall be of uniform thickness and truly cylindrical in section with a minimum of operations.

To the accomplishment of the foregoing and related ends, said invention, then, consists of the means hereinafter fully described and particularly pointed out in the claims; the annexed drawing and the following description setting forth in detail one approved method of carrying out the invention, such disclosed mode, however, constituting but one of the various ways in which the principle of the invention may be used.

In said annexed drawing:

Fig. 1 is a view in perspective of a strip of flat stock; Fig. 2 is a transverse sectional view of the stock after the first step or operation of my improved method; Fig. 3 is a view of the partly formed article of Fig. 2 when placed in position for the finishing operation between dies formed for that purpose; Fig. 4 is a transverse sectional view of the completed cylinder; and Fig. 5 is a view similar to Fig. 3, but illustrating a further stage in the manufacture of the bearing shown in Fig. 3.

In forming flat stock into cylindrical articles it is customary to first form a strip of flat stock into a U-shaped piece between male and female dies having the contour and dimensions of the finished cylinder. In other words, the strip of flat stock is forced into a semi-cylindrical die which has a diameter equivalent to the finished outside diameter of the cylinder to be produced by means of a cylindrical punch which has a diameter equal to the finished inside diameter of the cylinder to be produced. The result of this operation is the formation of a U-shaped strip, the bottom portion of which is of the finished size and shape. The following operations consist in flowing the upwardly projecting and parallel sides of the U over a cylindrical mandrel until the edges of the two sides meet. It is then necessary to again work the cylin-

der between dies to force the two abutting edges into contact and this last operation is really a swaging operation made necessary because otherwise the two edges of the metal will project tangentially upwardly and outwardly away from the mandrel due to the inherent resiliency of the metal. The final forming operation invariably results in either a thickening of the strip adjacent to the seam, that is the abutting edges, or to the formation of a flattened portion along this seam, so that the resulting cylinder is not accurate in thickness and is not truly cylindrical.

The present invention is directed to a method of producing bearings to avoid this lack of uniformity in the thickness of the metal and to secure a perfect abutment of the meeting edges of the stock and a truly cylindrical contour in the finished article.

Referring now to Fig. 1 there is shown a blank of flat stock 1 of suitable material, such, for example, as bearing brass. This blank is first placed over a semi-cylindrical die, into which it is pressed by means of a cylindrical punch of suitable form and bent and worked into the channel form 2, which is shown in Fig. 2. The form which is given to the curved bottom portion 3 of the blank 2 can be seen by reference to the circle 14 shown in dotted lines within the channel, which represents the finished inside diameter and form of the cylinder to be produced, and by reference to this it will be seen that the blank has been formed with its corners 4 bent about a shorter radius than the radius of the circle 14, that is, a radius that is shorter than the finished inside radius of the cylinder. The upper edges 5 of the channel are bent inwardly out of parallelism so that they incline toward each other.

The preliminarily formed channel 2 is next finished in a similar operation in the manner illustrated in Fig. 3. A mandrel 7 having an outside diameter equal to the desired finished inside diameter of the cylinder is first placed inside of the channel, after which the channel and mandrel are placed upon a die 8 having a semi-cylindrical recess therein having a diameter equal to the outside diameter of the cylinder to be produced. The channel initially rests upon the edges or corners of this

recess 9 in the die 8, and the channel is worked into its finished form by means of a die 10 having a semi-cylindrical recess 11 therein of diameter equal to the finished outside diameter of the cylinder, which is moved toward the die 8, engaging over the upper edges or portions 5 of the channel blank 2. The action of these dies as they approach each other is of course to force toward each other and over against the mandrel 7 the edges 5 of the channel blank into the position shown in dotted lines 12, and to also force the lower corners or projecting cheeks 4 of the blank into contact with the lower portion of the mandrel 7. The action which the blank is made to undergo produces a flowing of the side walls of the channel blank between dies consisting, of course, in one case of the lower die 8 and the mandrel 7, and in the other case of the upper die 10 and the mandrel 7, and this action is entirely different from the folding of the projecting upper edges of the blank, which is the action effected during the corresponding operation of the present method. When metal is bent over a die or article it of course springs back slightly, due to the inherent resilience, but when metal is forced between dies it is caused to flow and retain the shape into which it is flowed, and that is the action which is produced on the channel blank during the forming operation just described, with the result that the upper edges of the blank abut against each other and retain the true cylindrical shape into which they have been caused to flow during this operation.

The finished cylinder is of absolutely uniform thickness and is a true cylinder, as shown in Fig. 4. The chief difference between the present method and the one now in general use is that in the present method all parts of the blank are being worked and caused to flow during both the forming and the finishing operations, and because of this action the blank remains in the form which it is given between the finishing dies. In the method now in general use the first operation forms the lower half of the cylinder and this portion of the blank is not operated upon or changed during the finishing operation, the latter operation merely causing the upper portions, or the sides of the channel, to be folded over against each other, that is, first one-half of the cylinder is formed and then the other half, and in neither case is any portion of the blank caused to flow between dies. In the present method all portions of the blank are at some time during the formation of the cylinder caused to flow between dies and almost all of the metal of the blank is being caused to flow during the finishing operation to produce a set at all points in the metal wall and to prevent any thickening or flattening of the stock by reason of any

subsequent hammering or swaging operation to set the metal at the abutting edges.

The present method produces not only distinctly better and truer cylinders from sheet stock, but is also more rapid as one operation is entirely eliminated. Furthermore, by reason of the greater accuracy the scrap losses are practically entirely eliminated and the resulting product is suitable for uses to which the product of the previous process could not be applied at all.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the process herein disclosed, provided the step or steps stated by any of the following claims or the equivalent of such stated step or steps be employed.

I therefore particularly point out and distinctly claim as my invention:—

1. In a method of making cylindrical articles from flat blanks, the steps which consist in first forming a flat blank into a U-shaped channel of which the base of the U has a plurality of radii different from that of the desired finished cylinder, and then causing the metal in the side walls and bottom of the U-shaped channel to flow into true cylindrical shape.

2. In a method of making cylindrical articles from flat blanks, the steps which consist in forming a flat blank into a U-shaped channel having a non-cylindrical base portion formed of a plurality of radii and then forming such non-cylindrical base portion into truly cylindrical form and forcing the side walls of said channel into circular form with abutting edges.

3. In a method of making cylindrical articles from flat blanks, the steps which consist in forming a flat blank into a U-shaped channel, the base of which is larger than the desired finished article and then forming said channel into cylindrical form while causing all of the metal in said blank to flow between dies.

4. In a method of making cylindrical articles from flat blanks, the steps which consist in forming a flat blank into a U-shaped channel, the base of which is larger than the desired finished article and then forming said channel into cylindrical form while simultaneously flowing the metal of the channel and changing the curvature of the base thereof.

5. In a method of making cylindrical articles from flat blanks, the steps which consist in forming a flat blank into a U-shaped channel having convergently directed upper arms and a base portion having a plurality of radii different from that of the desired finished cylinder, and then causing the metal in said arms to flow into cylindrical form and thereby acquire a permanent set.

6. In a method of making cylindrical

articles from flat blanks, the steps which consist in forming a flat blank into a U-shaped channel having convergently directed upper arms, and a base portion of a plurality of radii different from the desired final radius, and then forming said channel into a cylinder while causing all of the metal in said channel to flow between dies and thereby acquire a permanent set.

5 Signed by me this 19 day of November, 1926.

10 WILLIAM H. KLOCKE.

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