May 24, 1949. A. TUTTLE 2,471,083

MEANS FOR BENDING STRAIGHT STRIPS INTO ANNULAR COLLARS OR FLANGES BETWEEN A DISK AND OSCILLATING ROLLERS

Filed Nov. 21, 1947 2 Sheets-Sheet 1

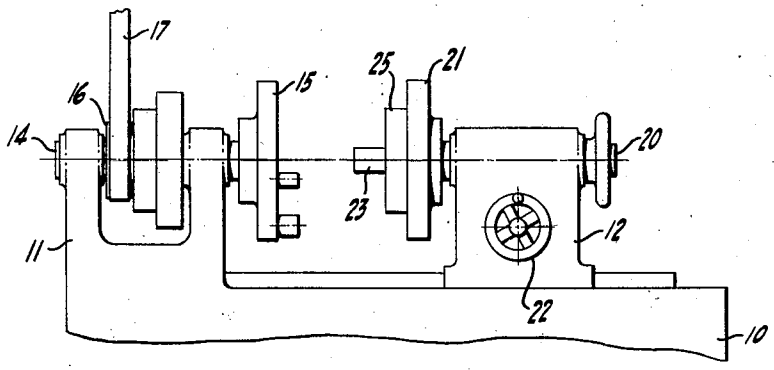


FIG. 1

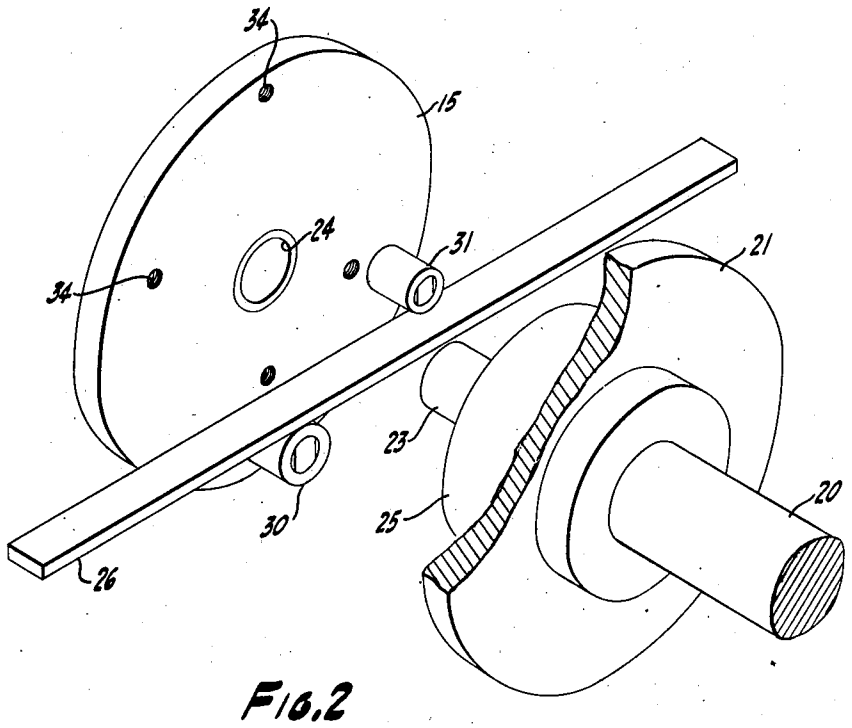


FIG. 2

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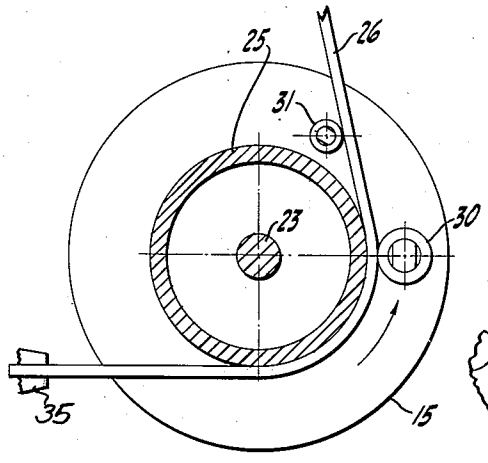


FIG. 3

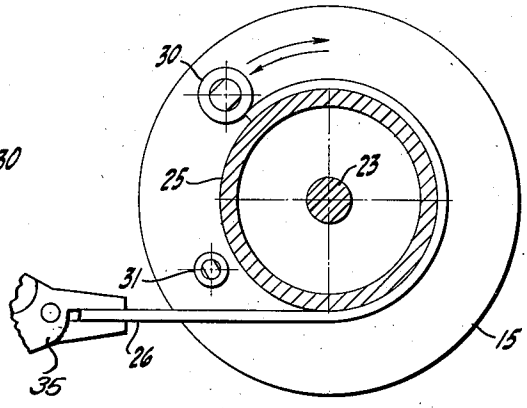


FIG. 4

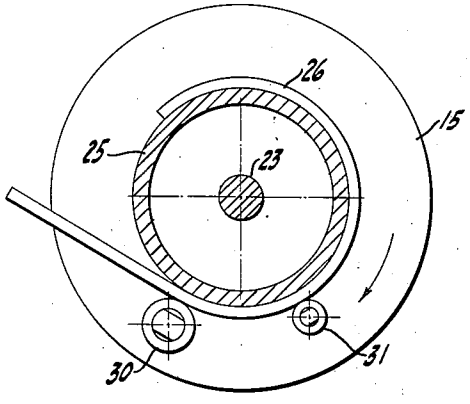


FIG. 5

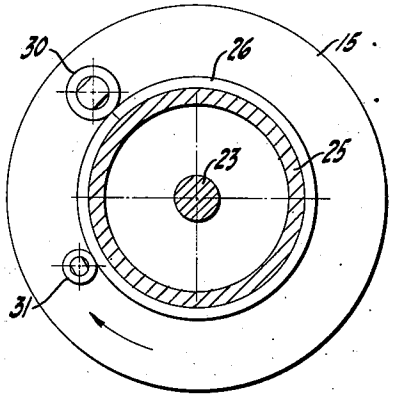


FIG. 6

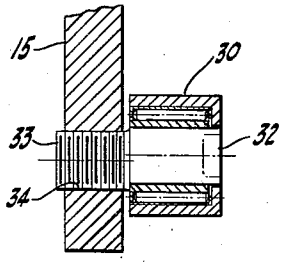


FIG. 7

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2,471,083

MEANS FOR BENDING STRAIGHT STRIPS INTO ANNULAR COLLARS OR FLANGES BETWEEN A DISK AND OSCILLATING ROLLERS

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Application November 21, 1947, Serial No. 787,352

9 Claims. (Cl. 153—45)

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The present invention relates to the manufacture of annular collars or flanges of metal or metal alloys and aims to furnish apparatus for manufacturing such objects in perfectly circular form at a minimum of cost and with a maximum of speed.

Broadly, therefore, it is an object of this invention to furnish means for manufacturing annular collars or flanges in an inexpensive, simple and efficient manner.

Another object of the invention is to furnish means for manufacturing annular collars or flanges, in a minimum of time.

More specifically it is an object of the present invention to furnish apparatus for transforming originally straight metal bars into collars or flanges of perfectly annular shape.

Furthermore, it is an object of this invention to furnish mechanism, of the type referred to, that is simple in construction, easy to manipulate and consequently capable of turning out large quantities of annular collars or flanges at minimum cost and within the shortest of time.

These and other objects of my invention will be apparent from the following description of the accompanying drawings which illustrate a preferred embodiment thereof, and wherein—

Figure 1 is a diagrammatical elevation of a machine embodying my invention, showing the particular mechanism which transforms an originally straight bar into an annular flange or collar, in an expanded position;

Figure 2 is a fragmentary perspective view of this mechanism with a blank properly positioned therein;

Figures 3, 4 and 5 are cross-sectional detail views of the mechanism illustrated in Figure 2 and represent successively later stages in the operation of the machine;

Figure 6 is an illustration similar to Figures 3, 4 and 5, representing the final stage in the manufacture of a metal collar in accordance with my invention; and

Figure 7 is a cross-sectional detail view illustrating the manner in which a roller of the type shown in the preceding figures may be arranged.

Referring to Figure 1, the machine of my invention comprises a bed plate 10 upon which is mounted a stationary support 11 and an adjustable carriage 12. Journaled in the stationary support is a horizontally disposed shaft or spindle 14 the inwardly directed end of which is provided with a circular plate or disc 15 firmly mounted upon said shaft for rotation therewith. The shaft 14 also carries a pulley 16 which may be operatively connected by a drive belt 17 with any suitable source of rotary power capable of selectively turning the shaft 14 in either direction of rotation, such as an electric motor (not shown).

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The adjustable carriage 12 supports a stationary spindle 20 in axial alignment with the rotary spindle 14 and firmly mounted upon the stationary spindle 20 near its inner end is another circular plate or disc 21 which may be identical in size with the disc 15, as shown. The adjustable carriage 12 is provided with a setting wheel 22 by means of which its axial distance from the stationary support 11 may be varied along the common axis of the spindles 14 and 20 from an operative position, in which the stationary disc 21 is situated adjacent to the rotary disc 15, to an expanded position in which the former is withdrawn from the latter in axial direction as shown in Figures 1 and 2. To insure perfect axial alignment of the two discs in operative position, the inner end of the stationary spindle 20 may be provided with a cylindrical mandrel 23 which is adapted to slide into and engage a corresponding bearing 24 in the center of the rotary disc 15.

Arranged coaxially with the stationary disc 21 and secured to the inwardly directed face thereof is a cylindrical anvil 25, as shown in Figure 2. The axial depth of the anvil 25 is equal to the width of the bar, that is to be transformed into a circular collar and which is designated with the numeral 26 in Figures 2 to 6. The circumference of the anvil 25 should be slightly larger than the length of said bar.

Pivoted to the inner face of the rotary disc 15 at points near the periphery thereof are two rollers 30 and 31 which are of an axial length equal to the axial depth of the anvil 25. These rollers are angularly spaced apart and may be of different size, as shown in Figure 2, with the clockwise roller 30 being preferably larger than the counterclockwise roller 31. These rollers should be so arranged that the spaces between their peripheral surfaces and the cylindrical surface of the anvil 25 equal the thickness of the bar 26, and in order that these spaces may be adjusted very precisely to the required size, means may be provided to slightly vary the position of the rollers on the disc 15 relative to the anvil 25. For this purpose the pivot 32 of each roller may be arranged to have a somewhat eccentric stem 33, as shown in Figure 7, and said stem may be formed in the manner of a screw bolt which is adapted to engage a correspondingly threaded socket 34 provided in the face of the rotary disc 15. Thus, by turning the pivot in its socket over an arc

of 180 degrees the position of its roller 30 or 31, as the case may be, relative to the cylindrical surface of the anvil 25 may be varied over a distance equal to twice the eccentricity of the pivot stem 33 relative to the pivotal axis.

The size of the angular interval between the rollers 30 and 31 is also of importance and is determined by a plurality of mutually opposing factors, as will appear from the following explanation of the manner in which the described mechanism is operated.

In preparation for the process of the invention the blank 26 is preferably somewhat softened in a suitable annealing furnace. To introduce the heated blank into the described mechanism the setting wheel 22 of the carriage 12 is operated to withdraw the anvil 25 from the rotary disc 15 and render the rollers 30 and 31 freely accessible. Assuming the rotary position of the disc 15 to be such that the clockwise roller 30 is located below the center of said disc, with the roller 31 spaced therefrom in counterclockwise direction as viewed in Figure 2, the blank is placed upon the roller 30 with its forward end passing underneath the roller 31, and is positioned tangentially with respect to the anvil 25, so that said anvil may slide freely into its operative position above said blank, when the setting wheel 22 is manipulated to move the stationary disc 21 toward the rotary disc 15.

The necessity of positioning the blank 26 on the roller 30 in the described manner relative to the anvil 25 and the roller 31 determines the lower limit for the angular interval between the rollers 30 and 31, because if the two rollers were located too closely together, it would be impossible to position the bar tangentially with respect to the anvil, and the latter could not be moved into its operative position with its cylindrical surface radially opposite to the peripheries of the rollers 30 and 31.

It will be understood that this lower limit for the angular interval between the rollers 30 and 31 is subject to variations depending upon the thickness of the blank and the size of the counterclockwise roller 31; for instance, if the thickness of the blank is large, such as in the case of bars that are to be bent edgewise to form circular flanges, it will be necessary to space the rollers further apart. On the other hand if the diameter of the roller 31 is small, such as in the exemplary embodiment illustrated in the accompanying drawings, the necessary angular spacing between the rollers may be correspondingly smaller.

With the blank 26 properly positioned and the anvil 25 moved into its operative position, and while the operator firmly holds the rear end of the blank with a suitable appliance, such as a pair of pliers 35 as indicated in Figures 3 and 4, power is applied to the rotary shaft 14 to turn the disc 15 in counterclockwise direction, as viewed in Figures 2 to 6. This causes the roller 30 to roll the forward end of the bar 26 over and against the cylindrical surface of the anvil 25, with the auxiliary roller 31 travelling idly ahead below the radially decreasing forward end of the blank as illustrated in Figure 3. However, as soon as the active roller 30 passes over the forward edge of the bar 26 (Figure 4), the movement of the rotary disc is reversed causing the roller 30 to re-track its course and climb back onto the outer surface of the blank 26. Since a certain amount of time may elapse before the counterclockwise motion of the disc 15 is arrested and reversed, it is of great importance that the angular interval between the rollers 30 and 31 be not too large as otherwise the latter may collide with the tangentially protruding rear end of the blank 26 and thus disrupt the whole production process.

As may be seen from Figure 2, the blank 26 was originally placed upon the roller 30 with at least half, and preferably more of its entire length projecting forwardly beyond said roller, so that the bend established by the above described initial phase in the operation of the mechanism may form an arc of at least 180° and preferably more (Figure 4). As a result thereof, whatever impact the roller 30 may cause, as it climbs back onto the outer surface of the blank, is unable to dislodge the blank from the anvil. It should be noted, however, that the described size of the initially established bend limits the angular interval between the rollers 30 and 31 to very much less than 180° so as to provide sufficient space ahead of roller 31 to take care of any overthrow of the disc 15 in counterclockwise direction without collision of said roller with the rear end of the blank.

As the rotary disc continues to turn in clockwise direction, the auxiliary roller 31 will also climb upon the outer surface of the blank, and as the leading roller 30 rolls the rearward end of the blank over and around the cylindrical surface of the anvil 25, both rollers cooperate to firmly hold the blank against said anvil (Figure 5). Hence, the operator may release the rearward end of the blank as soon as the auxiliary roller 31 has climbed upon its back so that the disc 15 may now make one or several complete revolutions in clockwise direction without any interference. Again it is of great importance that the angular interval between the rollers 30 and 31 be of the proper size because said interval must be large enough to enable said rollers to hold the blank securely against the anvil 25 with a minimum of slippage, and at the same time it must be sufficiently narrow to prevent warping or buckling of the blank intermediately of said rollers. I have found that an angle of the order of 60° will usually give very satisfactory results; it should be understood, however, that the invention is not limited to angles of this size and that the optimum value thereof will vary in practice depending upon the thickness of the blank and the nature of the material from which it is made.

When the rotary disc has made one full revolution in clockwise direction, the ends of the bar 26 are joined as shown in Figure 6. As a finishing operation the two rollers may now be oscillated several times over the juncture of the edges to insure perfect roundness in this region of the collar. The stationary disc 21 may then be withdrawn from the rotary disc 15 by operation of the setting wheel 22 and the completed collar may be removed from the anvil 25.

The described method of manufacturing circular collars or flanges is inexpensive since it proceeds from straight bars and the required mechanism is simple and easy to handle. It can be operated very speedily so that it is possible for a skilled mechanic to turn out a completed collar in less than a minute. The finished products are perfectly round without any warps and especially without any flat spots in the area where the two edges are joined so that screw threads may readily be cut into their inner or outer surfaces.

The apparatus of my invention may easily be constructed in such a manner that it can be employed to produce collars of different dimen-

sions. For this purpose the apparatus may be so constructed that the stationary disc with its anvil 25 can conveniently be exchanged for discs having anvils of different axial depths and different diameters. Correspondingly, the inner face of the rotary disc may be provided with a selection of sockets 34 adapted to detachably hold the pivots of the rollers (Figure 2) so that the position of the rollers relative to one another and relative to the center of the disc may be varied depending upon the size of the anvil employed and the thickness of the blank to be processed.

While I have explained my invention with the aid of a specific example, I do not wish to be limited to the various constructional details shown and described which may be departed from without departing from the scope and spirit of my invention.

Having thus described my invention and the manner in which it is to be performed, what I claim is:

1. Mechanism for producing arcuate metallic bodies, comprising a cylindrical anvil, a disc arranged coaxially with and adjacent to said anvil, a pair of rollers pivoted to said disc at angularly spaced points with their peripheries spaced equal radial distances from the periphery of said anvil, and means for selectively turning said disc in either direction of rotation.

2. Mechanism for producing arcuate metallic bodies comprising a cylindrical anvil; a pair of discs arranged coaxially with said anvil at either side thereof, said discs being of larger diameters than said anvil; a pair of rollers pivotally mounted intermediately of said discs at angularly spaced points with their peripheries spaced equal radial distances from the periphery of said anvil, and means for selectively moving said rollers concentrically around said anvil in either direction of rotation.

3. Arrangement according to claim 2 wherein one of said discs is arranged to be withdrawn from the other in axial direction.

4. Mechanism for rolling a straight bar into an annular collar or flange comprising a stationary disc, a cylindrical anvil mounted coaxially upon said disc and having an axial depth equal to the width of said bar, a rotary disc disposed coaxially with and adjacent to said anvil, a pair of rollers of an axial length equal to the axial depth of said cylindrical anvil pivoted to said rotary disc at angularly spaced points with their peripheries spaced radially from the periphery of said anvil, and means for selectively turning said rotary disc in either of its directions of rotation.

5. Arrangement according to claim 4 wherein said anvil is adapted to be axially withdrawn from said rotary disc.

6. Arrangement according to claim 4 wherein the angular interval between said rollers is of the order of 60 degrees.

7. Mechanism for rolling a bar into an annular collar or flange, comprising a stationary disc, a cylindrical anvil mounted coaxially upon said disc, a rotary disc disposed coaxially with and adjacent to said anvil, a pair of rollers pivoted to said rotary disc with their peripheries spaced from the periphery of said anvil, means for adjusting the space between said rollers and said anvil to the thickness of said bar, and means for selectively turning said rotary disc in either of its directions of rotation.

8. Arrangement according to claim 7 wherein said rollers are of different size.

9. Mechanism for rolling bars into annular collars or flanges comprising a cylindrical anvil, a rotary disc arranged coaxially with and adjacent to said anvil, a plurality of sockets provided in said rotary disc, a pair of pivots detachably held in angularly spaced ones of said sockets, a pair of rollers rotatably mounted upon said pivots with their peripheries spaced equal distances from the periphery of said anvil, and means for selectively turning said rotary disc in either of its directions of rotation.

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