W. R. CARROLL.

PROCESS OF MAKING METAL BANDS OR RINGS.

APPLICATION FILED JAN. 5, 1918.

1,351,202. Patented Aug. 31, 1920.

Fig. 1.

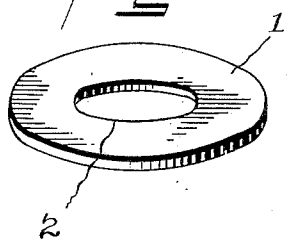


Fig. 2.

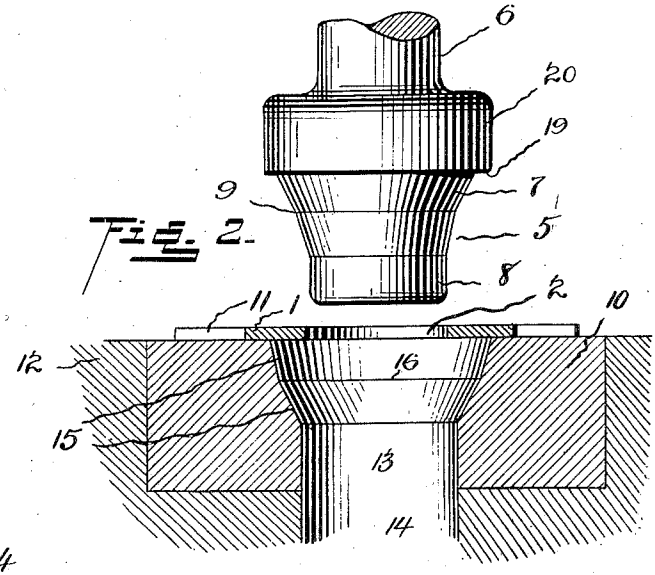


Fig. 3.

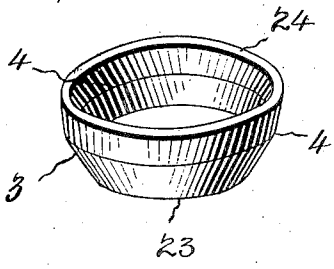


Fig. 4.

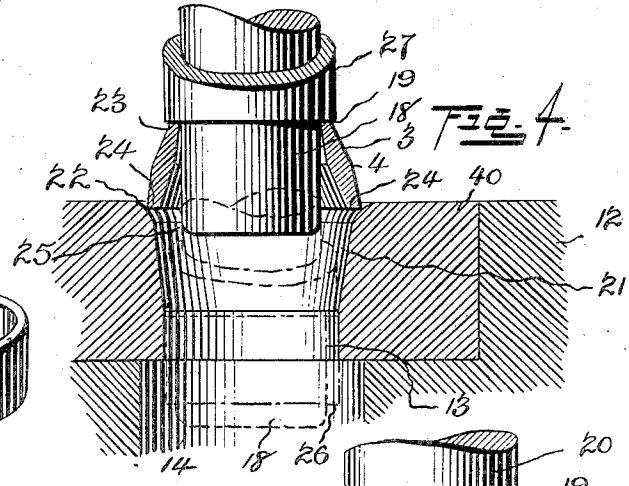


Fig. 5.

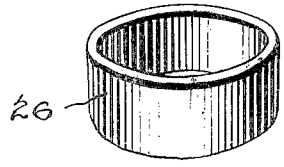


Fig. 7.

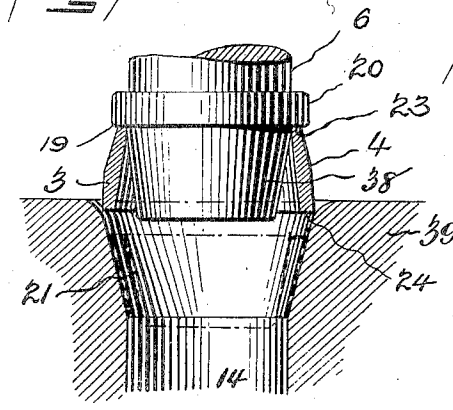
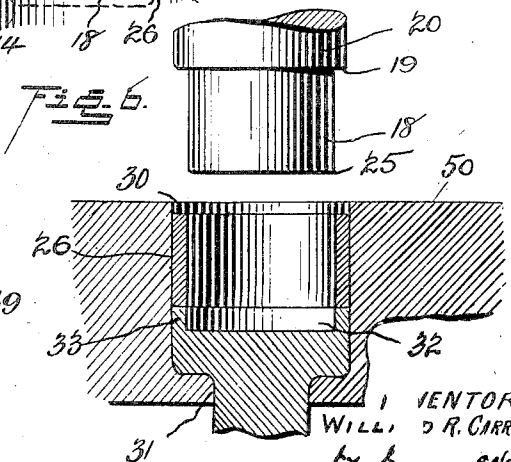


Fig. 6.



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PROCESS OF MAKING METAL BANDS OR RINGS.

1,351,202. Specification of Letters Patent. Patented Aug. 31, 1920.

Application filed January 5, 1918. Serial No. 210,422.

To all whom it may concern:

Be it known that I, WILLARD R. CARROLL, a citizen of the United States, residing at Derby, in the county of New Haven and State of Connecticut, have invented certain new and useful Improvements in Processes of Making Metal Bands or Rings, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to the manufacture of rings, annular bands or the like, of metal, having ductility, which will permit of its shape being changed by means of the metal drawing process forming the subject matter of the present invention.

The object of my improved process, among other things, is to produce from substantially flat metal, at a minimum of cost, material and labor, perfectly finished articles that are uniform in size and shape.

An embodiment of the invention will be hereinafter described with reference to the accompanying drawing, wherein,—

Figure 1 shows in perspective a perforated disk which is produced by any suitable means in the first operation of my improved process;

Fig. 2 is a sectional view illustrating a form of punch and die employed in the second operation of the process with a blank, substantially as shown in Fig. 1, positioned upon the die;

Fig. 3 is a perspective view of the article after the second operation thereon;

Fig. 4 is a sectional view illustrating a form of punch and die employed in the third operation with one of the articles in section, positioned therebetween, and showing the punch by both full and broken lines in two of its positions;

Fig. 5 is a perspective view of the article after the third operation;

Fig. 6 is a sectional view illustrating a form of punch and die employed for a subsequent sizing or finishing of the article produced by the third operation; and

Fig. 7 is a sectional view of a punch and die whereby a coniform ring or annulus is produced by the process.

In carrying out my invention I employ a series of improved punch and die sets, which may be used in a single press or in different presses, or in any suitable manner as may be desired.

The improved process commences by producing by any well known means, a blank or disk 1, having a perforation 2 therethrough, the diameter of which is based upon the dimensions of the finished article.

The second operation consists in transforming the blank or disk 1 into a cone shaped band or ring 3, having sides that taper away from a point between the ends thereof and toward each other, whereby it is thicker at 4 than at any other point, with the metal at the end 23 being thinner than at the end 24. The tools for effecting this operation consist in part of a punch 5 having a shank 6, by means of which the punch is held in a movable member (not shown) of a press, or similar mechanism. This punch is provided with a cone portion 7 having two angles of inclination separated by a line of demarcation designated by the numeral 9, that terminates in a concentric portion 8 of uniform diameter. The die 10, having a guide plate 11 adjacent thereto, for determining the position of the blank is mounted in a holder or bed 12 in any suitable manner. Through the die is a recess 13 opposite an opening 14 in the bed 12 and having an outwardly flaring throat, formed by the two tapered surfaces 15 of substantially uniform length but with different angles of inclination that join at a point designated by the numeral 16. In the operation of this punch and die, the punch 8 enters the perforation 2 and forces the blank or disk 1 into the tapered throat in the die, thus shaping the blank into a coniform ring or annulus substantially as shown in Figs. 3 and 4, thickened at a point, designated 4, between the ends thereof, to substantially the same thickness as the finished article. Instead of thickening the ring so as to leave an excess of stock both on the outside and inside of the ring, as shown in Figs. 3 and 4, the expansion of the metal may be on one side only, for example, on the outside, as shown in Fig. 7. At the conclusion of this operation the ring is ejected from the die 10 by any well known form of knockout mechanism operating through the opening

14 and recess 13. In the next operation I employ a punch having a substantially cylindrical portion 18 with a rounded corner 25 and a stripper sleeve 27 thereon, which also provides a shoulder 19 against which abuts the end 23 of the ring. The sleeve 27 is slidable upon the cylindrical portion 18 and in the movement of the punch in one direction is held in a fixed position thereon. The mechanism for controlling the movement of said sleeve is old and well known in the art, and therefore is not shown or described herein. A fixed collar 20, substantially as shown in Fig. 2, may be substituted for the sleeve, if desired. It is, however, preferable to employ a movable sleeve in this operation, because said sleeve can be utilized to force the blank off the punch while the same is being withdrawn from the die 40. Through this die is an opening, the portion 21 thereof being tapered, with a flaring throat or ledge 22 and the lower portion 13 straight, the latter registering with the opening 14 in the bed 12. In this operation the ring 3 is placed with its thicker and larger end 24 upon this ledge, thus being inverted relatively to that position in which it was formed by the preceding operation, and its thinner end 23 against the shoulder 19. When pressure is first applied, the end 24 is gradually reduced in diameter and moves inwardly toward the punch 18 by reason of the flaring throat or ledge 22 and the tapered portion 21 of the die opening. Thereafter the continued application of the pressure causes the metal to flow upwardly toward the end 23 and outwardly adjacent to this same end, so as to permit the end 24 to enter the straight portion 13 of the die opening, and as it passes therethrough the ring is transformed into one having substantially parallel sides with an inside diameter substantially the same as that of the punch 18, and an outside diameter substantially the same as the diameter of the straight portion 13. The metal at the end 23 of the coniform ring is of less thickness than the width of the shoulder 19, therefore a considerable flow of metal toward this shoulder can be accommodated during this operation before the outer edge of the ring is flush with the outer surface of the collar 20 or sleeve 27. This arrangement of the coniform ring in the die and punch permits of the flow of metal to this end so as to bring the thickness of the finished article at this point substantially the same as that portion of the ring designated 4, and no excess of material is permitted to crowd over the shoulder 19 to form a fin on the ring and project around said shoulder, thus marring the ring and requiring another operation to remove the fin and subjecting the punch and die to a possible breakage by reason of the excess material being in a place for which no room has been previously provided.

The aforesaid compression or upsetting of the ring causes the excess metal at the thicker end and intermediate portion of the ring to flow upwardly, producing a straight sided ring in the rough, and this facilitates the final drawing through the straight portion 13, which produces the finished ring 26 having substantially straight sides or sides of equal thickness at the top and bottom.

In an additional operation the ring 26 may be further sized with a greater nicety and also smoothed at all points to produce a highly finished article. The punch used in this operation is substantially the same as that used with the preceding operation except that the end 25 is not rounded. The die 50 therefor has a recess 30 therein of uniform diameter to receive the ring 26, and at the bottom thereof is an ejector 31 having a recess 32 in its upper surface of substantially the same diameter as the punch 18, and the flange 33 thereon is of substantially the same diameter as the collar 20 on the punch. In this operation the ring is sized as follows: the inside by the portion 18 of the punch, the outside by the recess 30 and the ends by the shoulder 19 on the punch and the ejector flange 33. This operation produces a ring of very exact predetermined dimensions as well as imparting thereto a high finish. The ring 26 is stripped from the die by the ejector 31 operated in any well known manner.

For some classes of work the article as shown in Fig. 5 is sufficiently complete without any subsequent operation, in which case the last described operation is omitted.

A ring in which the sides are not parallel or of equal thickness may be produced by the process, for example, as illustrated in Fig. 7. Herein the punch 38 and the die 39 are modified for the purpose of making a finished coniform ring 37, shown in broken lines, instead of a ring having substantially parallel sides, as shown in Fig. 5. The construction of this punch and die set are substantially the same as hereinbefore described, with the exception that the portion 38 of the punch and the walls of the recess 21 in the die are substantially parallel with each other.

Having described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. The process of making annular shaped articles from sheet metal consisting in forming a perforated disk of substantially uniform thickness and shaping said disk into a coniform ring or band, the ends thereof being of less thicknesses than a point between said ends and finally shaping said

ring or band into an article having ends and sides of substantially uniform thickness.

2. In the manufacture of articles of the character described, firstly, producing a perforated disk of substantially uniform thickness; secondly, upsetting said disk to form a conical ring that is thicker at a point between the ends than at the ends thereof; and thirdly, upsetting said conical ring to form a ring having substantially parallel sides.

In testimony whereof I have hereunto affixed my signature.

WILLARD R. CARROLL.