July 3, 1934. F. B. BELL 1,965,446

MANUFACTURE OF ANNULAR OBJECTS

Filed Sept. 23, 1932

Fig. 1

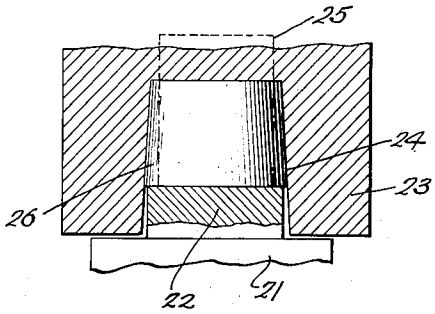


Fig. 2

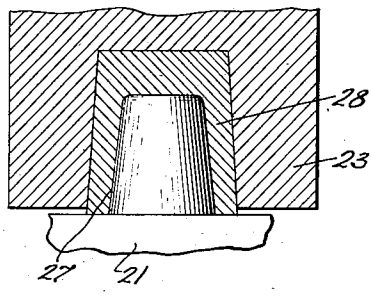


Fig. 3

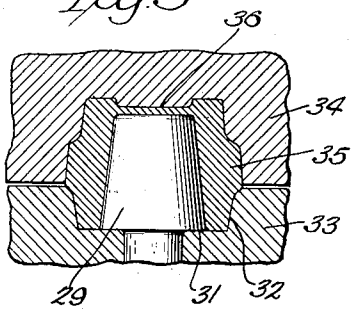


Fig. 4

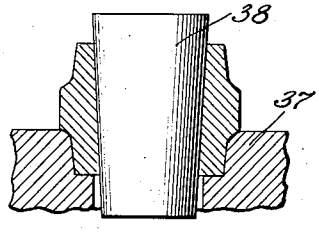


Fig. 5

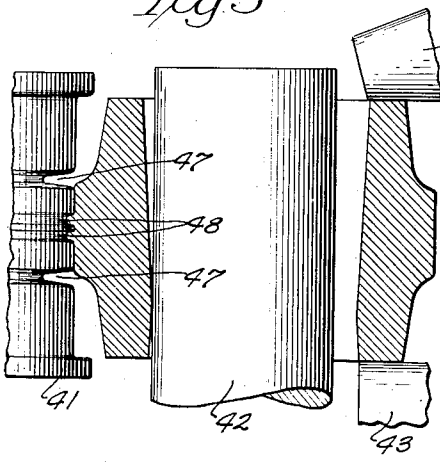
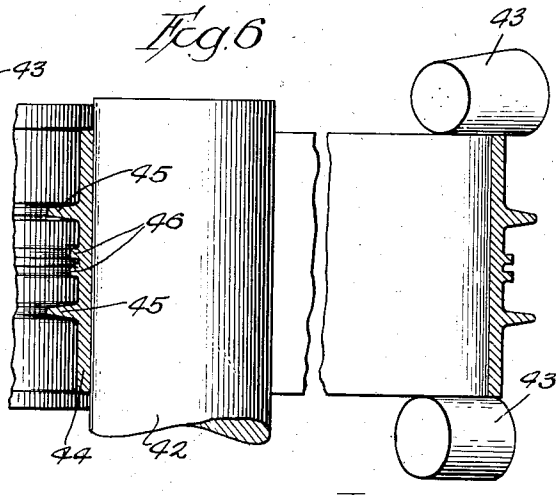


Fig. 6



Inventor:
Frank B. Bell
John C. Carpenter
Atty.

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UNITED STATES PATENT OFFICE

1,965,446

MANUFACTURE OF ANNULAR OBJECTS

Frank B. Bell, Pittsburgh, Pa., assignor to Edgewater Steel Company, Pittsburgh, Pa., a corporation of Pennsylvania

Application September 23, 1932, Serial No. 634,560

2 Claims. (Cl. 29—152.2)

This invention relates in general to the manufacture of rolled annular objects or rings of steel or other metal of ribbed, flanged or other contour, irregular in transverse radial section. In the past considerable difficulty has been experienced in the rolling of rings wherein flanges or ribs are formed upon the outer surface of the ring, this difficulty being occasioned by the requirement usually heretofore necessary of flowing the metal both transversely of the plane of the ring and radially into the profile of the rolls. Particularly is this difficulty experienced where the rolling action is accompanied by a substantial enlargement of the diameter of the bloom.

The invention contemplates the avoidance of this difficulty by first forging the bloom to arrange the metal in the upsetting action substantially in position for radial flow under the pressure of the rolls into its desired final location to produce an annulus or ring of the required configuration. The ingot is first drawn or extruded between dies to the general shape, presumably of much less diameter than that of the finished article, and thereafter in the rolling action the flow of the metal of the bloom is confined almost entirely but not necessarily entirely to radial movement.

Such transverse rolling of the metal as is required or accomplished in accordance with this invention is confined to areas or sections closely adjacent the areas or sections in which the radial flow is produced and the process of rolling closely approximates a straight radial extrusion or extrusions to fill out the profiles of the rolls.

A principal object of the invention, therefore, may be said to be the formation of annular objects, as rings, of transverse radial section providing ribs, flanges and other irregular contours without requiring substantial flow of the metal axially of the ring in the rolling action.

An important object of the invention is the provision of articles of the character described with minimum pressure between the rolls since flow of metal axially of the rolls is only attainable through the employment of pressures vastly greater than that which is necessary to the flow of the metal in planes of the engaging surfaces of the rolls.

Numerous other objects and advantages of the invention will be apparent as it is better understood from the following description, which, when taken in connection with the accompanying drawing, discloses a preferred embodiment thereof.

Referring to the drawing,

Figure 1 is a partial sectional schematic view showing the initial operation of compressing an ingot of steel or other metal into the initial bloom forming die;

Fig. 2 is a similar view showing a second operation of extruding or drawing the metal within the die by insertion of a punching member;

Fig. 3 shows a later operation of upsetting the metal between other dies to impart desired configuration to the bloom;

Fig. 4 shows the final punching of the bloom for the reception of an inner roll;

Fig. 5 is a schematic enlarged view showing the relation of the metal as arranged in the bloom to the profile or forming die; and

Fig. 6 is a view similar to Fig. 5 showing the flowing of the metal from its location in the bloom to final position to produce the finished article.

The invention is capable of use for the production of annuli of a wide variety of profiles and for the production of rings or annuli for widely different purposes in the arts and industries. The drawing illustrates an embodiment of the invention adapted for the production of a brake drum ring for automobiles. In accordance with the invention the finished article may be produced by the rolls themselves and used without subsequent machining, as illustrated in Fig. 6 of the drawing, or a blank adapted to be later machined to finished form may be produced.

Referring first to Figure 1, reference character 21 indicates the bed of a suitable press upon which is mounted a die block 22. Reference character 23 indicates a die having a tapered or frusto conical cavity 24 and adapted to move down over the die 21 in the movement of the press. An ingot 25, indicated in dotted lines in Fig. 1, is arranged upon the die block 22 and is upset or pressed into the cavity 24 as indicated at 26. The die 23 is then lifted together with its contained partially formed bloom 26 and a drawing or extruding punch 27 is arranged in axial alinement with the cavity 24. The die 23 is then forced down over the punch 27 and the metal is drawn or extruded in such action, as indicated at 28, to form a hollow shell.

The shell is then removed from the die 23 and is placed about a mandrel or post 29 arranged to extend up from the bottom 31 of a cavity 32 in a die 33 fixed or supported firmly upon the bed of the press. A mating die 34 is then forced down on the top of the partially formed bloom to further upset and compress it to the form illustrated in Fig. 3. It will be observed that the dies 33 and 34 have internal contour which accomplishes a radial extrusion of the metal into an annular en-

circling boss 35 which, as will be presently explained, is arrangeable in the rolls for the radial flowing of such extruded metal into the final profile desired.

The dies 33 and 34 may also be employed, if desired, to extrude some of the metal located at 36 at the top of the bloom to facilitate the final punching operations. This punching operation is accomplished by arranging the finally formed bloom in a punch block 37 in registration with a punch 38 adapted to be forced down upon the top 36 of the bloom to punch out the remaining metal.

The bloom thus formed and with the metal arranged for the radial flow is then rolled in a rolling mill having, preferably, an external profile or forming roll 41 rotatable about a fixed axis, an internal follower or pressure roll 42 over which the bloom is threaded, and top and bottom rolls 43 for maintaining or controlling the vertical or axial dimension of the ring.

The roll 42 is given a profile adapted to produce the finished article, indicated at 44 in Fig. 6, which may be divided or split to provide to provide two brake drums for automobile wheels. Two outwardly extending thin and deep encircling flanges 45 and two intermediate rims 46 are formed upon the outer face of the annulus to provide heat radiating units in the finished drums. The annulus may be split or divided between the two central or intermediate ribs 46 in known manner.

The roll 41 is accordingly provided with encircling deep depressions 47 adapted to produce the flanges 45 and intermediate shallow depressions 48 adapted to produce the ribs 46.

The flow of the metal is almost exactly radial and such vertical flow as is accomplished in the rolling is over sections of th bloom arranged closely adjacent the sections in which the radial flow is accomplished to force the metal from the projection 35 into the profile recesses of the forming roll 41.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it will be apparent that various changes may be made in the form, construction and arrangements of the parts without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the form hereinbefore described being merely a preferred embodiment thereof.

I claim:

1. The process of manufacturing annular brake drums having radial extensions, which comprises compressing an annular member between dies in a direction axially thereof to form a localized outer circumferential enlargement, and thereafter rolling said member between rolls of desired profile to flow the metal of said enlargement in a direction radially thereof to form the desired radial extensions.

2. The process of manufacturing annular brake drums having radial extensions, which comprises compressing a metal ingot to form a substantially cylindrical member, drawing said member to form a hollow cup shaped member with walls of substantial thickness, compressing said member between dies in a direction axially thereof to form a localized outer circumferential enlargement, completely perforating said member to form an annulus, and thereafter rolling said annulus between rolls of desired profile to complete the brake drum and flow the metal of said enlargement in a direction radially thereof to form said radial extensions thereon.

FRANK B. BELL.