Nov. 1, 1955 W. F. COUSINO 2,722,047

PRODUCTION OF PRECISION BUSHINGS

Filed May 5, 1951

Fig. 1

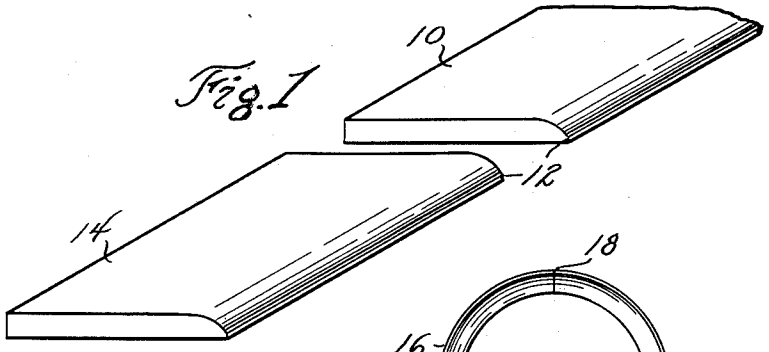


Fig. 2

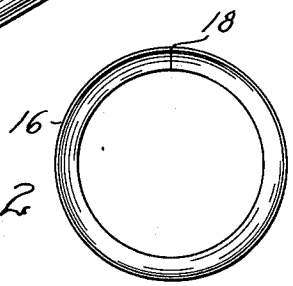


Fig. 3

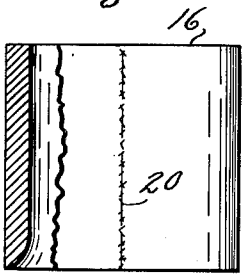


Fig. 4

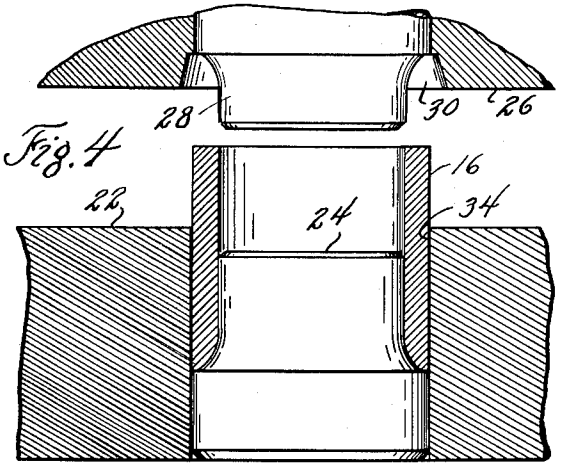


Fig. 6

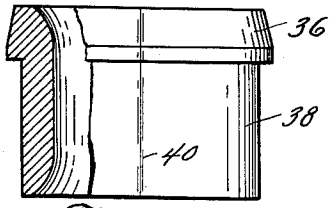


Fig. 7

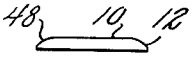


Fig. 8

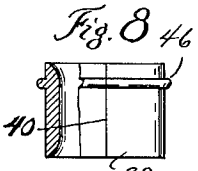


Fig. 5

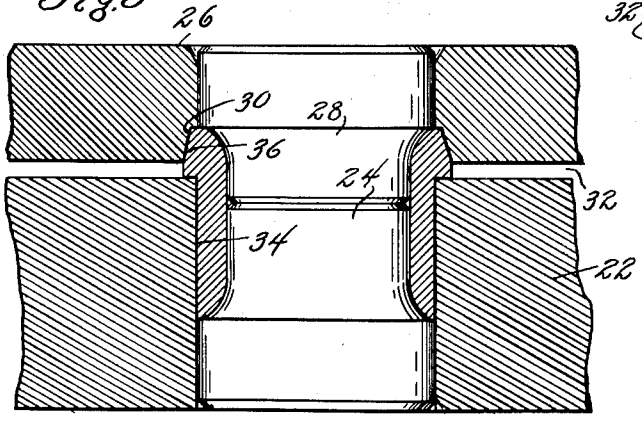
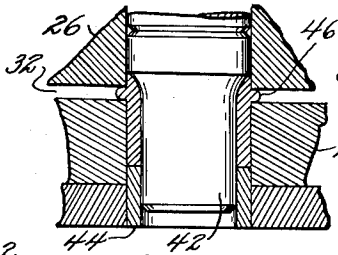


Fig. 9



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PRODUCTION OF PRECISION BUSHINGS

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8 Claims. (Cl. 29—149.5)

This invention relates to the production of bushings.

An object of this invention is to provide a method for the economical mass production of precision bushings.

Another object of this invention is the production from comparatively heavy steel stock, of bushings of predetermined dimensions within tolerances limited ±.001".

Another object of this invention is the production from strip stock, precision dimensioned bushings, without any scrap resulting therefrom.

And another object of this invention is the mass production of automotive bushings which eliminates major cutting, reaming, grinding and other tool operations heretofore employed in the production of similar elements and thereby reduce the cost thereof to a relatively small fraction of previous costs.

Other objects and advantages of this invention will be apparent to those skilled in the art upon consideration of the following description and appended claims, reference being had to the accompanying drawings forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

Referring to the drawings:

Fig. 1 is a perspective view of a strip of stock employed in the production of the bushings herein, illustrating at least one initial operation thereon, together with a blank severed therefrom;

Fig. 2 is an end elevation of a ring formed from the blank of Fig. 1;

Fig. 3 is a side elevation of the ring of Fig. 2, partly broken away;

Fig. 4 is a cross-section through a form of die arrangement for operating on the ring of Fig. 3, which embodies the method herein;

Fig. 5 is a view similar to Fig. 4, illustrating the completed die operation;

Fig. 6 is a side elevation of a completed bushing, partly broken away;

Fig. 7 is an end view of a stock strip subjected to a modified treatment;

Fig. 8 is a side elevation of another form of a finished bushing; and

Fig. 9 is a cross-section through a modified die arrangement which employs the novel method disclosed herein.

Certain automotive manufacturers demand vast quantities of flanged bushings including predetermined dimensions within tolerance limits of ±.001". Heretofore such bushings were comparatively expensive due to the number of operations required for their production which included cutting, grinding and the like, and there was material residual scrap. The method herein disclosed eliminates most of the expensive tool operations and residual scrap.

Strip stock **10** has one of its sides coined to provide a feathered edge **12**. Predetermined lengths are progressively sheared therefrom to provide blanks **14**. Each of these segregated blanks **14** are, by the novel method herein, formed into a completed precision dimensioned bushing, without any scrap therefrom.

The blank **14** is developed or formed into a cylinder or ring **16**, by suitable die operations, to include a resultant longitudinal butt seam **18**. The abutting faces of this seam are joined, in proper equipment, by a hydrogen copper braze **20**.

The ring **16** at this stage is irregular in comparison to any required dimension or the contour of the bushing to be finished therefrom. Tolerance limits are not considered.

The steel cylinder **16** is then placed in a die member **22** with punch portion **24** extending into the feathered end of the ring. A second die member **26**, with punch **28**, is then forced against the opposite end of the ring element. The second die member is also provided with flange determining recess **30** as a zone about the punch **28**. The dies are axially forced toward each other until the punch portions meet, which determines a space or clearway **32** between the die members.

The metals in the ring are axially compressed and forced to an accurate diameter as determined by the seat **34** in the die member **22**, the zone recess **30** shapes an endless flange **36**, and the bushing body excess metal is allowed to flow into the clearway **32**. The volume of metal within the blank **14** is precalculated so that this clearway flow of metal just finish forms its portion of the flange **36**.

In this single press operation, a finished bushing **38** is formed, with precision inner and outer diameters, length and flange contour, together with a polished braze seam **40**.

In the event any slight bulge develop around the plane of punch contact, it is only necessary to use a simple reamer to remove the same. Even this possibility can be avoided by the use of a punch **42** carried by the die **26**, which extends entirely through the bushing, and providing a ring seat **44** in the die **22**.

The flanges about the finished bushings **38** can be confined to any cross-sectional shape or the dies can be built to allow the metal to flow into the clearway **32** to fix the flange at any distance intermediate the ends of the bushing. This free flowing flange forming method is particularly useful when portions of the flange dimensions need not be severely accurate.

For some applications, it may be desirable to coin a second feathered edge **48** along the stock **10** opposite the edge **12**.

It will now be apparent that the volume of metal within a finished bushing can be calculated and this exact volume supplied by a blank **14**. The press forces and confines the bushing to finished form as determined by the dies with the metals flowing from the regions containing more than necessary for that region, into the flange formation, as well as removing the irregularities in the ring and in its brazed seam.

The seam is also finished with the metal flow or internal rearrangement of the fibers which are compressed from all directions throughout the bushing, resulting in a substantial overall increase in strength in the finished bushing. The resultant increase in strength is obtained by the use of compression forces throughout the method from the first coining operation to the finished bushing.

It is to be understood that the above detailed description of the present invention is intended to disclose an embodiment thereof to those skilled in the art, but that the invention is not to be construed as limited in its application by details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of being practiced and carried out in various ways without departing from the spirit of the invention. The language used in the specification

relating to the operation and function of the elements of the invention is employed for purposes of description and not of limitation, and it is not intended to limit the scope of the following claims beyond the requirements of the prior art.

What is claimed and is desired to secure by United States Letters Patent:

1. The method of producing a flanged bushing comprising segregating a blank sheet of metal having a predetermined volume, developing said blank into a cylindrical ring with a longitudinal butt seam, joining the abutting faces of said seam by brazing, and axially compressing said ring while confining portions of the flow of the metal caused by said compression to form the body of said bushing while allowing the remainder including a portion of the brazing to freely cold flow into an integral flange about said bushing including a completely brazed butt seam therein, said flange being in a plane at right angles to said longitudinal butt seam, a portion of the metal in said flange being unrestrained by contact with a rigid surface during said cold flow.

2. The method set forth in claim 1 wherein portions of the metals both from the blank and from the braze are shaped into an endless flange.

3. The method set forth in claim 1 wherein the blank is of steel and the braze a non-ferrous metal, both of which are shaped into said finished bushing body and integral flange.

4. The method set forth in claim 1 wherein said bushing body and flange are precision dimension finished solely by said compression operation.

5. The method of producing precision dimensioned bushings comprising segregating a sheet blank of steel containing a predetermined volume, developing said blank into a cylindrical ring within comparatively large dimensional tolerances including a butt seam, joining the seam by brazing, placing said ring between dies, axially

compressing said ring within said dies by pressure sufficient to cause the cold metals in said blank and braze to be redistributed into a precision dimensioned bushing as determined by said dies, and allowing terminal portions of said metals to freely cold flow into a lateral clearway provided by the dies for that purpose to produce an integral flange of said metals about said bushing body.

6. The method set forth in claim 5 including the step of coining at least one edge of said blank prior to forming the cylindrical ring.

7. The method of producing a bushing to tolerances of at least one-one thousandth of an inch comprising the steps of segregating a blank sheet of metal having a predetermined volume, developing said blank into a cylindrical ring with a substantially longitudinal butt seam, and cold compressing said ring along the longitudinal axis while completely confining the metal ring between die members except for a lateral clearway portion between the die members allowing for free cold flow of the metal into an integral flange about said bushing.

8. The method of claim 7 in which the blank sheet is steel and the substantially longitudinal butt seam is joined by brazing.

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