June 18, 1935. S. SMITH 2,005,328

PUSH BENCH GUIDE

Filed Feb. 19, 1932 2 Sheets-Sheet 1

Fig. 1.

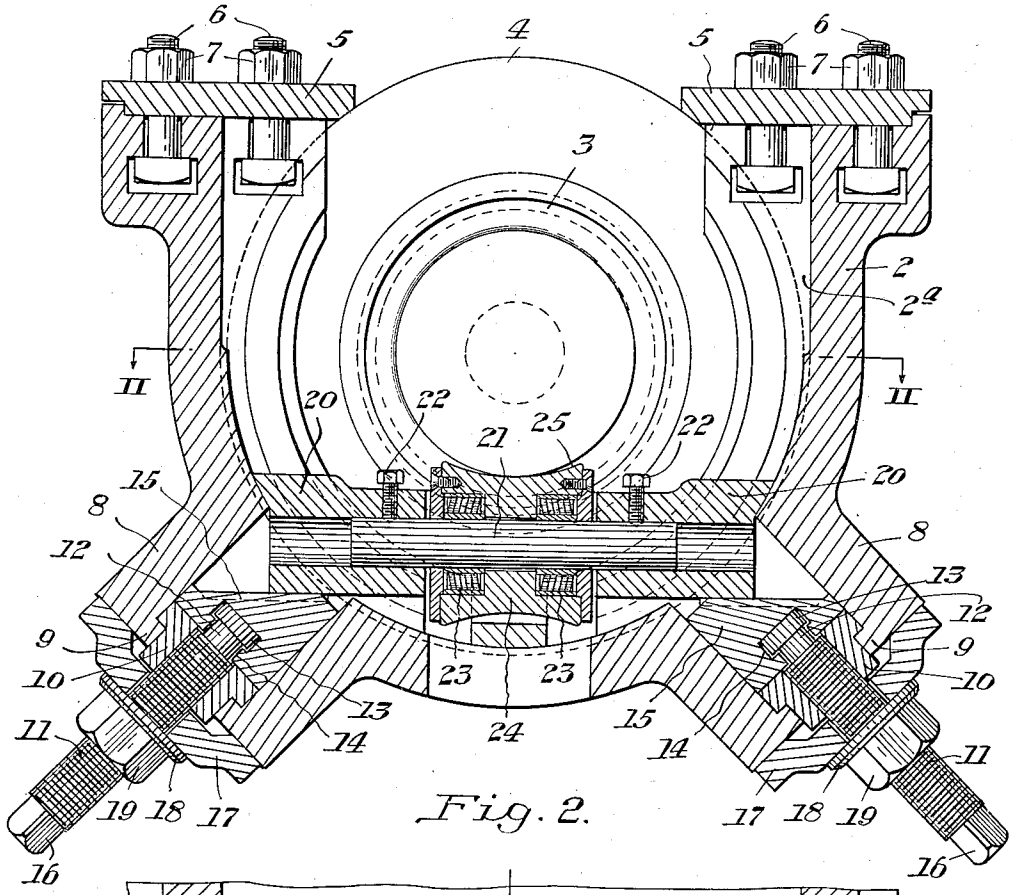
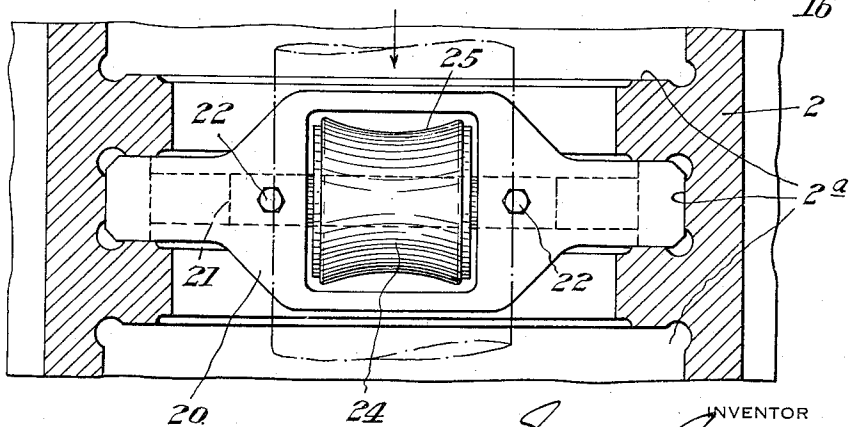


Fig. 2.



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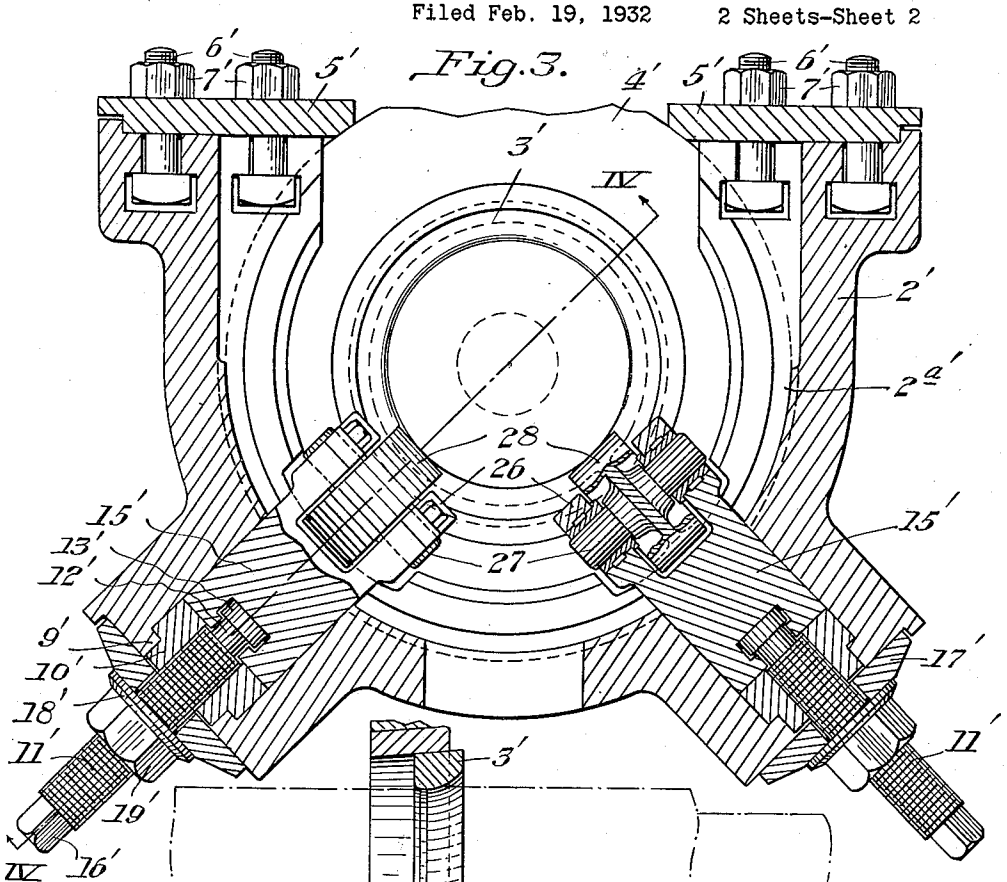
his attorneys

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Filed Feb. 19, 1932 2 Sheets-Sheet 2

Fig. 3.



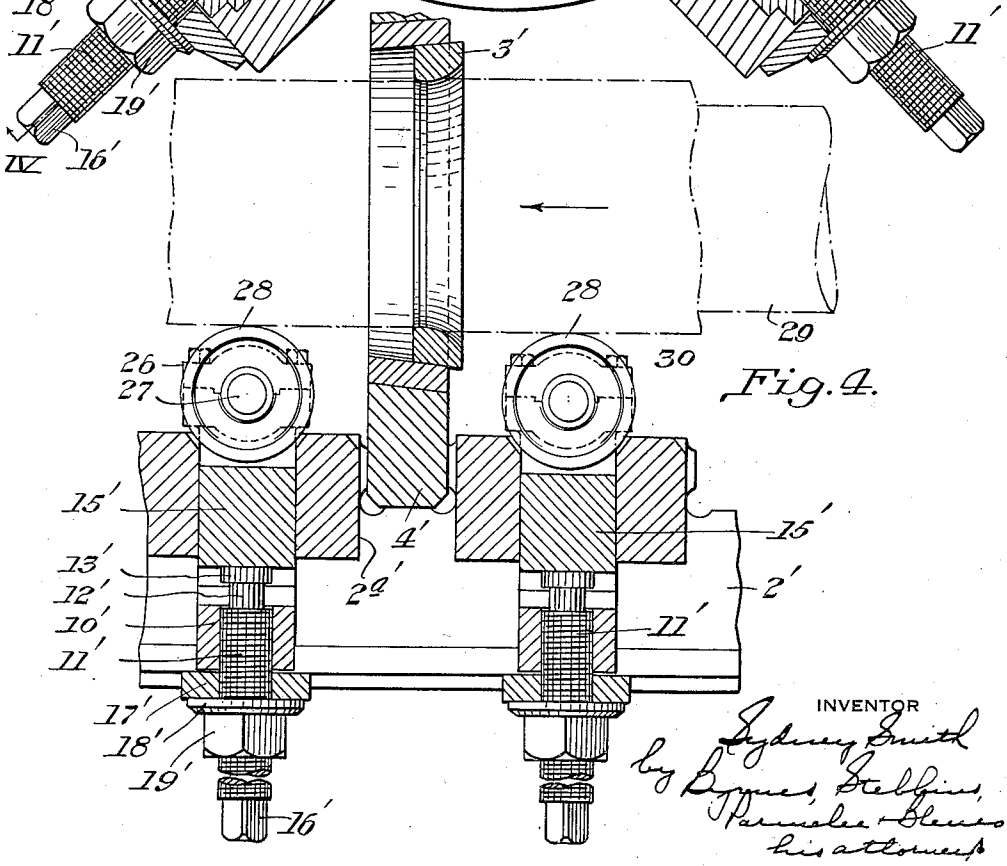


Fig. 4.

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2,005,328

PUSH BENCH GUIDE

Sydney Smith, London, England, assignor to Wellman Seaver Rolling Mill Co. Ltd., London, England, a British Company

Application February 19, 1932, Serial No. 594,037

14 Claims. (Cl. 205—4)

This invention relates to the manufacture of tubes by the push bench process. It relates more particularly to apparatus for the manufacture of tubes by the push bench process including means separate from the bench dies for guiding the mandrel and blank in proper cooperative relationship with respect to the dies.

In the push bench process of tube manufacture a heated billet is pierced in a press to form a "bottle" open at one end and closed at the other, and such bottle is then placed over the end of a mandrel and pushed through a series of aligned dies to thin and elongate the same. The dies at the fore part of the push bench are relatively closely spaced due to the shortness of the blank at that point. The dies at the rear part of the bench are more widely spaced as the blank is elongated.

It is of course desirable that the blank as formed on the push bench have uniform wall thickness throughout. Such uniform wall thickness is dependent upon accurate centering of the mandrel with respect to the dies so that the distance between the mandrel surface and the surface of each die through which it passes will be the same at all points circumferentially of the mandrel.

There is a tendency, due to the weight of the mandrel, particularly in the formation of tubes of the larger sizes, for the mandrel to somewhat more highly compress the lower portion of the blank than the upper portion as it passes through the dies, resulting in a tube whose wall thickness is less at the bottom than at the top. In order to overcome this tendency I provide means separate from the dies for guiding the mandrel and blank to insure as nearly as possible that the mandrel will enter each die substantially coaxially therewith and will remain coaxial with the die as long as any portion of the mandrel is within it. This results in the formation of tubes of substantially uniform wall thickness throughout.

Other objects and advantages of the invention will become apparent as the following description of certain present preferred embodiments thereof proceeds.

In the accompanying drawings I have shown certain present preferred embodiments of the invention, in which

Figure 1 is a transverse cross-sectional view of a push bench showing means for guiding a mandrel and blank;

Figure 2 is a horizontal cross-sectional view taken on the line II—II of Figure 1;

Figure 3 is a transverse cross-sectional view of a push bench showing modified guiding means; and

Figure 4 is a cross-sectional view taken on the line IV—IV of Figure 3.

Referring more particularly to Figures 1 and 2, the bed of the the push bench is designated generally by reference numeral 2 and is provided with grooves 2a for receiving and retaining dies adapted to cooperate with a mandrel to thin and elongate a blank into a finished tube. One of the dies is shown at 3, being carried by a holder 4 mounted in the bed and retained in place by plates 5 fastened to the bed by bolts 6 provided with nuts 7. The dies may be of any preferred construction, as well known in the art.

The bed 2 is provided opposite each groove 2a with generally downwardly and outwardly extending oppositely positioned hollow projections or bosses 8 each having an inturned flange 9 at its extremity. Fitting within each projection 8 and seated against the flange 9 thereof is a collar 10 through which is threaded a bolt 11. Each bolt 11 has a relatively small neck 12 and an enlarged head 13 adapted to be positioned within a groove 14 in a block 15 slidably mounted in the bore of the corresponding extension 8. The outer extremity of each bolt 11 is squared at 16 for the reception of a wrench. Rotation of each bolt causes it to move relatively to its collar 10 whereby to adjustably position the corresponding block 15 as may be desired within the bore of the corresponding extension 8. Each bolt is provided with a compression collar 17, a washer 18 and a nut 19 for locking it in desired adjusted positions. In the position shown in Figure 1 both blocks 15 are in their lowermost possible positions in contact with the respective collars 10.

Mounted in the bed 2 for vertically slidable movement in one of the grooves 2a is a roller frame 20 (Figure 2) having a central opening and receiving the opposite extremities of a shaft 21. The shaft 21 is fixedly positioned in the roller frame 20 by set screws 22. Journaled on the shaft 21 by roller bearing means 23, which may be of any preferred construction, and positioned within the opening in the roller frame, is a roller 24 having a concave outer surface 25.

The opposite extremities of the roller frame 20 are carried by the respective blocks 15. When such blocks are moved inwardly of the extensions 8 the roller frame 20 is elevated with respect to the die 3. The roller 24 is preferably positioned immediately adjacent the entrance

end of the die 3 and is adjusted at such a height that the mandrel and blank carried thereby in advancing through the bench will rest upon the roller and be guided thereby so that the mandrel is coaxial with the die. This prevents the mandrel from more highly compressing the lower portion of the blank than the upper portion due to the weight of the mandrel, as might occur if the mandrel and blank were simply moved through the die without being guided. This is particularly true when an unsupported portion of the mandrel of substantial length enters the die, as the weight of the mandrel will cause its nose to sag, if only very slightly. Every effort is made to eliminate sagging by constructing mandrels of special alloy steels and by designing them in such manner that they will not easily bend, but the weight of the mandrels and the unsupported length thereof is so great that it is virtually impossible to entirely eliminate sagging of the forward end of the mandrel at all points along the ring bed without some guiding means.

It is not essential that the mandrel and blank be guided in the horizontal direction because there are no unbalanced forces tending to move the mandrel in either horizontal direction as the force of gravity tends to move it downwardly. Therefore, the mandrel will substantially center itself in a horizontal plane when passing through the dies. In Figure 1 the roller 24 is shown as being mounted on the shaft 21 in such manner that it may move axially to a limited extent to accommodate itself to the horizontal position of the mandrel and blank.

A modified construction is shown in Figures 3 and 4 in which parts which correspond to parts in Figures 1 and 2 have the same reference numerals but with a prime affixed. Each block 15', instead of simply serving as a support for one end of a roller frame, is provided integrally at its inner extremity with a yoke 26 in which is suitably journaled a shaft 27 carrying a roller 28. The two rollers 28 cooperate to support and position the mandrel and blank, as shown in Figure 3. This method of support insures somewhat more perfect positioning than that of Figures 1 and 2. In Figure 3 the mandrel is indicated at 29 and the blank at 30.

Figure 4 shows one set of guiding rollers immediately before and another set immediately behind the die 3'. The rollers thus assist in positioning the mandrel and blank both before and after they pass through the die. As shown in the drawings, the rollers behind the die are at a slightly higher elevation than the rollers in front of the die to compensate for the reduction of the blank in the die, which raises its lower surface.

The grooves 2 are uniformly spaced along the ring bed and are of uniform dimensions. In line with each groove is a pair of the projections or bosses 8. The parts are so proportioned that each groove may be used for the reception either of a die or of a roller frame. Therefore, great flexibility of arrangement of the dies and rollers is provided for.

Various combinations and arrangements of the rollers may be utilized. For example, it may be desired to have rollers such as shown in Figures 3 and 4 immediately in front of a die and a roller such as shown in Figures 1 and 2 behind such die, as the former somewhat more exactly position the mandrel and blank, the latter simply serving to support a portion of the weight thereof. Likewise the spacings of the dies and guides may be varied. For example, it may be desired to use guides approximately halfway between adjacent dies so as to reduce the number of guides used in the bench. Although the guides are shown as being in the form of anti-friction rollers, they may assume other froms.

The term "tube" is used herein as a word of definition and not of limitation, and is not to be construed as denoting only that class of articles commercially known as tubes.

While I have shown and described certain present preferred embodiments of the invention, it is to be distinctly understood that the same is not limited thereto, but may be otherwise variously embodied within the scope of the following claims.

I claim:

1. Apparatus for the manufacture of tubes by the push bench process, comprising a mandrel, a plurality of dies for cooperation with the mandrel to thin and elongate a blank, and non-yieldably mounted means separate from the dies having a portion engaging the blank throughout substantially less than its entire periphery for guiding the mandrel and blank in proper cooperative relationship with respect to the dies.

2. Apparatus for the manufacture of tubes by the push bench process, comprising a mandrel, a plurality of dies for cooperation with the mandrel to thin and elongate a blank, and means mounted against retractive movement in any direction separate from and positioned intermediate the dies for guiding the mandrel and blank in proper cooperative relationship with respect to the dies.

3. Apparatus for the manufacture of tubes by the push bench process, comprising a mandrel, a plurality of dies for cooperation with the mandrel to thin and elongate a blank, and non-yieldably mounted anti-friction means separate from the dies engaging the blank in guiding relationship for guiding the mandrel and blank in proper cooperative relationship with respect to the dies.

4. Apparatus for the manufacture of tubes by the push bench process, comprising a mandrel, a plurality of dies for cooperation with the mandrel to thin and elongate a blank, and means separate from the dies and adjustable toward and away from the axis of the mandrel for guiding the mandrel and blank in proper cooperative relationship with respect to the dies, said means being adapted to engage the blank and being non-yieldable when in engagement therewith.

5. Apparatus for the manufacture of tubes by the push bench process, comprising a mandrel, a plurality of dies for cooperation with the mandrel to thin and elongate a blank, and non-yieldably mounted means separate from and intermediate the dies and adapted to engage the blank at points spaced circumferentially thereof for guiding the mandrel and blank in proper cooperative relationship with respect to the dies.

6. Apparatus for the manufacture of tubes by the push bench process, comprising a mandrel, a plurality of dies for cooperation with the mandrel to thin and elongate a blank, and non-yieldably mounted means separate from the dies having a portion engaging the blank throughout substantially less than its entire periphery and positioned adjacent the entrance end of at

least one thereof for guiding the mandrel and blank in proper cooperative relationship with respect thereto.

7. Apparatus for the manufacture of tubes by the push bench process, comprising a mandrel, a plurality of dies for cooperation with the mandrel to thin and elongate a blank, and means separate from the dies and positioned adjacent both ends of at least one thereof for guiding the mandrel and blank in proper cooperative relationship with respect thereto, said means being adapted to engage the blank and being non-yieldable when in engagement therewith.

8. Apparatus for the manufacture of tubes by the push bench process, comprising a mandrel, a plurality of dies for cooperation with the mandrel to thin and elongate a blank, and roller means separate from and positioned intermediate the dies and adjustable toward and away from the axis of the mandrel to assume guiding position in contact with the blank for guiding the mandrel and blank in proper cooperative relationship with respect to the dies.

9. Apparatus for the manufacture of tubes, comprising a push bench, a mandrel, dies in the push bench for cooperation with the mandrel to thin and elongate a blank, means mounted in the push bench for slidable movement transversely thereof, and means connected with said first mentioned means for engaging the blank to guide the mandrel and blank in proper cooperative relationship with respect to the dies.

10. Apparatus for the manufacture of tubes by the push bench process, comprising a mandrel a plurality of dies for cooperation with the mandrel to thin and elongate a blank, means separate from the dies for engaging the blank to guide the mandrel and blank in proper cooperative relationship with respect to the dies, and screw means for adjusting the position of said first mentioned means.

11. Apparatus for the manufacture of tubes, comprising a push bench, a mandrel, dies in the push bench for cooperation with the mandrel to thin and elongate a blank, a support mounted in the push bench for slidable movement transversely thereof, means for maintaining the support in desired adjusted positions, and anti-friction means carried by the support for engaging the blank to guide the mandrel and blank in proper cooperative relationship with respect to the dies.

12. Apparatus for the manufacture of tubes by the push bench process, comprising a bed having grooves therein, and die means and non-retractible mandrel guiding means positioned opposite a portion only of the periphery of the mandrel selectively disposable in such grooves.

13. Apparatus for the manufacture of tubes by the push bench process, comprising a mandrel, a plurality of dies for cooperation with the mandrel to thin and elongate a blank, and means in advance of the position of the forward end of the mandrel at the beginning of its stroke mounted against retractive movement during operation of the apparatus for guiding the mandrel and blank in proper cooperative relationship with respect to the dies.

14. Apparatus for the manufacture of tubes by the push bench process, comprising a mandrel, a plurality of dies for cooperation with the mandrel to thin and elongate a blank, and means in advance of the position of the forward end of the mandrel at the beginning of its stroke including anti-friction means mounted against retractive movement during operation of the apparatus for guilding the mandrel and blank in proper cooperative relationship with respect to the dies.

SYDNEY SMITH.