COBBLE REMOVAL FROM PUSH BENCHES

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2 Sheets-Sheet 1
This invention relates to the manufacture of hollow articles by the push bench process, and more particularly to the removal of cobbles from a push bench. It relates still more particularly to certain methods and apparatus for the removal of cobbles from a push bench.

In the push bench process of manufacturing hollow articles a so-called "bottle" is provided which is hollow throughout the greater portion of its length and is open at one end and closed at the other end. This bottle is placed over the nose of a mandrel and pushed through a series of dies to thin and elongate the bottle into a hollow blank.

The mandrel is pushed through the dies by a mandrel pusher bar which is connected with the mandrel at the rear end of the latter, suitable mechanism being provided for moving the mandrel pusher bar either forwardly or rearwardly at will. Normally the mandrel carrying the bottle about its nose is pushed by the mandrel pusher bar through the dies until the bottle has been thinned and elongated to the desired extent and until the rear end of the mandrel has emerged from the last die. The mandrel, with the blank still on it, is then disconnected from the mandrel pusher bar and transferred to stripping mechanism where the blank is stripped from the mandrel, and the closed forward end of the blank is then sheared off and the blank subjected to further finishing operations, if desired. The mandrel is reused with another bottle. After disconnection of the mandrel the mandrel pusher bar is withdrawn or moved rearwardly to its initial position at the entrance end of the push bench where it is provided with another mandrel and the operation is repeated.

During the forward movement of the mandrel and blank through the dies the metal of the blank is subjected to extremely heavy pressures created between the dies and the mandrel and the friction between the moving blank and the dies is of course very great. The pressure of the mandrel on the closed forward end of the blank is largely relied on to carry the blank through the dies. Thus, the metal of the blank adjacent the periphery of the nose of the mandrel is subjected to tremendous strain and it is relied on to insure continued forward movement of the entire blank with the mandrel in opposition to the frictional resistance of the dies. As is only to be expected, the metal at such portion of the blank sometimes fails and the nose of the blank tears off, leaving the body of the blank in engagement with the dies. The frictional resistance between the outer surface of the mandrel and the inner surface of the blank is small compared with the resistance offered by the dies, and consequently when the mandrel punches through a blank the body of the blank remains "hung up" in the dies, forming a cobb to, while the mandrel slides through the cobbie, carrying the nose of the blank with it.

Due to the heat of the blank and the high pressures created in the push bench, not only the blank but also the dies and the surrounding supporting structure are at a high temperature so that it is very difficult for workmen to work on the cobbie to remove it, and where ordinary methods of removal are used the men are forced to work under adverse conditions and the operation of the push bench is interrupted for a considerable time. The investment in a single push bench may run into several hundred thousand dollars, and in some cases a million dollars or more, so that every idle minute may be very expensive.

I provide for the rapid removal of a cobbie without the necessity of manually working on the cobbie when it is "hung up" in the dies and without the necessity of waiting for it to cool off. I withdraw the cobbie toward the entrance end of the push bench, and I preferably use either the mandrel or the mandrel pusher bar for this purpose. I move either the mandrel or the mandrel pusher bar, or both, backwardly while within the cobbie and cause the same to carry the cobbie therewith whereby to remove it at the entrance end of the push bench. Longitudinally removable dies may or may not be used, but when used facilitate removal of the cobbie, as will be described. Means may be provided extending transversely of the mandrel or mandrel pusher bar for engaging the cobbie, preferably at its forward end, whereby upon backward movement of the mandrel or mandrel pusher bar the cobbie may be positively moved toward the entrance end of the push bench.

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, wherein.

Figures 1A and 1B taken together represent diagrammatically in plan a push bench, the line x—x at the left-hand extremity of Figure 1A coinciding with the line x—x at the right-hand extremity of Figure 1B;
Figure 2 is a fragmentary longitudinal cross-sectional view through a portion of a push bench illustrating more or less diagrammatically a method of cobble removal;

Figure 3 is a vertical transverse cross-sectional view through a push bench and

Figure 4 is a fragmentary longitudinal cross-sectional view through a portion of a push bench illustrating more or less diagrammatically a modified method of cobble removal.

Referring more particularly to the drawings, reference numeral 2 designates generally a ring bed provided with a plurality of longitudinally spaced grooves 3 in desired ones of which are respectively positioned die holders 4 carrying dies 5. There are guided for longitudinal movement through the dies 5 a mandrel 6, shown in chain lines in Figure 1B, and a mandrel pusher bar 7.

Suitable driving mechanism is provided for driving the mandrel pusher bar in either longitudinal direction as may be desired, and such driving mechanism may conveniently comprise rack means, shown diagrammatically at 8 in Figure 1, operable by pinion means, shown diagrammatically at 9, driven through suitable gearing and a coupling 10 by a motor 11.

When the mandrel pusher bar, disengaged from a mandrel, is in its extreme right-hand position, viewing Figures 1A and 1B, the forward or left-hand end of the mandrel pusher bar is spaced from the first or entering die a distance greater than the length of a mandrel. A mandrel is supplied at 12 and is moved laterally into alignment with the mandrel pusher bar. The mandrel pusher bar is provided at its forward end with a mandrel socket 13 and the mandrel is provided at its rearward end with a projection adapted to enter the socket 13 in the mandrel pusher bar whereby to center the mandrel with respect to the mandrel pusher bar, the latter thus being adapted to push the former toward the left through the dies in the ring bed. Suitable guides, forming no part of the present invention and therefore not shown, are provided for guiding the mandrel and mandrel pusher bar.

The respective die holders 4 are maintained in their respective grooves by retaining plates 14 fastened to the ring bed by bolts 15. The dies, however, are longitudinally removable from the die holders, as each holder has a die receiving opening tapered forwardly of the bench and each die has a tapered periphery so that it is adapted to enter the opening in its holder from the rearward end of the push bench and to be held therein by friction during forward movement of the mandrel, mandrel bar and blank. Thus in the normal operation of the push bench the tendency is to push the dies more firmly into their tapered seats in the die holders, although, as will be readily appreciated, the dies may be removed from their respective holders by rearward pressure.

Sometimes, for reasons above stated or for other reasons, the mandrel will punch through the closed forward end of the blank, leaving the body of the blank "hung up" in the dies. Such a blank or cobble is shown at 16. The place where the forward end of the blank was torn away is designated by the irregular line 17. The cobble is tightly held in the dies, and the mandrel and mandrel pusher bar may be moved forwardly through the cobble until the mandrel has cleared the last die, whereupon the mandrel is preferably disengaged from the mandrel pusher bar and removed. At such time the forward end of the mandrel pusher bar projects some distance beyond the last die.

A collar 18 is slipped over the end of the mandrel pusher bar and a key 19 is inserted against the collar through a transverse opening provided in the mandrel pusher bar so as to prevent the collar from slipping off the end of the mandrel pusher bar. As shown in Figure 2, the collar is preferably of such size that it will pass through the last die of the push bench, or through the last die through which the cobble extends. As the dies toward the entering end of the push bench are larger, the collar will then pass through all of the dies between the forward end of the cobble and the entering end of the push bench. If the cobble does not extend through the last die of the push bench the collar may be connected with the mandrel bar adjacent the forward end of the cobble and a collar of as large a size as will pass through the last die through which the cobble extends is preferably selected.

The mandrel pusher bar is then moved rearwardly, or toward the right, viewing Figures 1A and 1B, and the collar 18 engages the forward end 17 of the cobble and positively forces the cobble toward the right, or toward the entrance end of the push bench. If the friction between any any die 5 and its support 4 is greater than the friction between the cobble and the die, the die will remain in place in the support and the collar 18 will simply push the cobble out through such die, leaving the die in place. If, however, the friction between the cobble and the die is greater than that between the die and its holder, the die will be pushed out of the holder and will move with the cobble. If the smallest diameter of the tapered opening in the next die holder is larger than the greatest diameter of a die capable of being struck by the cobble, such cobble will be pushed, or it may strike against the die holder and be loosened on the cobble. Disengagement of a die from its holder decreases the frictional drag on the cobble, thus facilitating removal of the cobble.

In Figure 4 is shown a modified construction in which the collar 18, held in place on the mandrel pusher bar by the key 19, has a shoulder 20 against which bears a sleeve 21 whose inside diameter is greater than the outside diameter of the cobble, the opposite end of the sleeve bearing against one of the dies 5. Upon rearward movement of the mandrel pusher bar such die will be disengaged from its support, and as the resistance offered such die by the cobble will ordinarily be greater than the resistance offered the cobble by the other dies, the cobble will move substantially with the mandrel pusher bar toward the entering end of the push bench. Once the cobble has been loosened its removal is comparatively easy and the friction between the interior of the cobble and the exterior of the mandrel pusher bar may be sufficient to effect removal of the cobble.

Although it is preferred that the mandrel pusher bar shall serve to remove the cobble, the mandrel itself may be used for this purpose if the mandrel is connected to the mandrel pusher bar in such a manner that upon backward movement of the mandrel pusher bar it will drive the mandrel itself. In such case the collar may be connected directly to the mandrel. The term "mandrel pusher bar" as used in the claims is intended to comprehend not only the mandrel pusher bar proper but also the mandrel itself unless used in a clearly contrary sense.

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

1. In the removal of a cobble from a push bench, the steps comprising moving the mandrel pusher bar backwardly while within the cobble and causing the mandrel pusher bar to carry the cobble with it whereby to remove the same at the entrance end of the push bench.

2. In the removal of a cobble from a push bench, the steps comprising moving the mandrel pusher bar backwardly while within the cobble and causing the mandrel pusher bar to carry with it the cobble and the dies in engagement with the cobble whereby to remove the same at the entrance end of the push bench.

3. In the removal of a cobble from a push bench, the steps comprising moving the mandrel pusher bar backwardly while within the cobble and causing the mandrel pusher bar to carry with it the cobble and the dies in engagement with the cobble whereby to remove the same at the entrance end of the push bench, removing the mandrel pusher bar from the cobble and removing the dies from the cobble.

4. In the removal of a cobble from a push bench, the steps comprising connecting with the mandrel pusher bar means for engaging the cobble to cause movement thereof with the mandrel pusher bar upon backward movement of the latter while within the cobble, and moving the mandrel pusher bar backwardly whereby to remove the cobble at the entrance end of the push bench.

5. In the removal of a cobble from a push bench, the steps comprising connecting with the mandrel pusher bar forwardly of the cobble means adapted to engage the forward portion of the cobble to cause movement thereof with the mandrel pusher bar upon backward movement of the latter while within the cobble, and moving the mandrel pusher bar backwardly whereby to remove the cobble at the entrance end of the push bench.

6. In the removal of a cobble from a push bench, the steps comprising moving the mandrel and mandrel pusher bar forwardly through the cobble until the former clears the cobble, detaching the mandrel from the mandrel pusher bar, moving the mandrel pusher bar backwardly, and causing the mandrel pusher bar to carry the cobble with it upon such backward movement whereby to remove the cobble at the entrance end of the push bench.

7. In the removal of a cobble from a push bench, the steps comprising fastening a collar over the mandrel pusher bar forwardly of the cobble, said collar being adapted to engage the forward portion of the cobble to cause movement thereof with the mandrel pusher bar upon backward movement of the latter while within the cobble, and moving the mandrel pusher bar backwardly whereby to remove the cobble at the entrance end of the push bench.

8. In the removal of a cobble from a push bench, the steps comprising connecting with the mandrel pusher bar means for engaging a die and moving the mandrel pusher bar backwardly whereby to remove at least some of the dies and the cobble at the entrance end of the push bench.

9. Push bench apparatus, comprising a mandrel pusher bar and cobble removing means adapted for connection with the mandrel pusher bar to extend transversely thereof.

10. Push bench apparatus, comprising a mandrel, a mandrel push bar, and cobble removing means adapted for connection with the mandrel pusher bar near its forward end to extend transversely thereof.

11. Push bench apparatus, comprising a mandrel pusher bar and a cobble removing collar adapted to be fastened over the mandrel pusher bar.

12. Push bench apparatus, comprising a mandrel pusher bar, dies removable toward the entrance end of the push bench, and cobble removing means adapted for connection with the mandrel pusher bar.

13. Push bench apparatus, comprising a mandrel pusher bar, removable dies, and means adapted for positive connection with the mandrel pusher bar for engaging and removing at least one of said dies upon longitudinal movement of the mandrel pusher bar.

14. Push bench apparatus, comprising a mandrel pusher bar having a transverse opening and means adapted to extend within said opening and to extend outwardly past the lateral surface of the mandrel pusher bar to assist in cobble removal.

15. Push bench apparatus, comprising a mandrel pusher bar, a cobble removing collar adapted to be placed over the mandrel pusher bar, and a key to maintain said collar in place.

16. A method of removing cobble from a push bench, comprising simultaneously supporting the cobble internally, engaging it transversely, and bodily moving it longitudinally out of the push bench.

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