Nov. 2, 1926. 1,605,545

C. P. HIGGINS

MANDREL FOR USE IN MAKING SINUOUS HEADERS

Filed June 11, 1923

Fig. 1

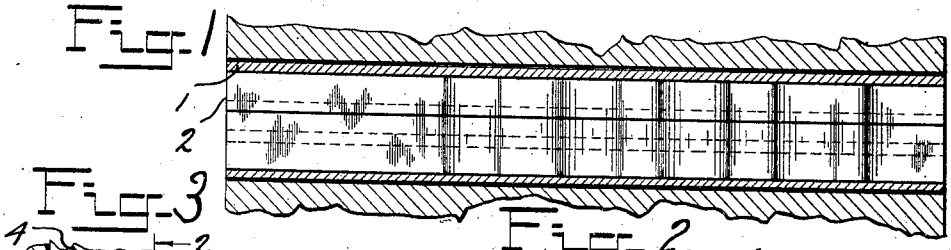


Fig. 3

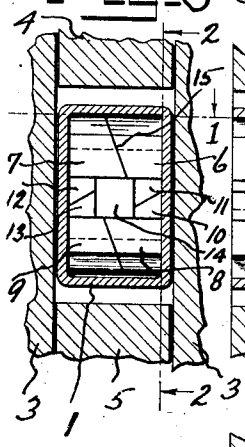


Fig. 2

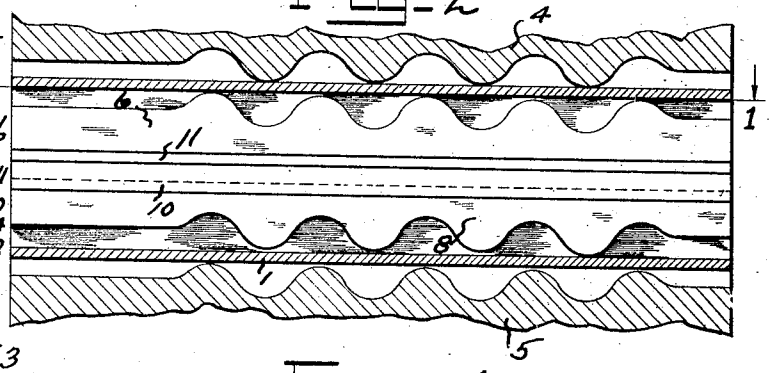


Fig. 4

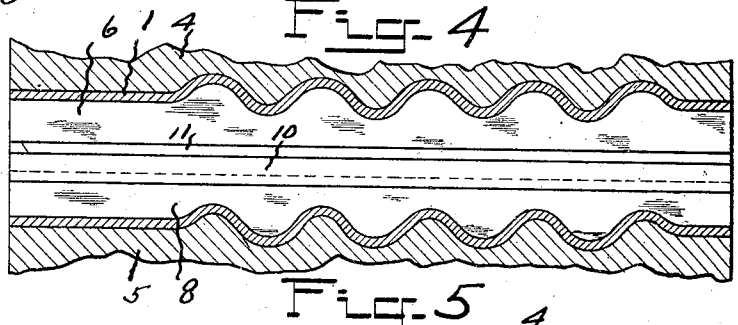


Fig. 6

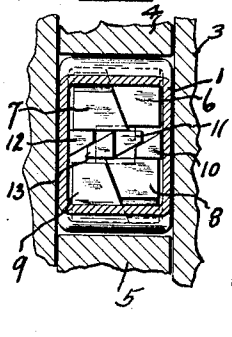


Fig. 5

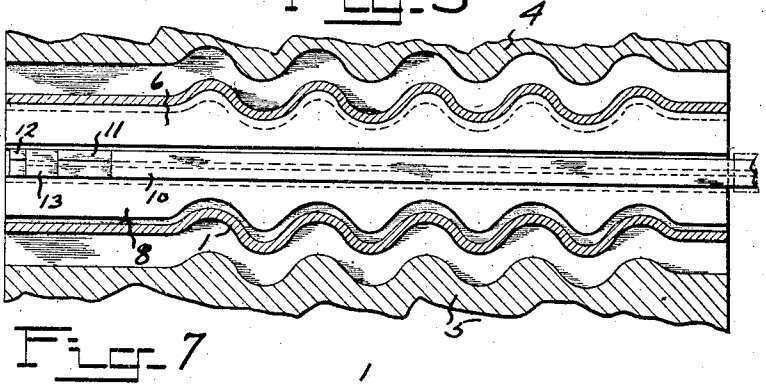
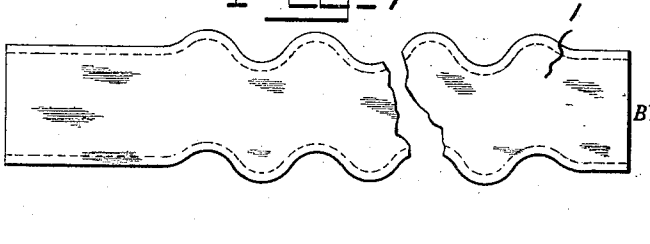


Fig. 7



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UNITED STATES PATENT OFFICE.

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MANDREL FOR USE IN MAKING SINUOUS HEADERS.

Application filed June 11, 1923. Serial No. 644,721.

My invention relates to mandrels for making hollow metal articles, and particularly in making staggered or sinuous headers for steam boilers.

My invention will be best understood from the following description taken in connection with the accompanying drawings of an illustrative embodiment of my invention applied to the making of sinuous headers for boilers, in which Fig. 1 is a sectional plan view taken on line 1—1 of Fig. 2, which shows a header blank with a mandrel in place; Fig. 2 is a sectional view taken on line 2—2 of Fig. 3; Fig. 3 is an end view of the devices shown in Fig. 2; Fig. 4 is a view similar to Fig. 2, with the dies closed; Fig. 5 is a section of the header showing the mandrel in place and the dies and part of the mandrel withdrawn; Fig. 6 is an end view of the device shown in Fig. 5, wherein the mandrel has been collapsed; and Fig. 7 is a side view of a portion of the completed header.

Referring to the drawings, 1 designates a a header blank having the cross section shown in Fig. 3, and in which the mandrel is placed. Dies 3, 3 and 4, 5 are provided to press the blank on the mandrel, in the well-known manner, the dies 4, 5 being provided with corrugations to correspond to the shape to be given to the exterior of the blank.

Because of the corrugations in the finished header, the mandrel on which it is formed must be designed so that it can be taken apart to remove it. It is desirable that such a mandrel shall have as few parts as possible and that they shall be arranged so that they can be quickly and easily assembled and disassembled. The mandrel of my invention embodies these advantages, by being formed of parts which preferably extend throughout the length of the blank, so that they can be withdrawn one at a time through the open end of the header without reaching into the interior.

In the illustrative embodiment, the mandrel comprises a plurality of longitudinal members 6, 7, 8, 9, 10, 11, 12 and 13 and a key member 14. The members 6 to 13, inclusive, are preferably trapezoidal in cross-section and preferably extend throughout the length of the blank. The key member 14 is arranged to engage each of the members 6 to 13 and hold the same rigidly in extended position during the forming operation. The members 6—7 and the members 8—9 are provided with sinuous or undulating surfaces which are staggered relative to each other so that when the dies 4, 4, which have corresponding surfaces thereon, are pressed down upon the mandrel, the blank is formed into a header having a serpentine form. After the dies have closed to the position shown in Figure 4, and have been opened to the position shown in Figure 5, the key member 14 is withdrawn endwise from the blank whereupon the other members 6 to 13, inclusive, take the positions best shown in Fig. 6, whereupon each of the parts may also be removed endwise, 10 and 11 being removed first, then 12 and 13 and then 6, 7, 8 and 9. The removal of these members is facilitated by reason of the fact that the plane 15 along which the contacting surfaces of the members 6 and 7 meet is at an angle to a plane perpendicular to the side of the header. The same is true of the planes of the contacting surfaces of the other members 8, 9 and 10, 11, 12 and 13. By reference to Fig. 6, it will be noted that after the key member 14 and the intermediate members 10 to 13, inclusive, are removed, the outside members are free to move toward the longitudinal axis of the header. The vertical height of the key member 14 and the side pieces 10—13 is made sufficient to permit the upper parts 6 and 7 to drop down, so that their tops are below the lowest part of the top of the finished header.

In use, the mandrel is assembled in a trough and the header blank is placed with its end against the end of the trough and in line with the trough. The mandrel is forced from the assembly trough into the heated header blank which, with the mandrel therein, is placed between the dies 4 and 5 and pressed into the desired shape.

Changes may be made in the details of the various parts without departing from the spirit of my invention. For instance, while it is preferable to divide the various members on planes making an angle with the sides of the header, this is not essential, since these may be parallel with the sides. The key member 14 may extend from side to side of the header, though I prefer to divide it as shown. The top and bottom members also may be divided longitudinally in

lengths equal to one or more undulations in the header.

I claim:

1. A mandrel adapted for use in making rectangular-cross-sectioned, sinuous headers for boilers, comprising two sets of corrugated blocks each having a surface configuration to give the desired shape to opposite sides of the header, each of said blocks being substantially as long as the header to be formed, and a main key member between the sets of blocks and extending through the header blank, said key member having parallel sides contacting with said sets of corrugated blocks.

2. A mandrel adapted for use in making rectangular-cross-sectioned, sinuous headers for boilers, comprising two sets of corrugated blocks each having a surface configuration to give the desired shape to opposite sides of the header, each of said blocks being not less in length than the distance between adjacent depressions in the sides of the headers, a main key member between the sets of blocks and extending through the header blank, said key having parallel sides contacting with said sets of corrugated blocks, and a supplemental key member at the side of the main key member and of the same height as the main key member.

3. A mandrel adapted for use in making rectangular-cross-sectioned, sinuous headers for boilers, comprising two sets of corrugated blocks each having a surface configuration to give the desired shape to opposite sides of the header, each of said blocks being substantially as long as the header to be formed, and a main key member between the sets of blocks and extending through the header blank, said key member having parallel sides contacting with said sets of corrugated blocks, each of the corrugated blocks being formed of two parts with contacting faces extending along the axis of the header and making an angle with the sides of the header.

4. A mandrel adapted for use in making rectangular-cross-sectioned, sinuous headers for boilers, comprising two sets of corrugated blocks each having a surface configuration to give the desired shape to opposite sides of the header, each of said blocks being not less in length than the distance between adjacent depressions in the sides of the headers, a main key member between the sets of blocks and extending through the header blank, said key member having parallel sides contacting with said sets of corrugated blocks, and a supplemental key member at the side of the main key member and of the same height as the main key member, said supplemental key member being formed of two parts with contacting faces extending along the axis of the header and making an angle with the sides of the header.

5. A mandrel adapted for use in making rectangular-cross-sectioned, sinuous headers for boilers, comprising two sets of corrugated blocks each having a surface configuration to give the desired shape to opposite sides of the header, each of said blocks being not less in length than the distance between adjacent depressions in the sides of the headers, a main key member between the sets of blocks and extending through the header blank, said key member having parallel sides contacting with said sets of corrugated blocks, and a supplemental key member at the side of the main key member and of the same height as the main key member, each of the corrugated blocks being formed of two parts with contacting faces extending along the axis of the header and making an angle with sides of the header, said supplemental key member being formed of two parts with contacting faces extending along the axis of the header and making an angle with the sides of the header.

6. A mandrel adapted for use in making rectangular cross-sectioned, sinuous headers for boilers, comprising two sets of corrugated blocks each having a surface configuration to give the desired shape to opposite sides of the header. each of said blocks being not less in length than the distance between adjacent depressions in the sides of the headers, and a keying device extending through the header blocks and supporting the blocks in operative position while the header is being formed, said keying device extending from side to side of the header blank and being constructed and arranged to be collapsed in a direction at right angles to the sides of the header to permit the withdrawal of the keying device after the header is formed.

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