

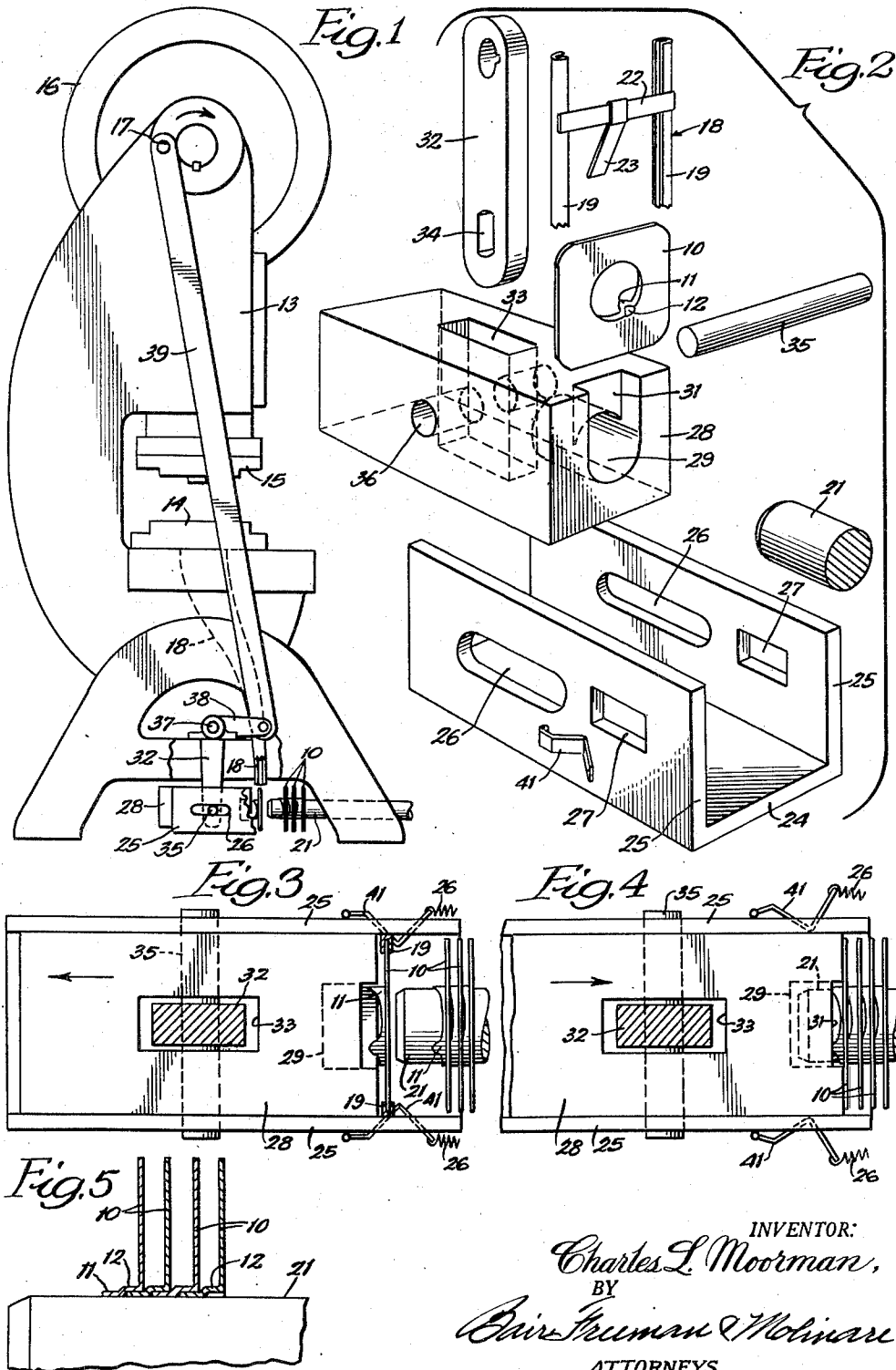
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C. L. MOORMAN

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APPARATUS FOR FORMING FINNED TUBING

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INVENTOR:
Charles L. Moorman,
BY
Baird Truman & Molinar
ATTORNEYS.

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APPARATUS FOR FORMING FINNED TUBING

Charles L. Moorman, Millington, Ill., assignor to Union Asbestos & Rubber Company, Chicago, Ill., a corporation of Illinois

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5 Claims. (Cl. 29—202)

This invention relates to apparatus for forming finned tubing and more particularly to the manufacture of finned tubing of the type in which fin plates are assembled on a tube.

Heretofore, it has been the common practice to form finned tubing and particularly relatively large sizes of steel tubing by forcing punched fin plates onto a tube. The plates are generally formed with central openings surrounded by projecting flanges which fit closely over the tube and interfit with each other to space the fins and to hold them in the desired angular relationship which is particularly important in the case of non-circular fins.

In the manufacture of such tubing, it has been the usual practice to punch out the fin plates and then assemble them in the desired relationship on a mandrel. The fin plates are then held in a supporting rack while the mandrel is attached to a pipe or tube and is utilized to draw the tube through the fins to complete the assembly. In this operation, assembly of the fin plates on the mandrel has been a tedious and time consuming operation since the plates must be forced onto the mandrel in proper relationship with their flanges properly interfitting and this requires a great deal of manual effort.

It is accordingly one of the objects of the present invention to provide an apparatus for forming finned tubing in which the fin plates are automatically forced onto the mandrel in proper assembled relationship with each other.

According to one feature of the invention, the apparatus may be combined with a punch press on which the fin plates are formed to take the plates directly from the press and assemble them automatically on the mandrel.

Another object is to provide an apparatus in which the reciprocating head which forces the plates onto the mandrel serves also to index and time the feeding of the plates and to slow the travel thereof so that they will fall properly into the feeding station.

The above and other objects and features of the invention will be more readily apparent from the following description when read in connection with the accompanying drawing, in which:

Figure 1 is a side elevation of a punch press equipped with the apparatus of the present invention;

Figure 2 is a disassembled perspective view of the feeding head assembly;

Figure 3 is a top plan view with parts in section of the feeding head assembly;

Figure 4 is a view similar to Figure 3 showing the parts in a different position; and

Figure 5 is a partial sectional view showing the fins assembled on the mandrel.

The present invention relates to finned tubing of the type in which substantially rectangular fin plates are forced onto a pre-formed tube to complete a finned tube assembly. As shown, the plates 10 are of generally rectangular outline with central openings therein defined by outwardly projecting flanges. The flanges include a plurality of sharp projections 11 which may be pointed

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at their outer ends and adjacent the plane of the plate the flanges may be offset to define small triangular pockets 12 each adapted to receive the pointed projections 11 of an adjacent flange. Preferably three such pointed projections and pockets are provided on each plate so that when the plates are properly assembled the pointed projections and pockets will hold them accurately spaced and in proper angular relationship with respect to each other so that the fin plates will be lined up in the assembly.

In the manufacture of finned tubing, the plates 10 are pre-formed on a punch press which may be of the type indicated generally at 13 in Figure 1. This press comprises a fixed die plate 14 formed with an opening therethrough through which the fin plates may drop as they are cut off from a continuous strip. An upper die plate or head 15 reciprocates vertically toward and away from the plate 14 to form the fin plates 10 with the central flange openings therein and to cut off the completed plates from the strip. The upper die plate or head 15 is driven through a rotating fly wheel 16 provided with an eccentric crank pin 17 for a purpose to appear hereinafter.

The completed fin plates dropping through the die plate 14 are received by a guide, indicated generally at 18, which receives the plates and directs them to a feeding station. As best seen in Figure 2, the guide 18 may be formed by a pair of facing channel strips 19 into which the edges of the fin plates 10 are received. The strips, as indicated by dotted lines in Figure 1, are twisted to receive a completed fin plate and to turn it into a vertical plane transverse to the axis of a mandrel 21 onto which the plates are to be assembled. Preferably the guide includes one or more cross strips 22 connecting the channel strips 19 at least one of which may carry a resilient spring finger 23 normally projecting into the path of the fin plates to slow down the travel of the fin plates through the guide. The spring finger 23 may be made of any desired strength to yield when engaged by a fin plate so that the plate may pass freely to the feeding station, but so that its speed will be reduced.

Fin plates traveling through the guide means are received in a horizontal channel shaped guide beneath the press and at the lower end of the guide means. The channel shaped guide, as best seen in Figure 2, includes a flat bottom 24 with upstanding sides 25 and is open at its top. The sides 25 may be formed with elongated slots 26 and with openings 27 near the forward end of the guide.

The guide receives a slidable head 28 of rectangular section to fit slidably into the guide and formed at its forward end with a central recess 29 to receive the flanges on the fin plates and the end of the mandrel 21. A groove 31 extends from the top of the head to the recess 29 so that the flanges on the fin plates may travel therethrough into registry with the recess.

The head is adapted to be moved through a crank arm 32 which extends into an open slot 33 in the top of the head. At its lower end, the crank arm is formed with an elongated slot 34 to receive a pin 35 which projects through the slot 26 in the guide and through bores 36 in the sides of the head. The crank arm is carried by a shaft 37 journaled in pillow blocks on the punch press frame and which has a second crank arm 38 secured thereto. The crank arm 38 is connected through a link or connecting rod 39 to the crank pin 17 so that as the press runs the head 28 will be reciprocated in timed relation to the press operation.

The guide means 18 terminates above the horizontal guide to discharge fin plates in a vertical plane adjacent to the front end of the guide and forward of the head 28 when it is in its retracted position, as shown in Figure 3.

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To hold the plates properly in the feeding position until they are picked up and moved by the head, resilient fingers 41 are provided pivoted on the sides 25 of the horizontal guide and extending through the openings 27 in the sides to lie just ahead of the fin plates. Springs 26 urge the fingers inward to the position shown in Figure 3 and yield as the head advances to the feeding position shown in Figure 4 to allow the fin plates to move onto the mandrel.

In operation the mandrel is positioned, as shown, with one end in registry with the opening in a fin plate at the feeding station to receive a series of fin plates. With the press running a completed fin plate will be formed each time the head 15 descends and the plate will be directed by the guide means 18 to the feeding station. As the fly wheel 16 turns, the reciprocating head 28 will be moved in a horizontal direction toward and away from the end of the mandrel. The crank pin 17 is so positioned that when a fin plate completed by a downward stroke of the punch 15 reaches the feeding station, the feeding head 28 will be advanced to the right in the position shown in Figure 4. Thus the completed plate will strike the top of the head and will be held thereby against further downward movement.

As the fly wheel continues to turn, the feeding head 28 will be retracted to the position shown in Figure 3. As the head 28 moves out from under the guide means 18 the fin plate held thereby can drop down to the feeding station with the projecting flanges thereon traveling through the open groove 31 in the head 28 until the lower edge of the plate rests on the bottom 24 of the horizontal guide and the flanges thereon are in registry with the recess 29. Since the fin plate drops only a very short distance equal to its height, it will travel at a relatively low velocity and will not tend to bounce to any appreciable extent so that there is no likelihood that the fin plate will bounce out of the proper feeding position. On the next stroke of the press, as the feeding head travels to the right, it will engage the fin plate at the feeding station and move it to the right onto the end of the mandrel. In the extreme feeding position, as shown in Figure 4, the end of the mandrel projects well into the recess 29 so that the fin plate is forced well onto the mandrel. During this operation, the last plate being fed will engage plates previously on the mandrel and will advance them along it. Preferably the plates feed freely on the mandrel so that they can be advanced easily although for relatively short lengths of finned tubing the actual pipe itself might be used as a mandrel and the feeding head might press the fin plates tightly thereon.

Operation of the machine, as above described, may be continued until the desired number of fin plates are on the mandrel at which time the machine may be stopped and a new mandrel placed in position to receive the fin plates. It will be seen that by the present apparatus the fin plates are formed and are accurately assembled on the mandrel with no manual intervention and in a substantially continuous automatic process. Thus much of the manual handling heretofore required is eliminated and the manufacture of finned tubing is thereby accordingly facilitated.

While one embodiment of the invention has been shown and described herein, it will be understood that this is illustrative only and is not to be taken as a definition of the scope of the invention, reference being had for this purpose to the appended claims.

What is claimed is:

1. In apparatus for forming finned tubing, means for guiding fin plates having central flanged openings therein downward edgewise to a feeding station, means to support an elongated mandrel in horizontal alignment with the flanged opening in a fin plate at the feeding station, a reciprocable feeding head movable horizontally toward the mandrel to engage a fin plate at the feeding station and force it onto the mandrel, the head lying beneath

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the guiding means when it is moved toward the mandrel whereby a fin plate delivered by the guiding means will strike the head and be prevented thereby from moving to the feeding station, and means to reciprocate the head in timed relation to supply of fin plates by the guiding means to the feeding station.

2. In apparatus for forming finned tubing, means for guiding fin plates having central flanged openings therein downward edgewise to a feeding station, means to support an elongated mandrel in horizontal alignment with the flanged opening in a fin plate at the feeding station, a reciprocable feeding head movable horizontally toward the mandrel to engage a fin plate at the feeding station and force it onto the mandrel, the head lying beneath the guiding means when it is moved toward the mandrel whereby a fin plate delivered by the guiding means will strike the head and be prevented thereby from moving to the feeding station, means to supply fin plates to the guiding means, and common drive means connected to the supply means and the head to operate them in timed relationship.

3. In apparatus for forming finned tubing, means for guiding fin plates having central flanged openings therein downward edgewise to a feeding station, means to support an elongated mandrel in horizontal alignment with the flanged opening in a fin plate at the feeding station, a reciprocable feeding head movable horizontally toward the mandrel to engage a fin plate at the feeding station and force it onto the mandrel, the head lying beneath the guiding means when it is moved toward the mandrel whereby a fin plate delivered by the guiding means will strike the head and be prevented thereby from moving to the feeding station, the guiding means delivering the fin plates with the flanges thereon facing toward the head and the head having a central recess therein to receive the flanges and an open groove from the top of the head to the recess through which the flanges can pass as the fin plates drop to the feeding station, and means to reciprocate the head in timed relation to movement of the fin plates to the feeding station.

4. In apparatus for forming finned tubes, means for guiding fin plates having central flanged openings therein downward edgewise to a feeding station, a horizontal open topped guide at the feeding station to receive the fin plates, means to support a horizontal mandrel at one end of the guide in alignment with the opening in a fin plate at the feeding station, a head horizontally reciprocable in the guide to engage a fin plate at the feeding station and force it on to the mandrel, spring fingers carried by the guide to support a fin plate at the feeding station and yieldable to permit forcing of the fin plate from the feeding station onto the mandrel by the head, the head lying beneath the guiding means when it is moved toward the mandrel whereby a fin plate delivered by the guiding means will strike the head and be prevented thereby from moving to the feeding station, means to supply fin plates to the guiding means, and common drive means connected to the supply means and the head to operate them in timed relationship.

5. In apparatus for forming finned tubes, means for guiding fin plates having central flanged openings therein downward edgewise to a feeding station, a horizontal open topped guide at the feeding station to receive the fin plates, means to support a horizontal mandrel at one end of the guide in alignment with the opening in a fin plate at the feeding station, a head horizontally reciprocable in the guide to engage a fin plate at the feeding station and force it onto the mandrel, spring fingers carried by the guide to support a fin plate at the feeding station and yieldable to permit forcing of the fin plate from the feeding station onto the mandrel by the head, the head lying beneath the guiding means when it is moved toward the mandrel whereby a fin plate delivered by the guiding means will strike the head and be prevented thereby from moving to the feeding station, the guiding means

delivering the fin plates with the flanges thereon facing toward the head and the head having a recess therein to receive the flanges and an open groove extending from its top to the recess through which the flanges can pass as the fin plates move to the feeding station, means to supply fin plates to the guiding means, and common drive means connected to the supply means and the head to operate them in timed relationship.

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