May 3, 1960 W. F. KRAUSE 2,935,111

APPARATUS FOR BENDING PARTS INTO C-SHAPE

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FIG. 1

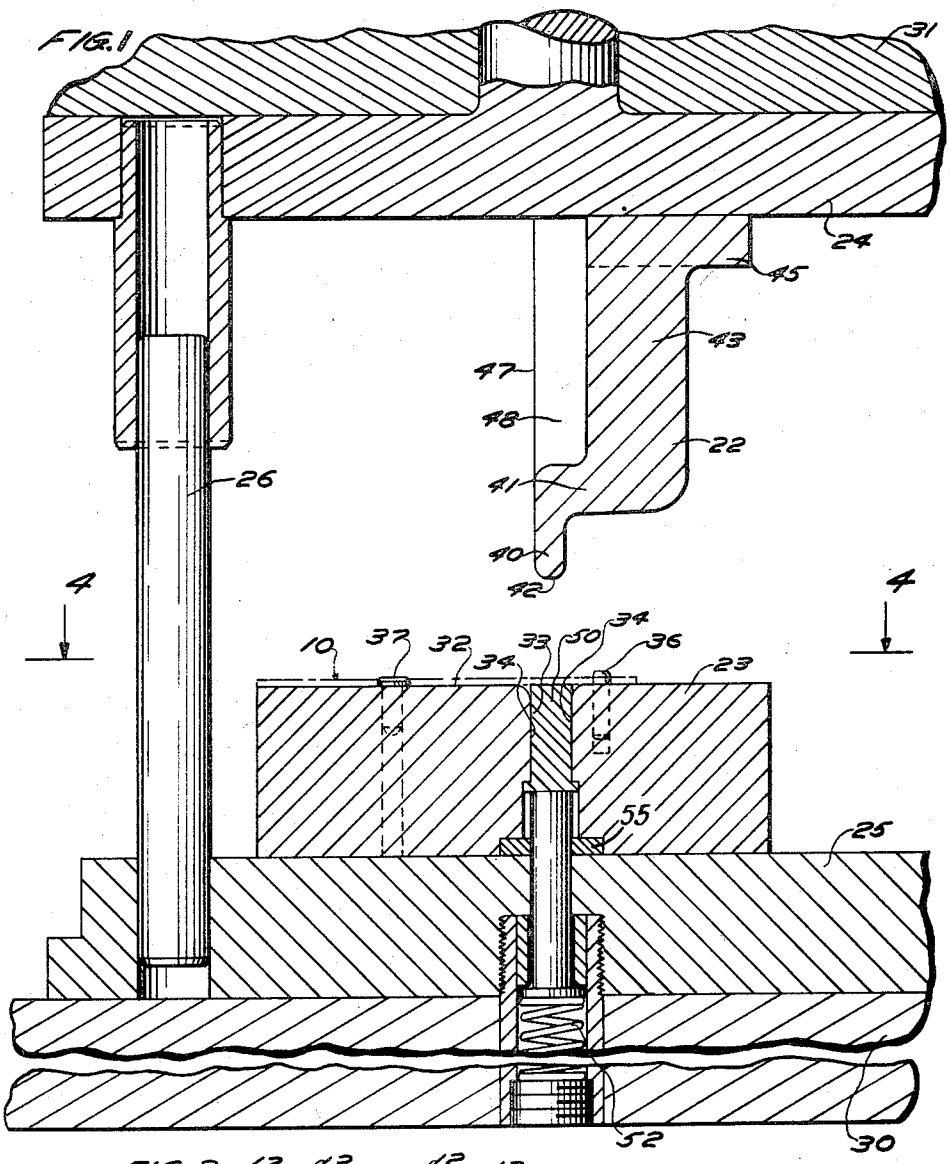


FIG. 2

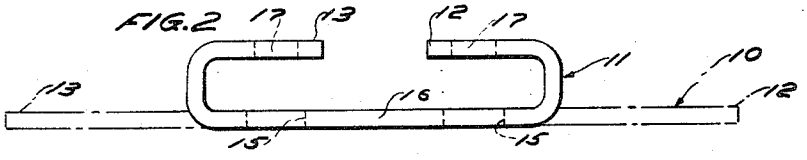
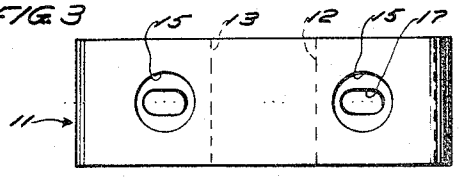


FIG. 3



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FIG. 4

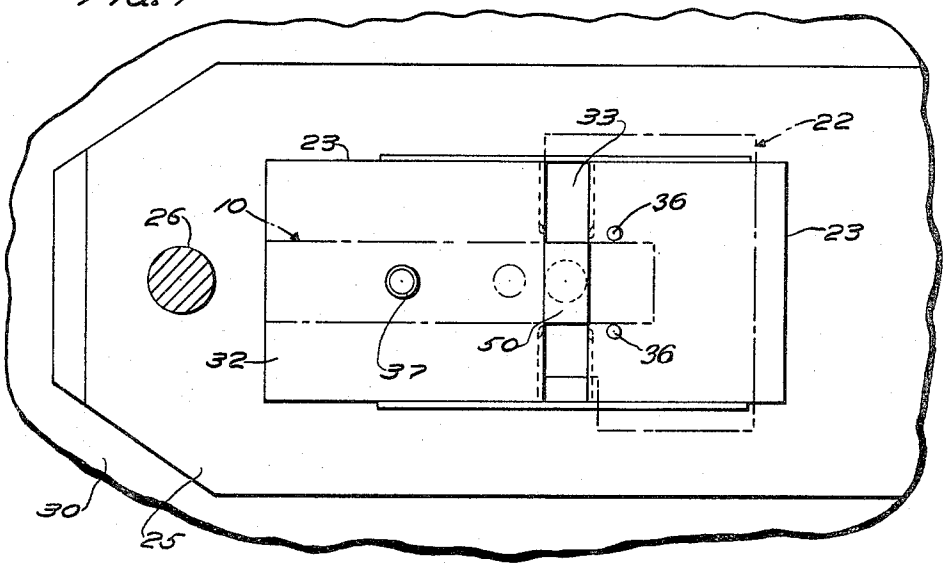


FIG. 5

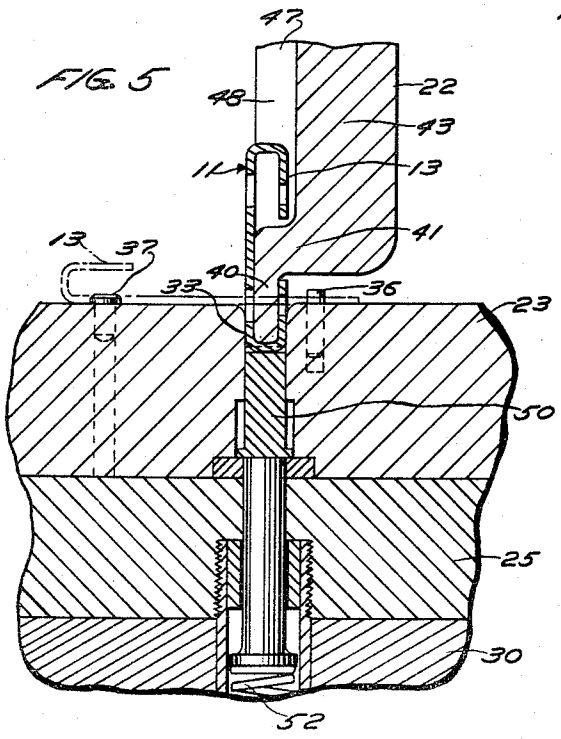
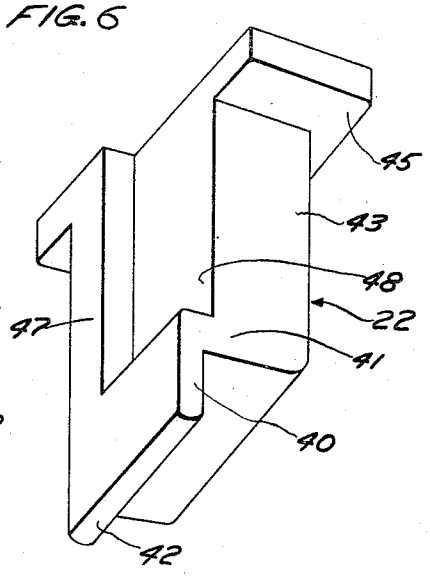


FIG. 6



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APPARATUS FOR BENDING PARTS INTO C-SHAPE

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2 Claims. (Cl. 153—21)

This invention relates to apparatus for forming articles, and more particularly to an apparatus for bending a part into C-shape.

An object of the invention is to provide an apparatus for forming a C-shaped part.

Another object of the invention is to provide an apparatus for bending a straight part into C-shape.

An apparatus illustrating certain features of the invention may include a die or lower tool mounted on a platen of a press and a punch or upper tool mounted on the ram of the press for reciprocation therewith, the punch having an aupper surface for supporting a flat part thereon and having a recess extending downwardly from the upper surface and the punch having a vertically disposed forming head disposed above the recess in said die for pressing an end portion of the flat part into the recess to bend it into U-shape. The punch has an offset neck portion extending horizontally from the upper portion of the head and a body portion extending upwardly from the neck portion in laterally spaced relation to the head to provide clearance above the head for one U-shaped end of the part when the part is being formed into C-shape. The die has means thereon for positioning the part in predetermined positions thereon, whereby the part may be placed thereon and one end portion bent into U-shape to form a J-shaped part which is then placed on the die in another position and the other end portion bent into U-shape to form the C-shaped part. An ejector on the die ejects the formed part therefrom, which part when formed into C-shape adheres to the punch and is removed therefrom by sliding it horizontally from the head.

Other objects and advantages of the invention will become apparent by reference to the following detailed description and the accompanying drawings illustrating a preferred embodiment thereof, in which—

Fig. 1 is a fragmentary vertical sectional view through an apparatus for forming a part into C-shape and showing forming tools of the apparatus in open position;

Fig. 2 is a front view of a part which has been bent from a straight condition into C-shape;

Fig. 3 is a bottom plan view of the C-shaped part shown in Fig. 2;

Fig. 4 is a fragmentary plan sectional view of the apparatus taken on line 4—4 of Fig. 1;

Fig. 5 is a fragmentary vertical sectional view of the apparatus showing the forming tools in closed position with the part bent into C-shape; and

Fig. 6 is a perspective view of the upper forming tool.

The present apparatus is designed to form a flat part 10 of strap iron into a C-shaped article 11 by sequentially bending the end portions 12 and 13 of the flat part 10 into U-shape as shown in Fig. 2. The flat part 10 and the article 11 formed therefrom have a pair of round holes 15 in the intermediate portion 16 thereof and a pair of elongated holes 17 in the end portions.

The apparatus comprises an upper tool or punch 22 and a lower tool or die 23 secured to a punch holder 24 and a die holder 25, respectively, which are guided for relative reciprocation by aligning pins 26. The die holder 25 is secured to a platen 30 of a punch press, and the punch holder 24 is secured to the ram 31 of the punch press for reciprocation therewith.

The die 23 has a flat upper surface 32 for supporting the flat part 10, and has a vertically and transversely disposed slot or recess 33 therein providing a pair of vertically disposed forming surfaces 34, the upper portions of which are curved and join the upper surface 32. A pair of aligning pins 36 extending upwardly from the die 23 and engageable with the side edges of the flat part 10 cooperate with a pin 37 engageable in the apertures 15 of the flat part to align the part 10 in two different positions on the die so that the end portions thereof may be bent into U-shape.

The punch 22 has a vertically disposed substantially flat head or forming portion 40 aligned with the recess 33 of the die for engaging an end portion of the flat part 10 and pressing it into the recess to bend the end portion of the part into U-shape. A neck 41 of the punch extends horizontally from the upper portion of the head 40 in spaced relation to the lower surface 42 thereof and a relatively heavy body portion 43 of the punch extends upwardly from the neck in laterally spaced relation to the head 40. At its upper end of the body portion 43 of the punch has a horizontally disposed flange 45, by means of which the punch 22 is secured to the punch holder 24. A rib 47 extending upwardly from the head 40 and the neck 41 and extending laterally from the body portion 43 flush with the head 40 is provided for reinforcing the head 40 at one end thereof. The rib 47 and the body portion 43 of the punch form a recess 48 above the head 40 to allow for the movement of the U-shaped end portion of the part 10 as the part is bent into C-shape.

In the operation of forming the flat part 10 into C-shape the part 10 is placed on the die 23 with one end thereof disposed between the aligning pins 36 and with the aligning pin 37 engaging one of the apertures 15 therein as indicated in dotted lines in Fig. 1. The press is then actuated, causing the head 40 of the punch to engage the flat part 10 a predetermined distance from one end thereof and press the part downwardly into the recess 33 to form one end portion thereof into U-shape and the part in J-shape. During the forming operation, the head 40 moves the U-shaped end until a member 50 strikes a stop 55 whereupon the member 50 cooperates with the head 40 to flatten the trough of the U-shaped end. The member 50, which is mounted in the recess 33 in the die 23 and is urged upwardly by spring means 52, ejects the part from the die. The J-shaped piece part is then removed from the punch and replaced on the die with the other end portion thereof disposed between the aligning pins 36 and with the other aperture 15 engaging the aligning pin 37 as shown in dotted lines in Fig. 5, after which the press is again actuated to cause the head 40 of the punch to press the other end portion of the part 10 into the recess 33 and bend it into U-shape and thereby change the J-shaped part into C-shape as shown in full lines in Fig. 5. The punch 22 is so shaped that the intermediate neck portion 41 thereof is disposed between the return bent ends 12 and 13 of the C-shaped article 11 after it has been fully formed, and sufficient clearance is provided above the head 40 by the recess 48 for movement of one returned bent end portion of the part 10 as the other end portion thereof is being formed into U-shape and the J-shaped part is bent thereby into C-shape. After the ram 31 and the punch 23 have been raised, the C-shaped article 11 may be removed from the punch by sliding it horizontally parallel to the head 40 thereof in a direction away from the rib 47.

It is to be understood that the above-described arrangements are simply illustrative of the application of the

principles of this invention. Numerous other arrangements may be readily devised by those skilled in the art which will embody the principles of the invention and fall within the spirit and scope thereof.

What is claimed is:

1. In an apparatus for forming a flat part into C-shape, the combination of a lower tool having an upper surface for supporting a flat part thereon and having a recess extending downwardly from the upper surface, an upper tool having a vertically disposed reduced head aligned with the recess for pressing opposite end portions of the part into the recess to bend them into U-shape to form a C-shaped part, the upper tool having a neck portion extending laterally from the head and having a body portion extending upwardly from the neck portion in laterally spaced relation to the head to provide clearance for a predetermined distance above the head for a U-shaped end portion of the part as the part is formed into C-shape, and a rib formed on the body portion to extend from the neck portion to the upper end thereof.

2. In an apparatus for forming a flat part into C-shape, the combination of a lower tool having an upper surface for supporting a part thereon and having a recess extending downwardly from the upper surface, an upper tool having a substantially vertically disposed body and a laterally offset neck at the lower end thereof and having a head depending from the neck in laterally spaced relation to the body for pressing a portion of the part into the recess in the lower tool to form it into U-shape, whereby the end portions of the part may be successively bent into U-shape to form said C-shaped part, means for moving the tools relative to each other, the upper tool being shaped so that the neck portion fits between the ends of the C-shaped part and clearance is provided above the head for movement of a U-shaped end portion of the C-shaped part during the forming of the part into C-shape, and a rib extending upwardly from the one end of the head and the neck of the upper tool and laterally from the body to reinforce the head.

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