Dec. 10, 1935. G. LAWSON 2,023,638

METHOD FOR PRODUCING SHARP CORNERS IN METAL STOCK

Filed Feb. 15, 1932 2 Sheets-Sheet 1

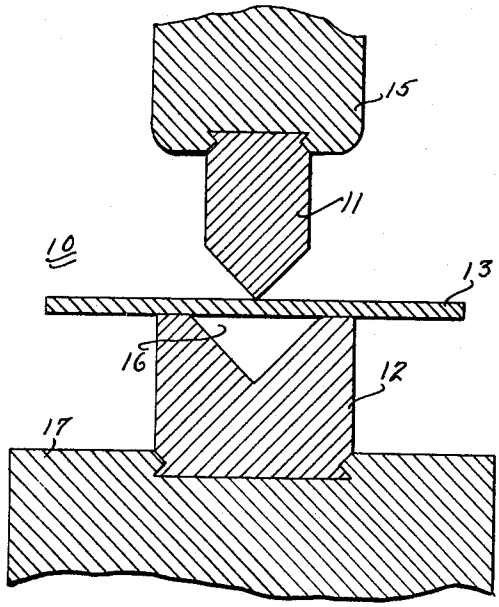


FIG. 1

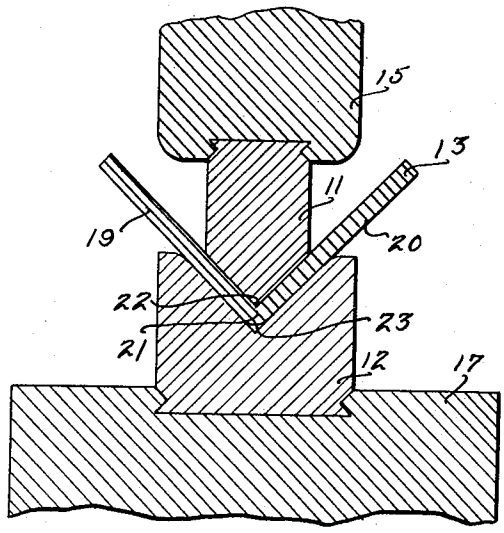


FIG. 2

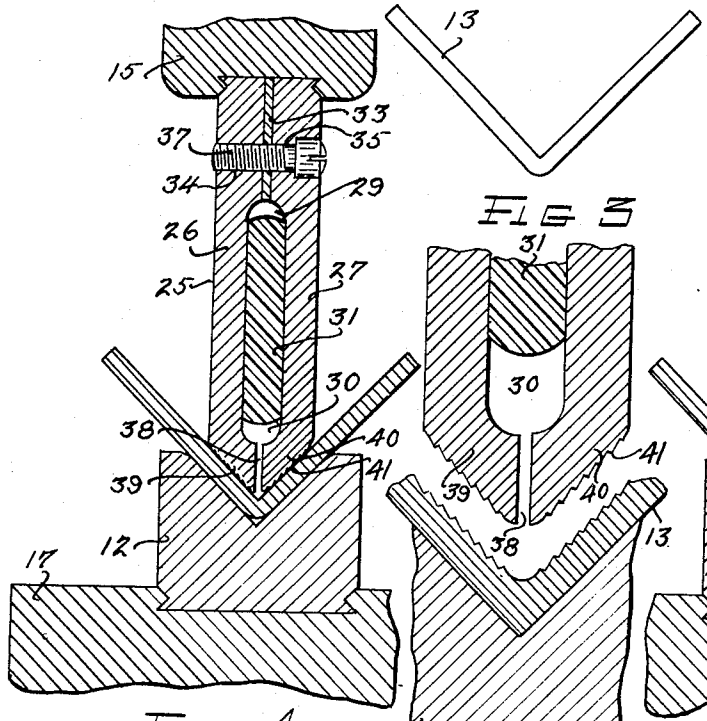


FIG. 4

FIG. 3

FIG. 6

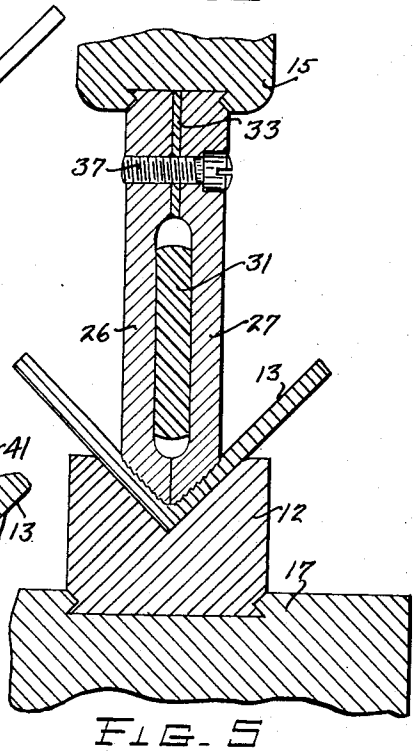


FIG. 5

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METHOD FOR PRODUCING SHARP CORNERS IN METAL STOCK

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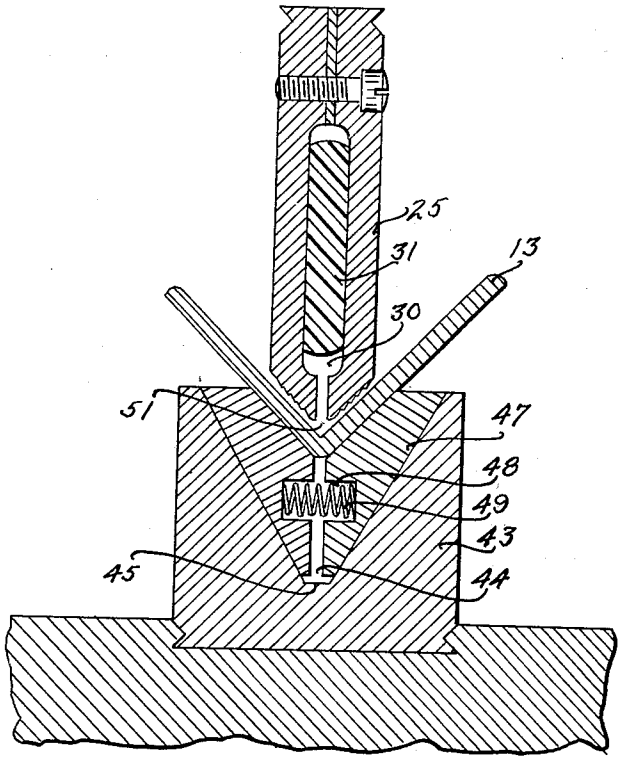


FIG 7

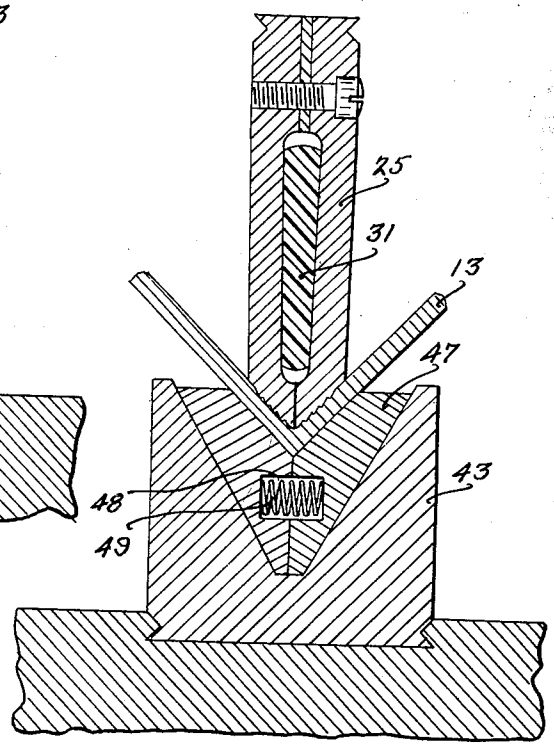


FIG 8

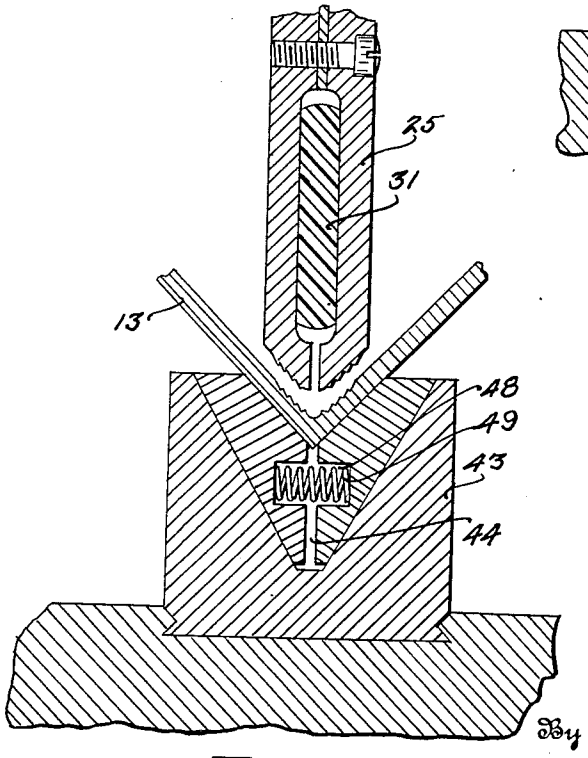


FIG 9

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METHOD FOR PRODUCING SHARP CORNERS IN METAL STOCK

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Application February 15, 1932, Serial No. 592,900

6 Claims. (Cl. 29—148)

This invention relates to a method for producing sharp corners on angularly bent metal stock.

Metal doors, door enclosures, furniture, etc., are produced from one form or another of angularly bent stock. The stock is generally formed in a press or roller die. The angular bends produced in this fashion are rounded rather than sharp. Since there are many instances where it is essential that the angular corners be sharp and well defined, it has been necessary to bend the material and produce a slight bulge on the outside of the bend. This bulge was then removed by belt sanding down to the angularly disposed flanges of the material to produce a sharp outer corner. While this method gives the desired appearance, it has been found that the stock in and adjacent the bend is greatly thinned and weakened, and as a result the material often fractures at this point. This has occurred particularly in metal door and enclosure structures where unavoidable vibration occurs.

The present invention discloses a method for producing a sharp and well defined angular corner with little or no weakening of the stock along the bend and without the necessity of performing extra work such as sanding or dressing down to obtain the desired sharpness.

The principal object of the invention lies in the provision of a method for producing a sharp corner in metal stock.

Another object of the invention is the method of bending metal stock to produce a sharp and well defined corner by means of a two-step process.

A further object of the invention lies in the method for producing well sharply defined corners in metal stock without greatly distorting the metal.

Another and further object of the invention is to provide a method for using a punch which causes a previously bent piece of stock to fill and conform to the sharp contour of a given die.

Another and still further object of the invention lies in the method of producing a sharply defined angular corner in metal stock, the thickness of the metal at the angle being somewhat greater than the normal thickness of the stock.

Other and further objects of the invention will be more clearly understood from a consideration of the following specification which is taken in conjunction with the accompanying drawings, and in which

Fig. 1 is a front elevation of a press about to perform the first operation on a piece of flat metal stock;

Fig. 2 shows a punch projecting into a die and the stock bent to a given angle;

Fig. 3 is an end view of the stock removed from the press;

Fig. 4 shows a punch and die for the second step of the process with the punch about to cause the round corner to flow into and fill the die cavity;

Fig. 5 shows the punch engaged with the stock at the completion of this operation;

Fig. 6 is an enlarged fragmentary view, showing the punch withdrawn from engagement with the stock;

Fig. 7 shows a slight modification of the punch and die, the die in this instance being arranged with laterally movable jaws, similar to those of the punch;

Fig. 8 shows the press engaged with the stock, and the elements of both punch and die moved laterally; and

Fig. 9 shows a method of ejection through the released spread of the punch and die.

Reference is now had to the drawings in which is shown a press, generally indicated by the reference numeral 10, which includes a punch 11 and die 12. The punch and die in this showing are arranged to produce a right angle corner in a strip of metal stock 13. The punch, mounted in any convenient manner in a head 15, is vertically movable to engage the stock 13 and causes it to be pressed into the V-shaped cavity 16 of the die. The die is mounted in any convenient manner in a base 17. Inasmuch as the present invention has only to do with a punch and die and the results obtainable therewith on the stock 13, further and more elaborate showing of the supporting structure is unnecessary.

In Figure 1 of the drawings, the stock 13 is shown mounted on the die 12 with the punch 11 in position preparatory to the first operation. When the punch 11 moves downward into the die, as shown in Figure 2, the stock 13 is bent to a right angle. It will be noted when the stock 13 is thus bent to produce an angle element, the sides 19 and 20 meet in a right angle 21 which is defined by a sharp inner corner 22 and a curved outer corner 23. Figure 3 of the drawings shows the stock upon removal from the press at the completion of the first operation.

The punch 11 may be removed from the head 15 and another punch 25 substituted therefore. This punch comprises substantially duplicate elements 26 and 27. The elements are arranged with coinciding transverse recesses 29, forming together a pocket 30 in which a resilient means, such as a rubber block 31, is located. Above the pocket 30 a spacing strip 33 is mounted between the adjacent faces of the punch elements 26 and 27. A drilled and tapped opening 34 is provided in the element 26 and a coinciding opening 35 is made in the element 27, this latter opening receiving a screw 37 which, when engaged with the threads of the opening 34, draws the elements 26 and 27 together, slightly compressing the block

31. It will be noted that the lower ends of the punch elements are shaped to jointly form a right angle, a gap 38 occurring therebetween. This gap is for the purpose of permitting the elements 26 and 27 of the punch to move toward each other under certain conditions of operation which will hereinafter be more fully set forth. The lower ends or jaws 39 and 40 of the elements 26 and 27 are formed with saw teeth 41. The teeth on one element project downwardly and toward the teeth of the other element. The purpose of these teeth is to provide engagement of the punch with the stock 13 during the second operation. The die 12, in this modification, may be the same as that shown for the first operation.

After mounting the angularly shaped stock in the die 12, the punch 25 is lowered to engagement with the stock. As pressure is exerted upon the punch, the teeth of the elements 26 and 27 bite into the stock and upon further downward pressure of the punch, move toward each other compressing the block 31. This inward and downward pressure of the punch elements causes the stock to flow downwardly to completely fill the V-shaped cavity of the die 12. A comparison between the showing of the stock in Figures 4 and 5 indicates that the downward and inward pressure exerted by the relatively movable punch elements has caused the round corner 23 of the angle 22 to change to a sharp corner defined by the shape of the cavity in the die. As soon as downward pressure on the punch ceases, the resilient block 31 tends to spread the punch elements 26 and 27, causing the teeth 41 thereof to readily release the stock. It will be noted that the inner surface of the stock adjacent the angle bears the teeth marks of the punch but since such marring of the stock always occurs on the inside of the angle and is concealed, such marring is not objectionable. However, since the teeth are merely for gripping the stock, any other known arrangement may be employed.

Attention is particularly directed to the enlarged fragmentary view of the stock in Figure 6. It will be noted that the stock is now thicker across the angle 21 than it is along the sides 19 and 20. In other words, the metal has been made to flow to produce a thick as well as sharp corner which will more effectively resist fracture than the corner formed by the first operation. It is well to mention that the first operation described and shown in Figures 1 and 2 is quite similar to present methods used in bending stock with the exception that there is usually a slight enlargement in the base of the die cavity which allows the metal to flow downwardly to form a bulge of sufficient thickness to permit sanding down to produce a sharp corner. This is common practise and was referred to in the introductory paragraph.

A modification of the structure for completing the second step in the process of bending stock to produce sharp outside corners is shown in Figures 7 through 9 of the drawings. In this instance, a die 43 is provided with a V-shaped cavity 44 which terminates in a narrow flat bottom wall 45. Mounted in the cavity 44 are duplicate oppositely disposed shoes 47. The shoes are formed with co-axial pockets 48 in which is located spring or other resilient means 49. The purpose of the spring is to normally hold the shoes apart and in engagement with the sloped walls of the die. The upper portion of the shoes are shaped to provide a cavity 41, the angularity of which corresponds to that described in connection with the first step in this process.

The stock 13 is placed in the cavity 51 and when the punch 25 moves downwardly, the shoes 47 are likewise moved downwardly and inwardly. This movement of the shoes 47 is simultaneous with the inward movement of the elements 26 and 27 of the punch. When the lowermost position of the punch is reached, the cavity 51 assumes a sharply defined angle at its base which is filled by the stock caused to flow through the action of the elements of both punch and die. This modification is better adapted for fast work since, upon raising the punch, the elements 26 and 27 as well as the shoes 47 of the die spread apart, thus permitting ready removal of the shaped stock.

Attention is directed to the fact that applicant can produce a sharply defined corner without the aid of the teeth shown on the lower faces of the punch elements 26 and 27 and without the aid of relatively movable shoes forming the die. These slight modifications as well as other deviations in structure, which may be suggested by the present showing, are contemplated and within the scope of applicant's invention in so far as they may be defined in the hereunto annexed claims.

Having thus set forth my invention what I claim as new and for which I desire protection by Letters Patent is:

1. The method of bending metal stock to produce a sharp outer corner consisting in first; bending the stock to the desired shape, and second; applying forces adjacent to and converging at the bend in the stock.

2. The method of bending metal stock to produce sharp outer corners consisting in first; bending the stock to partially conform to the shape of a given die, and second; applying forces to increase the thickness of the stock at the bend and fill the die.

3. The method of bending metal stock to produce sharp outer corners consisting in first; bending the stock to partially conform to the shape of a given die, and second; subjecting the inner faces of the stock adjacent the bend to convergent forces to cause the stock at the bend to fill the die.

4. The method of bending metal stock to produce sharp outer corners consisting in first; bending the stock to partially conform to the shape of a given die, and second; applying force by which to crowd additional metal into the bend to fill the die.

5. The method of bending metal stock to produce sharp outer corners consisting in first; bending the stock to a given shape, second; locating the bent stock in a die of said given shape, and third; applying converging forces to the inner walls of the stock adjacent the bend to cause the stock to fill the die at the bend.

6. The method of bending metal stock to produce sharp outer corners consisting in first; bending the stock to a given shape, second; locating the bent stock in a die of said given shape, and third; applying forces to crowd additional metal into the bend and increase the thickness of the stock at this point.

GUST LAWSON.