Aug. 19, 1947. C. L. BEARD 2,425,913

ANGLE SHRINKER

Filed Sept. 8, 1944

FIG. 8.

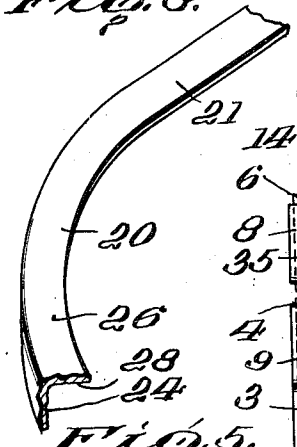


FIG. 1.

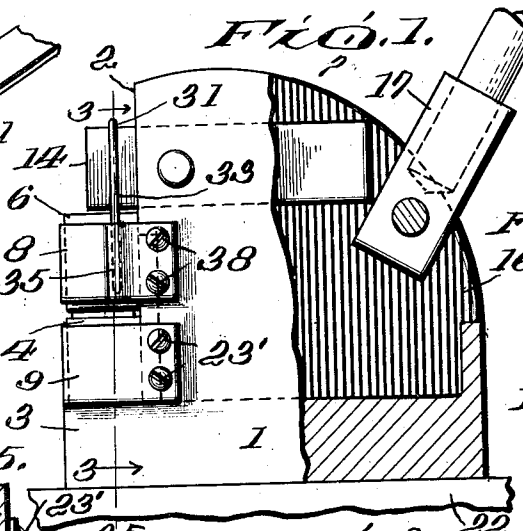


FIG. 7.

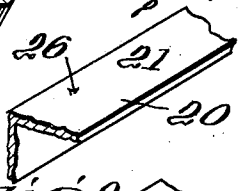


FIG. 9.

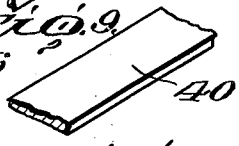


FIG. 6.

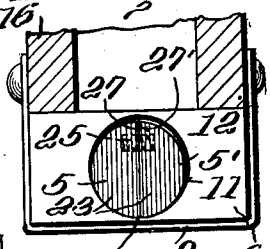


FIG. 5.

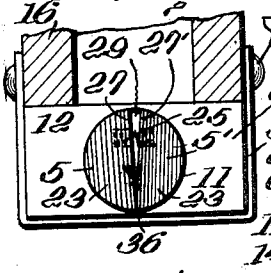


FIG. 2.

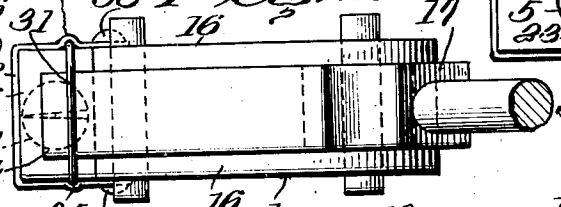


FIG. 3.

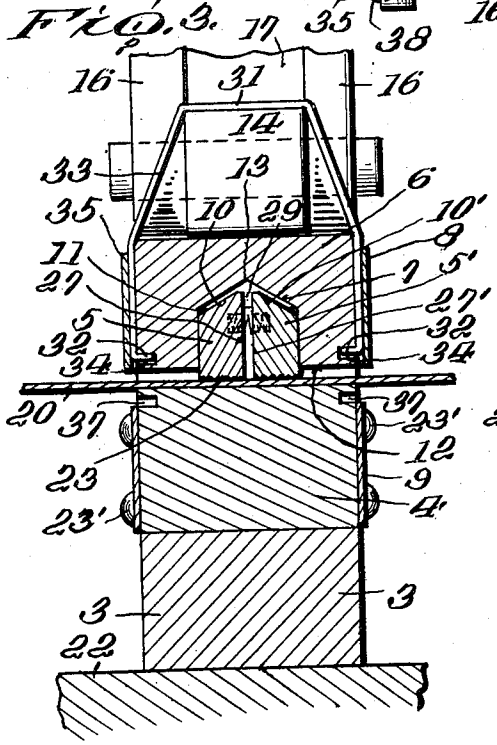
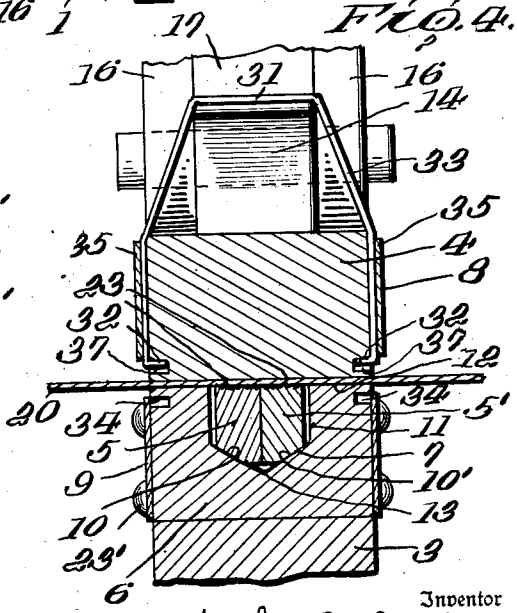


FIG. 4.



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ANGLE SHRINKER

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Application September 8, 1944, Serial No. 553,249

3 Claims. (Cl. 78—61)

1

This invention relates to improvements in machines for contracting either an angle shaped or a flat strip of metal into curved form, to fit a predetermined pattern or shape.

In the curving of flat metal strips in their own plane by the so called shrinking method, wherein the material is gripped between two pairs of gripping jaws and the jaws of each pair being arranged to be moved towards each other to shrink or upset the strips, it is well known that the inside edge or that edge of the strip which must be shrunk, offers the greatest resistance. This also applies to the gripped flange of an angle strip.

One of the objects of the present invention is to provide an improved device in which the shrinking effort is concentrated on that part offering the greatest resistance namely, the forward edge or that edge of the flange or strip fed to the gripping or shrinking jaws.

A further object of the invention is to provide an improved device in which the shrinking effort is concentrated on the forward edge of the work piece and gradually and in progressively diminishing degree extended in the direction of the opposite edge thereof.

Other objects and advantages of the invention will be apparent as this specification is considered in connection with the accompanying drawings, wherein:

Figure 1 is a side view, partly broken away, of the improved machine;

Figure 2 is a top plan view of the machine;

Figure 3 is a vertical section on the line 3—3 of Figure 1, showing the jaws expanded or spaced laterally;

Figure 4 is a section on the line 3—3 of Figure 1, showing a modified form of the invention in which the jaws and jaw guiding member are shown in interchanged position with respect to the anvil member and the jaws being shown in the position assumed when the handle of the actuating lever is rocked downwardly;

Figure 5 is a fragmentary plan view showing the gripping jaws in open position;

Figure 6 is a view similar to Figure 5 but showing the jaws in closed position;

Figure 7 is a fragmentary view of an angle shaped strip of metal before it has been operated upon by the machine;

Figure 8 is a view similar to Figure 7 showing the curvature of the strip after the shrinking operation; and

Figure 9 is a fragmentary view of a flat strip of metal before being shrunk.

2

Referring more particularly to the drawings 1 denotes a frame or body preferably of heavy cast construction and formed at its bifurcated front end 2 with a forwardly projecting table portion 3. Seated upon the table portion 3 is a solid anvil member 4, of rectangular shape and having smooth upper and lower faces. Arranged above the anvil 4 is a jaw guiding and actuating member 6, formed with a cylindrical vertically disposed chamber 11. This chamber 11 opens at its lower end through the lower face 12 of the guiding member 6, and terminates at its upper end in a restricted conical portion 13, the walls 7 of which are tapered inwardly and upwardly at an angle of approximately 30° from the body of the bore.

Freely received within the chamber 11 are a pair of semi cylindrical jaws 5—5' having serrated outer ends or gripping faces 23. The overall diameter of the two jaws is slightly less than the diameter of the body or lower portion of the chamber 11, and the truncated inner ends 10—10' of the jaws 5—5', like the inner end of the chamber 11, are tapered inwardly and upwardly at an angle of approximately 30°. The opposing vertically disposed flat faces 27—27' of the jaws are adapted to be guided into longitudinal engagement with each other, throughout their entire length, when the jaws are forced home in the bore or chamber 11, in a manner presently described. Any suitable means, such as a key and key-way connection, not shown, may be employed between the jaws and the walls of chamber 11, to prevent the jaws from becoming dislodged from the chamber.

Normally the opposing faces 27—27', of the jaws 5—5', are forced apart arcuately by a coil expansion spring 25, as indicated by the substantially V-shaped space 29, between these faces, as best shown in Figure 3 of the drawing. This spring is positioned at a point intermediate the ends of the jaws and is offset rearwardly from the axial center of the cylinder, formed by bringing the two flat faces of the jaws together, and thus causes the jaws to move apart about their front contacting edges 36, as a pivot.

The jaws 5—5', as well as the jaw guiding member 6, are suspended from a pivoted bar 14, described more fully hereinafter, by means of a substantially inverted U-shaped wire member 31. This wire member seats, intermediate its ends, upon the front end of the bar 14 and may be secured thereto by any suitable means, not shown. The inwardly bent extremities 32, of the depending legs 33, of the wire member 31 are anchored

in grooves 34, formed in opposite sides of the member 6. Upper and lower substantially U-shaped metal housings 8 and 9, suitably connected to the front end of the body 1, are employed to confine these parts in relatively movable but compact assembled relation. The upper housing 8 is formed with grooved or offset portions 35 in which the legs 33 of the wire member 31 are snugly received, for an obvious purpose. The weight of the longer or rear end of the pivoted bar 14, is sufficient to normally maintain the jaws 5—5', and the jaw guiding or actuating member 6, in elevated position, thus permitting the spring 25 to operate freely.

Assuming that a worker desires to impart to the sheet metal angle strip 21, shown in Figure 7, the curvature shown in Figure 8, he inserts the horizontal flange 20 of the strip 21 between the serrated working faces of the jaws 5—5' and the smooth upper working face of the anvil member 4. The workman then manipulates the lever 17, in an obvious manner, to cause the outer end of pivotally mounted bar 14, to exert pressure against the jaw guiding member 6. This operation first causes the flange 20 to be gripped by and compressed between the serrated faces of the jaws and the smooth working face of the anvil member 6, and then causes the jaws 5—5', to move inwardly and arcuately toward each other, about their outer contacting edges 36, as a pivot, against the tension of the spring 25. It also results in crowding or shrinking the material, of those areas of that face of the flange 20 which the jaws 5—5' engage, in opposing directions toward the space 29 between the jaws. Repeated successive applications of this gripping pressure, throughout substantially the entire length of the flange 20, causes the angle strip, as a whole, to assume the curvature illustrated in Figure 8. It will of course be understood that during the working stroke of the lever 17, the upper or inner inclined ends 10—10' of the jaws will slidably contact the conical upper or inner wall 7 of chamber 11 and the jaws will be forced tightly together. Release of pressure will now permit the spring 25 to return the gripping jaws to their normal spaced position. During the slight outward movement or expansion of the gripping jaws, within the confines of the housing 8, the jaws as well as the guide member 6 are elevated by the action of bar 14.

It should be noted that when a flat piece of metal, such as the strip 40, shown in Figure 9, is inserted between the jaws 5—5' and the anvil member 4, and the tool actuated in the manner previously described, the strip 40 will be deformed or caused to assume the curvature of flange 20, in Figure 6.

Owing to the fact that when the face of flange 20, which is to be exposed to the weather, is roughened during the shrinking operations just described, severe weather conditions may cause corrosion and other deterioration, with serious results. This is particularly true where the work piece is made of sheet aluminum, widely used in airplane construction, maintenance and repair. Consequently the workman will always insert the strip 21 in such manner that the unexposed top face 26 of the flange 20 will be engaged by the jaws 5—5', which of necessity roughen and otherwise mar this surface during shrinking operations. On the other hand the bottom face or surface 28 of flange 20, the part which for example we will assume is to be exposed to the weather, will not be roughened or otherwise scarred because it contacts the smooth top face of the stationary anvil member.

In line with the foregoing it should be noted that, for convenience of operation the body 1 is suitably positioned upon a bench or other elevated support 22, and therefore it frequently happens that with strips having a relatively deep vertical flange 24 it is not possible to insert the flange 20 in the shrinker in the position desired, that is, with the flange 24 in depending relation to the horizontal flange 20, because the flange 24 will contact the bench or other support on which the tool is mounted. Thus mere reversal of the metal strip will not suffice to present the proper face of the flange 20 to the laterally immovable anvil member. Therefore, to obviate this difficulty the jaws 5—5', jaw guiding member 6 and anvil member 4 are so constructed and mounted with respect to each other that they can be conveniently interchanged. That is, the jaws 5—5' together with the guiding member 6 are designed to be placed in inverted position on the table extension 3 and the anvil member 4, also inverted, is adapted to assume the position previously occupied by the first two above mentioned parts, all as illustrated in Figure 4. To this end, the anvil member is formed with grooves or recesses 37, similar to the grooves 34 in jaw guiding and actuating member 6, in which the bent extremities 32 of the wire member 31 are anchored.

In order to shift the parts from Figure 3 to Figure 4 position, it is merely necessary for the workman to remove both housings 8 and 9, which are secured in place by screws 38 and 23' respectively, then release the legs of wire member 31 from the guide member 6, and finally secure the housings back in place.

For some purposes it may be desirable to upset the work piece by stretching. Thus it is obvious that if the cam faces 10—10' of the jaw guiding member 6 instead of sloping outwardly are arranged to slope inwardly, and the coacting sloping faces of the jaws 5—5' be correspondingly changed the jaws will be caused to move outwardly to stretch the work piece, when the lever 17 is appropriately manipulated.

Having thus described my invention, what I claim is:

1. A machine of the character described, comprising a body, an anvil member supported by said body, a guide member and a pair of semicircular jaws supported for relative vertical movement toward and away from said anvil member, said jaws and said anvil member having serrated gripping faces and a smooth gripping face respectively adapted to receive therebetween a substantially straight piece of metal, said guide member having a chamber for receiving said jaws, said chamber comprising a circular body portion terminating in a conical inner end portion, the diameter of the body portion of said chamber being greater than the combined diameter of said jaws, a spring for normally forcing the jaws away from each other in an arcuate direction within said body portion of said chamber, said jaws having inclined truncated ends, and means for forcing said guide member and said jaws and said anvil member relatively toward each other to bring said truncated ends of the jaws and the conical inner end portion of said chamber into relative sliding contact to cause the jaws to move arcuately towards each other and to cause the work piece to be tightly gripped between the

serrated faces of the jaws and smooth face of the anvil member and whereby the serrated faces of the jaws will crowd the gripped material of one face of the work piece in opposing arcuate directions without disturbing or marring the other face thereof.

2. A machine of the character described comprising a body, an anvil member supported by said body, a guide member and a pair of semi-circular jaws supported for relative vertical movement toward and away from said anvil member, said jaws and said anvil member having gripping faces adapted to receive therebetween a substantially straight piece of metal, said guide member having a chamber for receiving said jaws, said chamber comprising a circular body portion terminating in a conical inner end portion, the diameter of the body portion of said chamber being greater than the combined diameter of said jaws, a spring interposed between said jaws and offset rearwardly from the axial center of said jaws for normally forcing the jaws away from each other in a pivotal arcuate direction within said body portion of said chamber, said jaws having inclined truncated ends, and means for forcing said guide member and said jaws and said anvil member relatively toward each other to bring said truncated ends of the jaws and the conical inner end portion of said chamber into relative sliding contact to cause the jaws to move arcuately towards each other and to cause the piece of metal to be tightly gripped between the gripping faces of the jaws and anvil whereby the faces of the jaws will crowd the gripped material of one face of the metal in opposing arcuate directions without disturbing or marring the other face thereof.

3. A machine of the character described comprising a body, an anvil member supported by said body, a guide member and a pair of jaws supported by said body for relative vertical movement toward and away from said anvil member, said jaws having opposing flat faces, said jaws and said anvil member having gripping faces adapted to receive therebetween a substantially straight piece of metal, said guide member having a chamber for receiving said jaws, said chamber comprising a circular body portion terminating in a conical inner end portion, a spring interposed between the flat faces of and intermediate the ends of said jaws, said spring being offset rearwardly from the axial center of the jaws for normally forcing the jaws away from each other in an arcuate direction about their front contacting side edges, said jaws having inclined truncated ends, and means for forcing said guide member and said jaws and said anvil member relatively toward each other to bring said truncated ends of the jaws and the conical end portion of said chamber into relative sliding contact to cause the jaws to move arcuately towards each other and to cause the piece of metal to be tightly gripped between the faces of the jaws and anvil whereby the gripping faces of the jaws and anvil will crowd the gripped material of one face of the metal in opposing arcuate directions without disturbing or marring the other face thereof.

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