May 18, 1948. B. LERMONT 2,441,707

GRIPPING MEANS FOR HYDRAULIC RAM TYPE OF METAL SHAPING PRESSES

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FIG.1.

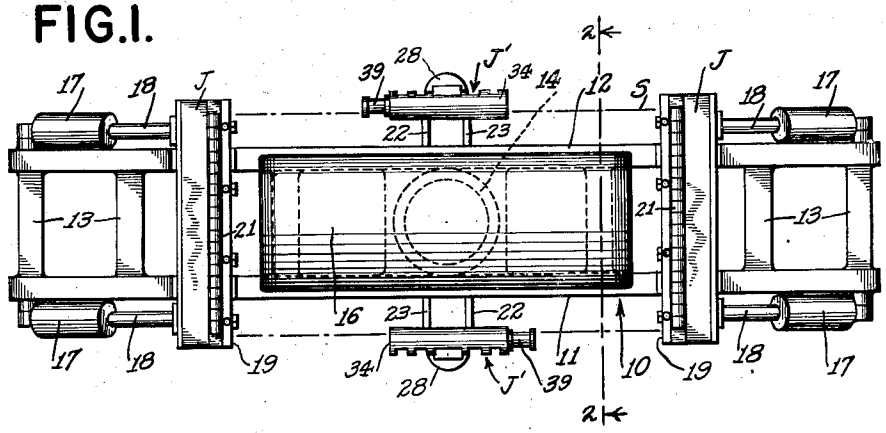
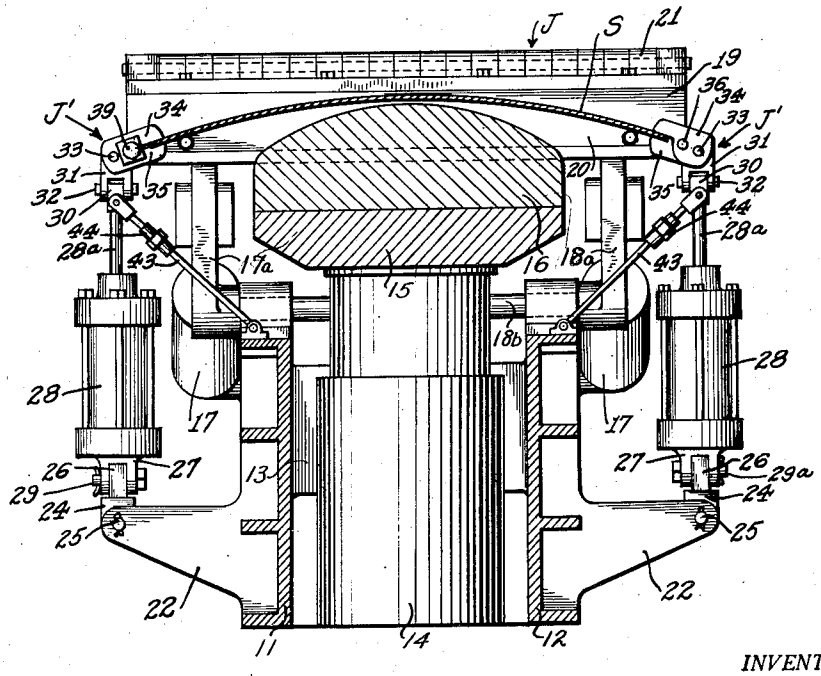


FIG.2.



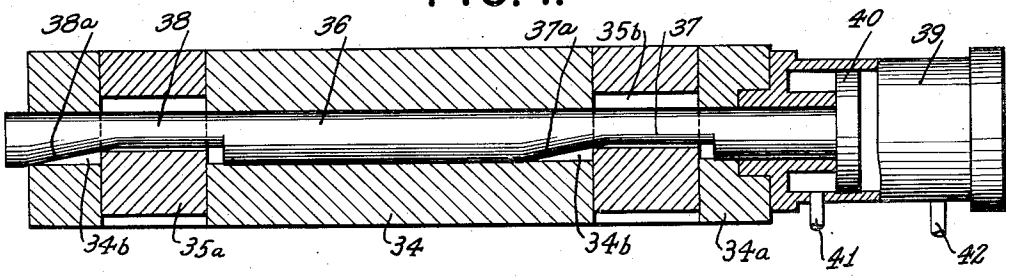
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GRIPPING MEANS FOR HYDRAULIC RAM TYPE OF METAL SHAPING PRESSES

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FIG.4.



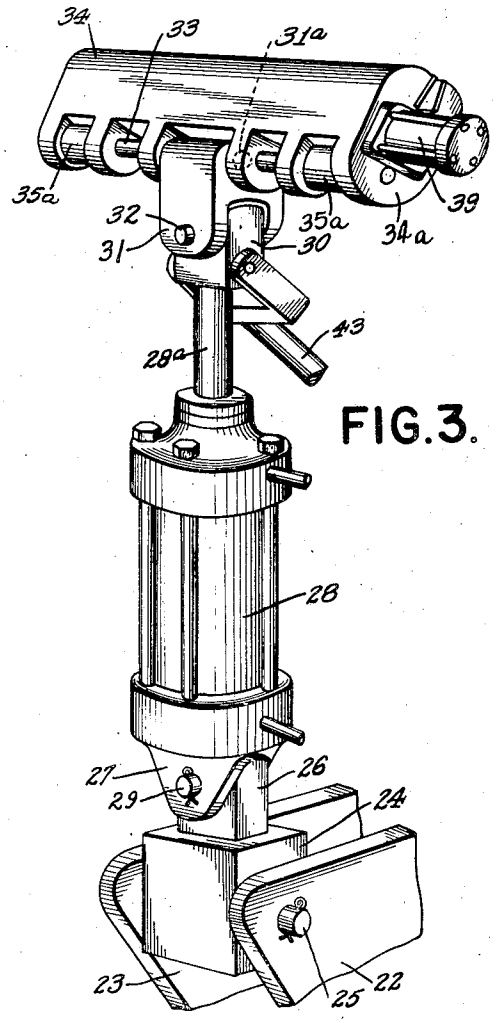


FIG.3.

FIG.5.

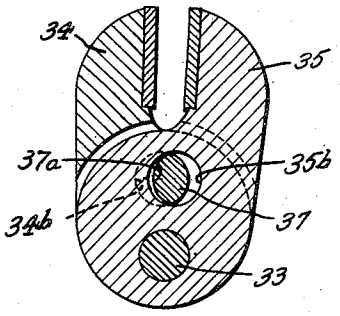
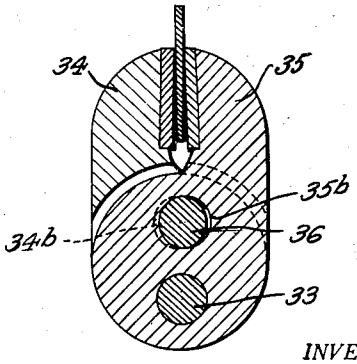


FIG.6.



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UNITED STATES PATENT OFFICE

2,441,707

GRIPPING MEANS FOR HYDRAULIC RAM TYPE OF METAL SHAPING PRESSES

Basil Lermont, New York, N. Y., assignor, by mesne assignments, to Sutton Patents, Inc., New York, N. Y., a corporation of New York

Application September 10, 1943, Serial No. 501,774

4 Claims. (Cl. 153—48)

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This invention relates to improvements in devices for shaping sheets of metal into curved or concavo-convex form and relates particularly to improvements in devices of the type disclosed in my co-pending application Serial No. 493,984, filed July 9, 1943 and subsequently abandoned.

The aforementioned co-pending application discloses a device for shaping sheets of metal which includes a ram mechanism having a form or die supported thereby which can be brought into engagement with a sheet of metal and pressed against the metal in order to deform the metal into a shape substantially complemental to the shape of the form.

In order to retain the sheet under tension during shaping of the sheet, the end and the side edge portions of the sheet are gripped by suitable gripping members and the movement and location of the gripping elements are regulated so that a controlled flow of the metal in the sheet is obtained. By arranging the gripping members in the manner described above, it is possible to reduce to a large extent the tendency of the metal to flow inwardly from the edges and thereby prevent the sheet from becoming narrower and wrinkling.

It has been found, however, that in some types of operations there is a tendency of the sheet to flow more at one zone than at another for the reason that one portion of the sheet may be stretched to a greater extent than another portion. Sometimes wrinkles are formed in the portion of a sheet in which the greatest flow of metal takes place and in some instances the sheet tears for the reason that the clamping or gripping means engage the edges of the sheet rigidly and cannot move with the sheet to equalize the stresses exerted parallel to the gripping means.

An object of the present invention is to provide gripping means for gripping the edges of the sheet which are capable of slight movement relatively to the form so as to compensate for flow of metal parallel to the edges of the sheet.

Another object of the invention is to provide a ram type of device having gripping jaws which are mounted for universal movement so that they can move endwise with the sheet, while at the same time exerting a transverse stretching action on the sheet thereby to compensate for the flow of the metal.

Other objects of the invention will become apparent from the following description of a typical form of device embodying the invention.

In accordance with the present invention, a

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device is provided that includes a ram for shaping sheets of metal and members for gripping and retaining the ends and edges of a metal sheet. Some of the gripping members are mounted with capacity for movement in substantially all directions to subject the sheet to controlled tension, but permitting a certain freedom of movement of the retained edges of the sheet to compensate for stresses exerted at angles to the directions in which the sheet is tensioned.

More particularly, the members for gripping the lateral edges of the sheet are supported for universal movement on a mechanism for moving the gripping members to exert tension on the sheet, and the mechanism is mounted for universal movement, likewise, whereby the gripping members can move toward and away from the ram, and in the direction of the length of the gripping members without binding during any of these movements.

The freedom of movement of the gripping members allows the gripped portion of the sheet to shift slightly in response to stresses thereon with the result that the stresses on the sheet are equalized and more uniform flow of the metal in the sheet results during the forming operation.

For a better understanding of the present invention, reference may be had to the accompanying drawing, in which:

Figure 1 is a plan view of a typical form of device embodying the present invention;

Figure 2 is a view in cross-section taken on line 2—2 of Figure 1;

Figure 3 is a view in perspective of a typical form of gripping mechanism embodying the present invention;

Figure 4 is a view in longitudinal section of the gripping jaws disclosing the actuating mechanism for the jaws;

Figure 5 is a view in transverse cross-section of the gripping jaws shown in open position; and

Figure 6 is a view in transverse cross-section showing the jaws in closed position.

The device chosen for illustrating the invention consists of a frame 10 including a pair of spaced apart, parallel side members 11 and 12 which are connected by transversely extending members 13. Between the side members 11 and 12 and disposed substantially centrally with respect thereto is a hydraulic ram 14 carrying a platen 15 at its upper end which is provided with a form 16. The form 16 may be of substantially any desired shape depending upon the curvature that is to be imparted to the metal

sheet S. As illustrated, the form 16 is of generally rectangular shape and is curved longitudinally and transversely. It will be understood that the form 16 may be varied widely in shape depending upon requirements and is not limited to the shape illustrated.

At opposite ends of the frame 10 are disposed hydraulic cylinders 17 having piston rods 18 therein which are joined to gripping members J of a type disclosed more particularly in my copending application Serial No. 493,984, filed July 9, 1943 and subsequently abandoned. The members J consist of a pair of pivotally connected jaw elements 19 and 20 having complementally curved edges for engaging the ends of the sheet S. The jaw elements 19 and 20 are joined by a hinge connection 21 which permits them to be opened and closed, preferably by means of hydraulic rams and toggles (not shown).

A gripping member J of the type described above is provided at each end of the frame 10 and may be supported on the spaced apart arms 17*a* and 18*a* that are connected to the opposite ends of a shaft 18*b* which is rotatably mounted in the frame 10 so the member J may be moved pivotally about the axis of the shaft 18*b* to exert a desired tension on the sheet S by means of the hydraulic motors, each including a cylinder 17 and a piston rod 18.

The device is also provided with lateral gripping members J' of novel type which will be described now.

On opposite sides of the frame 10 and projecting outwardly from the side members 11 and 12 are pairs of spaced apart lugs 22 and 23, shown more particularly in Figure 3, between which is pivotally mounted a block 24 by means of a shaft or spindle 25. The upper end of the block 24 is provided with a reduced portion 26 which is received in a bifurcated portion 27 at the lower end of the cylinder 28. The bifurcated portion 27 is joined to the block 24 by means of a pivot pin 29 extending at right angles to the spindle 25, thereby providing a universal connection and permitting rocking movement of the cylinder 28 about axes at right angles.

The cylinder 28 is provided with a piston (not shown) having a piston rod 26*a* connected thereto which projects from the upper end of the cylinder and is provided with a block 30 on the end thereof which is received in the bifurcated bracket 31. The bracket 31 and the block 30 are joined by means of a pivot pin 32 extending parallel with the pivot pin 29.

The bifurcated bracket 31 is provided with an aperture 31*a* through which passes a hinge pin 33 that supports for pivotal movement a pair of gripping jaws 34 and 35. Each of the jaws 34 and 35 is provided with lugs 34*a* and 35*a*, respectively, having apertures therein for receiving the hinge pin 33 and permitting them to oscillate about the hinge pin 33. It should be noted that the hinge pin 33 extends substantially parallel to the pivot pin 25 and thus while the cylinder may rock about the pivots 29 and 25, the jaws may oscillate about the hinge pins 33 and 32 and remain substantially parallel to the pin 25.

The jaws 34 and 35 are opened and closed by the mechanism disclosed in Figures 4, 5 and 6. The jaws 34 and 35 are provided with circular apertures 34*b* and 35*b* in which is received a rod 36 extending entirely through the jaws. Adjacent the opposite ends of the rod 36 are portions 37 and 38 of reduced oval cross-section

which permit separation of the jaws 34 and 35 when in the position shown in Figure 5 and Figure 4, inasmuch as these reduced sections do not fit the openings 34*b* and 35*b* closely. Adjacent to the reduced sections 37 and 38 are inclined portions 37*a* and 38*a* which exert a camming action on the jaws 34 and 35 to move them together to the positions shown in Figure 6 when a rod 36 is moved to the right as viewed in Figure 4.

The rod 36 is moved axially or endwise by means of the cylinder 39 and piston 40 which is connected to the end of the rod 36. Thus, when fluid pressure is supplied to the inlet 41 of the cylinder 39, the piston 40 and rod 36 are urged to the right, causing the jaws 34 and 35 to close and grip the sheet of metal S. When fluid is supplied to the connection 42, the piston 40 and the rod 36 are shifted to the left to release the jaws as shown in Figure 5.

The gripping members J' are maintained in an upright position and are prevented from falling inwardly or outwardly by means of the extensible rods 43. The rods 43 are pivotally connected to the frame member 11 or 12 and the block 30 at the upper end of the piston rod 29. The rods 43 may be provided with turnbuckles 44 permitting the rods to be lengthened or shortened. The rods 43 act as thrust members to permit the sheet S to be tensioned transversely, but do not prevent slight endwise shifting of the jaws 34 and 35 to compensate for shifting of the sheet S lengthwise.

In operation, the members J are actuated to grip a sheet of metal and pressure is exerted in the hydraulic cylinders 17, to move the members J outwardly to place the sheet S under endwise tension. The side gripping members J' may likewise be closed upon the lateral edges of the sheet S and by supplying fluid pressure to the cylinder 28, the sheet of metal is subjected to transverse tension. When the ram 14 is actuated and the form 16 is forced against the tensioned sheet S, the sheet S is stretched beyond its elastic limit and is deformed permanently into a shape complemental to the surface of the form 16. During the shaping operation, the tension of the members J and J' may be increased or decreased as necessary.

When the sheet S is stretched more at one end than another, there may be a tendency for a portion of the sheet to move slightly endwise in order to compensate for the unequal flow of the metal. Inasmuch as the edge gripping members J' on opposite sides of the form are capable of rocking movement, they can vary their position and travel slightly with the sheet in endwise direction without losing their parallel relationship or altering their argular relationship to the edges of the sheet S. In this way, there is no tendency for the side gripping members J' to rock and thereby exert a varying tension transversely of the sheet. Moreover, the pivotal support for the members J' always permits them to move into alignment with the sheet, thereby preventing bending of the sheet at the edges of the gripping means J', regardless of the position the edges of the sheet S assume.

Thus, the lateral gripping members J' permit the necessary slight movement of the sheet to prevent the formation of wrinkles or tears in the sheet.

It will be understood that devices of the type described herein can be modified considerably without departing from the invention. Thus,

the size and shape of the form, the location and size of the gripping elements, the type of mechanism for actuating the members and the type of universal mounting for the members J' may be varied considerably without departing from the invention. Moreover, gripping members like the members J' may be substituted for the members J and the number of these elements may be varied as desired.

Therefore, the form of the invention described herein should be regarded as illustrative and not as limiting except as required by the scope of the claims.

I claim:

1. In a gripping and tensioning member for a metal-forming device having a frame and a metal-shaping form; the combination of a cylinder, a piston in said cylinder, a piston rod connected to said piston, an universal connection between one end of said cylinder and said frame, a pair of pivotally connected jaws mounted on said piston rod for substantially universal movement relatively thereto, and means for supplying fluid pressure to said cylinder to extend and retract said piston rod.

2. A gripping and tensioning member for a metal-forming device having a support, comprising a hydraulic ram having a cylinder, a piston and a piston rod, means connecting said cylinder to said support for universal movement relatively thereto, a member pivotally connected to one end of said piston rod, a hinge pin passing through said member at a right angle to the axis of the pivotal connection between said member and said piston rod, a pair of elongated gripping jaws hingedly connected by said hinge pin, and means carried by said jaws for opening and closing said jaws.

3. A gripping and tensioning member for a metal-forming device having a support, comprising a hydraulic ram having a cylinder, a piston and a piston rod, means connecting said cylinder to said support for universal movement relatively thereto, a member pivotally connected to one end of said piston rod, a hinge pin passing through said member at a right angle to the axis of the pivotal connection between said member and said piston rod, a pair of elongated gripping jaws hingedly connected by said hinge pin, a cylinder carried by one of said jaws, means forming apertures in said jaws adapted to be aligned when said jaws are together, a piston having a piston rod projecting from said cylinder, and having portions fitting said apertures, and means forming zones of reduced cross-section in said rod receivable in said apertures to permit said jaws to separate.

4. A gripping and tensioning member for a metal-forming device having a support, comprising a hydraulic ram having a cylinder, a piston and a piston rod, means connecting said cylinder to said support for universal movement relatively thereto, an adjustable thrust member pivotally connected to said piston rod and said support and forming therewith a triangulated structure for supporting said cylinder in a predetermined relation to said support, a member pivotally connected to one end of said piston rod, a hinge pin passing through said member at a right angle to the axis of the pivotal connection between said member and said piston rod, a pair of elongated gripping jaws hingedly connected by said hinge pin, a cylinder carried by one of said jaws, means forming apertures in said jaws adapted to be aligned when said jaws are together, a piston having a piston rod projecting from said cylinder and having portions fitting said apertures, and means forming zones of reduced cross-section in said rod receivable in said apertures to permit said jaws to separate.

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