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R. J. LINDSEY

2,437,105

METAL STRETCHING PRESS HAVING SLIDABLE PLATEN

SUPPORTS PROVIDED WITH CLAMPING FACES

Filed Dec. 8, 1944

3 Sheets-Sheet 1

Fig. 1

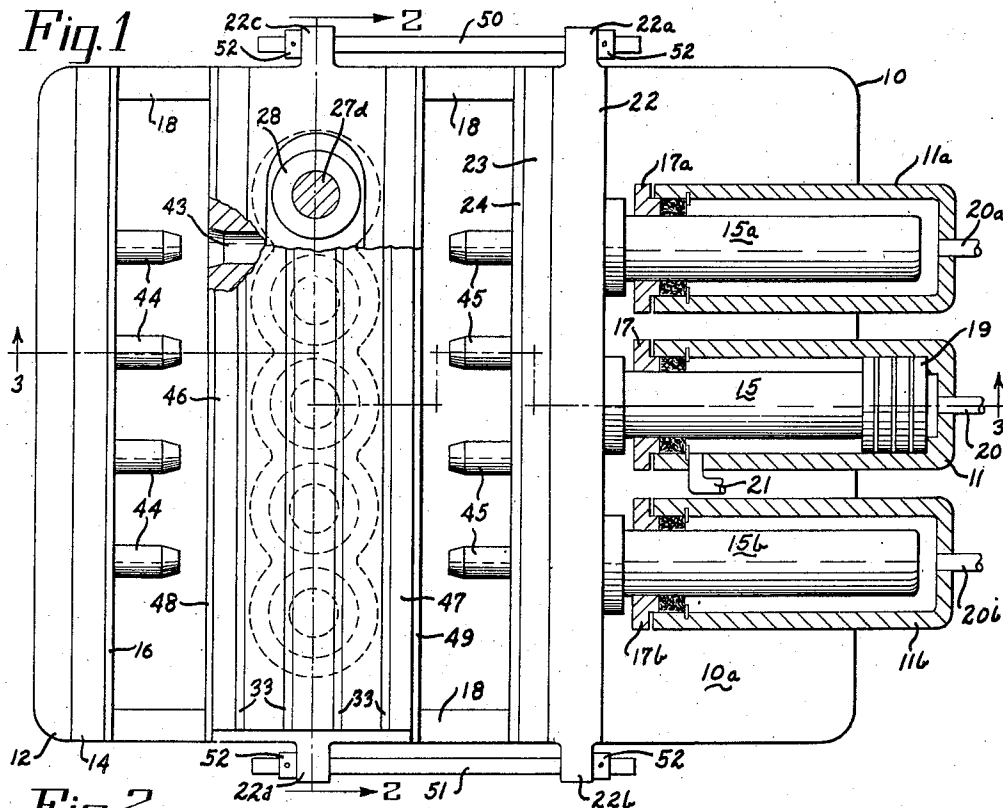
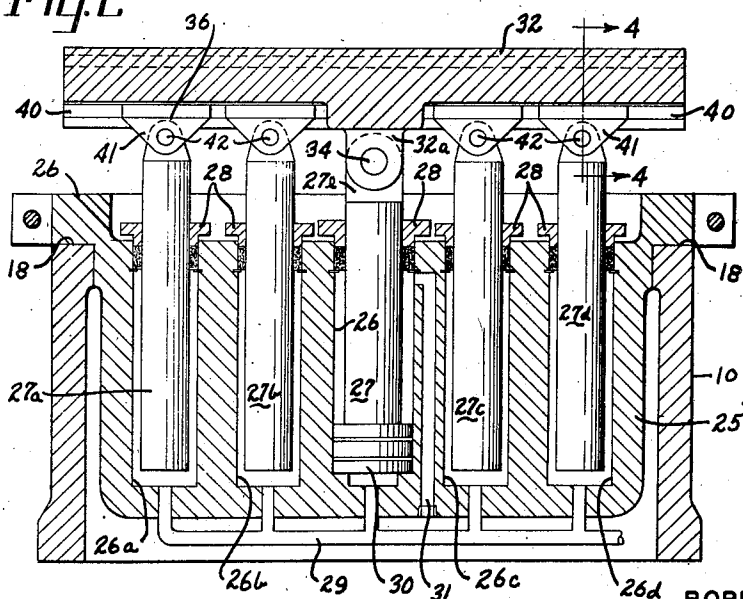


Fig. 2



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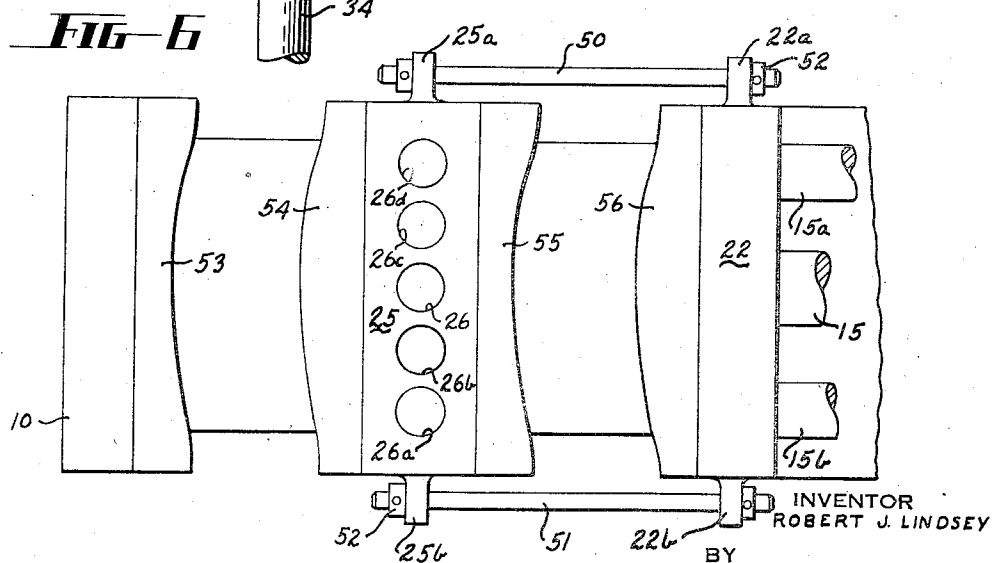
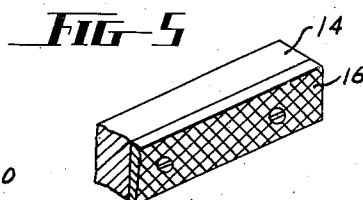
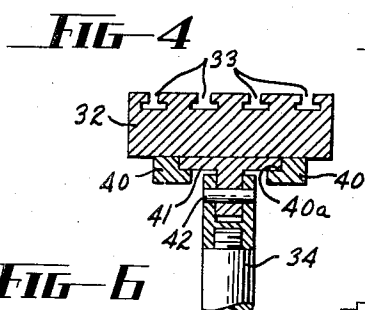
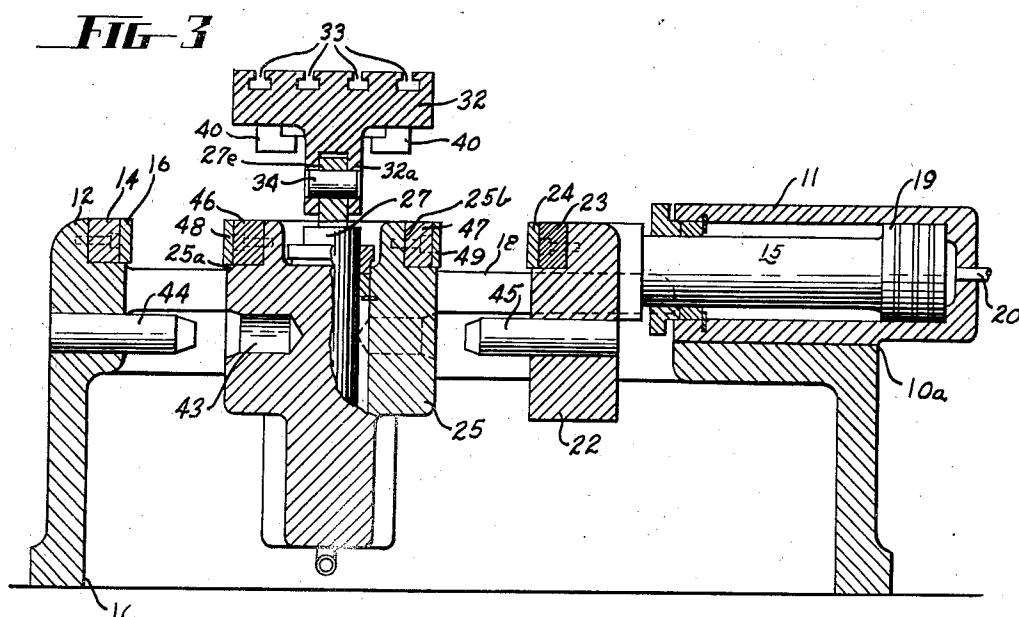
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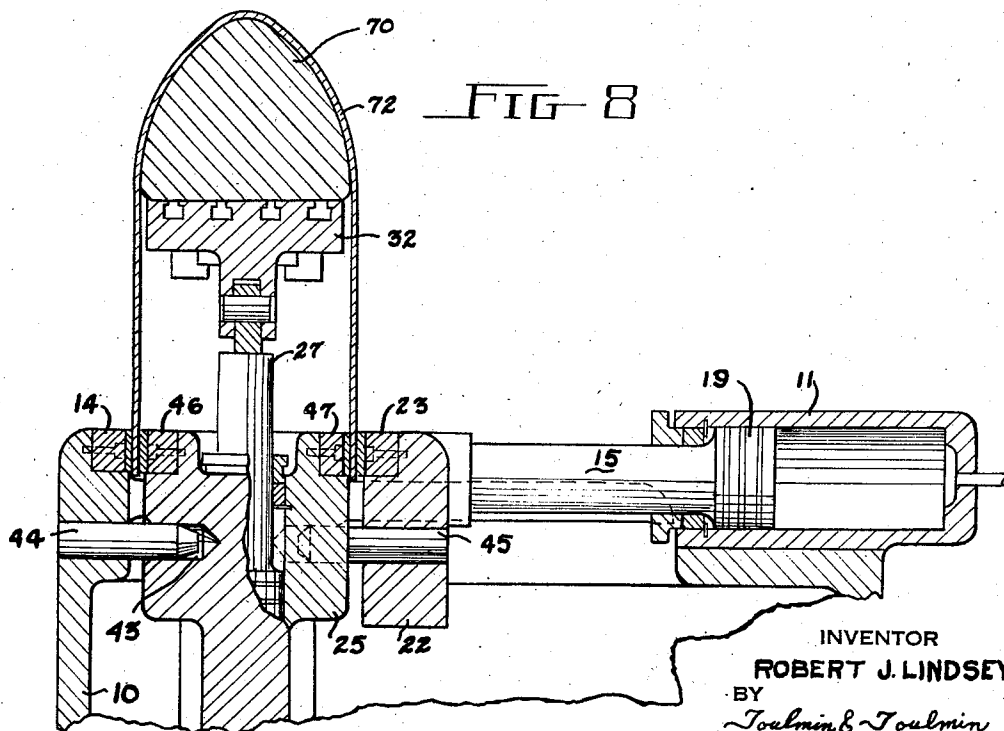
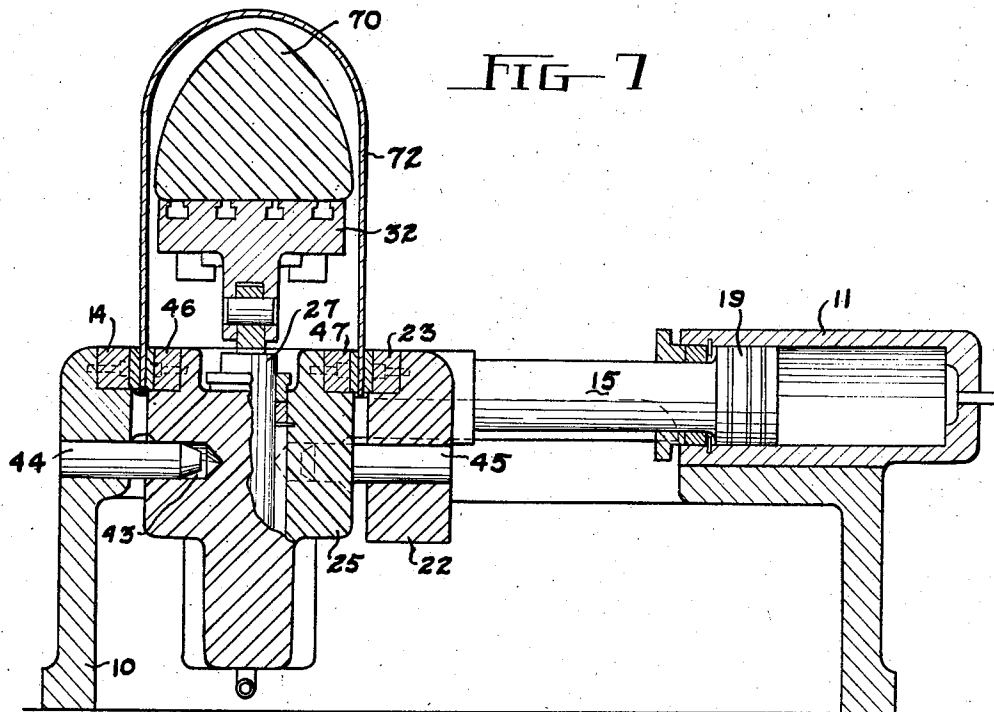
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3 Sheets-Sheet 3



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METAL-STRETCHING PRESS HAVING SLID-
ABLE PLATEN SUPPORTS PROVIDED WITH
CLAMPING FACESRobert J. Lindsey, Mount Gilead, Ohio, assignor
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13 Claims. (Cl. 153—48)

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This invention relates to presses particularly of the type forming metal sheets by stretching them over a die member.

One object is to provide a mechanism clamping opposite edges of a sheet metal workpiece by a single power means in a single operation.

Another object is to provide a stretching press wherein the workpiece may be given a compound curved surface in a single stretching operation.

A further object is to provide a pivoted press platen that is slightly tiltable so that the die member carried thereby may adjust itself and conform to the contour of an irregularly-shaped workpiece.

A still further object is to provide a structure clamping opposite edges of the workpiece and locking the clamping elements into a rigid unitary structure in a single operation whereby all reactions of the press plungers are taken by the clamping structure itself and are not transmitted to the press frame.

A still further object is to provide a press clamp having three relatively movable members together with double acting power means to close said members into gripping relation with opposite side edges of a work sheet by one direction of motion of said power means; and to positively open or separate said members to fully release the work sheet by a single reverse operation of said power means.

A still further object is to provide a stretching press that is easily and simply constructed, positive in operation and that is well adapted for automatic control effecting operations of clamping, stretching and release, in sequence.

Other objects and advantages will become apparent as the description proceeds.

In the drawings:

Figure 1 is a plan view partly in section, of a stretching press constructed according to this invention;

Figure 2 is a transverse vertical section through the platen and bed of the press on the line 2—2 of Figure 1;

Figure 3 is a vertical longitudinal section through the press taken on the line 3—3 of Figure 1;

Figure 4 is a transverse section through the platen of the press taken on the line 4—4, Figure 2;

Figure 5 is a perspective view showing one type of jaw facing adapted for use on the jaw members;

Figure 6 is a plan view of a press in which the

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jaw members have been replaced with jaw members having curved gripping surfaces.

Figure 7 is a view similar to Figure 3 but showing a sheet of metal in the press clamped between the jaw faces and prior to energization of the platen rams; and

Figure 8 is a view similar to Figure 7 but showing the platen actuated to drive the die carried thereon into stretching position.

Referring in detail to the drawings wherein like numerals identify corresponding parts throughout, 10 indicates the generally rectangular frame formed with parallel side tracks 18 and a portion indicated at 12, Figure 3, upstanding above the upper level of tracks 18 and shouldered to receive a fixed jaw member 14 having a knurled or roughened gripping facing 16. At its end opposite member 14, frame 10 is formed with a supporting surface 10a, somewhat below the upper level of tracks 18. A number of cylinders 11, 11a and 11b, are rigidly secured in any desired manner to supporting surface 10a. As shown at Figure 1, three cylinders are employed, and central cylinder 11 is double acting, while cylinders 11a and 11b are single acting. It will be understood, however, that the invention is not limited to any particular number of cylinders and that, within physical limits, any number may be employed. In some cases, one cylinder alone will suffice.

Cylinders 11, 11a and 11b are located with their axes parallel to the path determined by tracks 18 and, preferably, closely adjacent a horizontal plane centrally through jaw member 14.

Plungers or rods 15, 15a and 15b extend within the respective cylinders through glands 17, 17a and 17b, and from Figures 1 and 3 it will be noted that plunger 15 is made double acting by a piston 19 attached thereto, and fluid connections 20 and 21 admitting and exhausting fluid under pressure to and from said cylinder. Fluid connections 20a and 20b are provided, conveying fluid under pressure to cylinders 11a and 11b, respectively. In practice, all cylinders will be supplied from a common pressure source.

A bar 22 has its ends shaped to be supported and guided by tracks 18 so that it moves substantially in translation only in a direction normal to its length. This bar has a jaw member 23 fixed thereto in any suitable manner and provided with a knurled gripping facing 24. Thus, as fluid under pressure is admitted to cylinders 11, 11a and 11b through connections 20, 20a and 20b, bar 22 is moved along tracks 18 to the left in Figure 1; and

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retraction movement to the right is effected by connecting 20, 20a and 20b to exhaust by valve connections not shown while admitting fluid under pressure to connection 21 of central cylinder 11.

A press or cylinder block 25 is slidably guided upon tracks 18, as clearly shown at Figure 2 and is thus limited to translation parallel to the direction of action of plungers 15, 15a and 15b. Member 25 is formed with a plurality of cylinder bores 26, 26a, 26b, 26c and 26d having their axes normally vertical, and in each of which a respective plunger 27 and 27a to 27d is reciprocably guided by glands 28. A pressure conduit 29 leads from a source of pressure, not shown, and has branches to each of the bores 26 and 26a to 26d, as clearly indicated at Figure 2, whereby all pistons 27 etc., may be forced upwardly in unison upon admission of pressure to conduit 29. Cylinder 26 is made double acting by a piston 30 fixed to plunger 27 and fitting bore 26. Retraction movement in the downward direction is effected by connecting conduit 29 to exhaust and admitting fluid under pressure through a passageway 31 above piston 30.

A platen or bar 32 is supported by, and interconnects the upper ends of plungers 27 and 27a to 27d. This platen may conveniently have longitudinally extending T-slots 33, Figure 3, formed in its upper flat surface. Centrally of its lower surface, platen 32 is formed with a pair of spaced lugs 32a. The upper end of plunger 27 is flattened, as at 27e, to fit between these lugs, and a pivot pin 34 fits aligned apertures in lugs 32a and flattened portion 27e to pivotally connect plunger 27 and platen 32. Parallel guide strips 40 are fixed to the under side of platen 32 to extend longitudinally thereof on either side of lugs 32a. These strips are rabbeted as indicated at 40a, Figure 4, to form guide channels therebetween. Slides 41, T-shaped in cross-section, have their heads slidably fitting these channels and the stem of each slide projects downwardly to fit between the grooved upper ends of the respective plungers 27a to 27d. Pivot pins 42 pass through aligned holes in the stems of slides 41 and the grooved ends of plungers 27a to 27d, whereby each slide is pivotally connected to a respective plunger. From this description, and from inspection of Figure 2, it will be noted that bar 32 may have a slight tilting movement about the axis of pin 34 to thereby conform to the particular shape of the die or dies intended to be mounted on bar 32 and secured thereto by T-slots 33.

Member 25 has formed therein two series of holes 43, flared at their outer ends, and so positioned as to receive corresponding series of dowel pins 44 and 45 fixed in frame 10 and bar 22, respectively, as shown at Figure 3. Member 25 is shouldered or rabbeted along its upper transverse edges, as at 25a and 25b, to receive jaws 46 and 47 having knurled face plates 48 and 49; and it will be noted that face plates 16 and 48 are aligned and form a coacting pair of gripping surfaces while plates 24 and 49 form a second pair.

Bar 22 has lugs 22a, 22b extending therefrom as shown at Figure 1 while member 25 has corresponding lugs 22c and 22d. Rods 50, 51 slidably pass through aligned holes in the respective pairs of lugs and have collars 52 fixed thereon to engage the opposite faces of the lugs. The spacing of collars 52 is so adjusted that, at a desired position in the retraction movement of

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bar 22, lugs 22a and 22b engage collars 52 and operate through rods 50 and 51 to apply a retracting force to member 25, whereby the latter is also moved until pins 44 are clear of holes 43.

The operation of the invention will now be clear. Assume for example, that it is desired to stretch a piece of sheet metal into a form that is generally U-shaped in cross section but of a form curved about two or more angularly-related axes, that is, a surface whose generating line is a curve rather than a straight line. A die or dies as shown at 70 in Figure 7 having the desired surface contour of the finished article, is secured to pressure bar 32 by means of slots 33. The work piece, indicated at 72 in Figure 7, bent into the form of a U, is inserted so that one edge lies between faces 16 and 48 while the other edge lies between faces 24 and 49. A valve, not shown, is then operated admitting fluid under pressure through conduits 20, 20a and 20b. Bar 22 is thereby moved until pins 45 enter one set of holes 43 in member 25 and one edge of the workpiece is clamped between faces 24 and 47. Continued movement of bar 22 then moves member 25 until pins 44 enter the other set of holes 43 and the other edge of the workpiece is clamped between faces 16 and 48. The edges of the workpiece are now rigidly clamped in the press and, by reason of pins 44 and 45, the parts 22 and 25 are firmly and rigidly fixed to frame 10. At this stage of the working cycle the press parts and workpiece are in the position illustrated in Figure 7. Fluid under pressure is now admitted to conduit 29 to simultaneously urge plungers 27 and 27a to 27d upwardly and thus force the dies against the concave portion of the work piece to thereby stretch the work piece and force it to conform to the shape of dies on bar 32. At the end of the stretching operation, the press parts and the workpiece are in the position illustrated in Figure 8. After the desired shape has been thus imparted to the workpiece, conduits 29, 20, 20a and 20b are connected to exhaust while pressure fluid is admitted to conduits 21 and 31 to thereby lower bar 32, retract bar 22 from member 25 and, through rods 50, 51, move member 25 from face 16 to the position shown at Figure 1.

While, for simplicity of illustration, I have shown the clamping faces 16, 48, 49 and 24 as being planar, such is not necessarily the case and in the species of Figure 6 I have shown my invention as adapted to operate upon and give a predetermined curvature to the clamped edges of the work sheet. In this modification, all parts except the clamping surfaces are the same as in the species of Figures 1 to 3, and hence have been given corresponding reference characters. The platen or pressure bar 32 and its attached plungers have been omitted in the interests of clarity. It is therefore merely necessary to point out that jaw members 53, 54 having complementary curved faces, are substituted for plane jaw members 14 and 46, while a second pair of jaw members 55 and 56, likewise having complementary curved faces, are substituted for members 47 and 23. Depending upon the desired shapes of the edges of the finished article, the two pairs 53, 54 and 55, 56 may have the same or different contours. The operation of this species is the same as that of Figures 1 to 3 and hence need not be described in detail. Likewise the dies used may be curved in a vertical plane normal to tracks 18, parallel to said tracks, or both.

While I have shown the embodiment of my

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invention now preferred by me, it is clear that numerous modifications and substitutions of equivalents will occur to those skilled in the art. Therefore I do not wish to be limited to the specific embodiment shown but desire to reserve all such modifications and substitutions as fall within the scope of the claims.

Having now fully described my invention, what I claim and desire to secure by United States Letters Patent is:

1. In a stretching press, a press block having a plurality of parallel cylinder bores therein, a plunger reciprocable in each bore, a platen, a pivotal connection between one plunger and said platen, a sliding pivotal connection between each remaining plunger and said platen, said block having generally parallel clamp faces along opposite sides thereof in planes substantially parallel to the plane of said plungers, and a press frame, having track means on which said block is guided for translation substantially normal to said planes.

2. In a stretching press, a press block, a press platen, fluid pressure operated power means between said platen and block, said block having clamp faces on opposite sides thereof substantially parallel to the direction of movement of said platen, a press frame having means guiding said block in a direction substantially normal to said faces and also having a clamp face engageable with one clamp face of said block, a press bar guided in said direction on said frame and having a clamp face engageable with the other clamp face on said block, and power means connected to shift said bar and therethrough said block to move all said faces into clamping relation.

3. A stretching press comprising a press frame having straight line guide means and a clamp face substantially normal to said line, a press block movable on said guide means to bring one of two opposite clamp faces thereon into clamping relation with the face on said frame, a bar movable on said guide means to bring a clamp face thereon into clamping relation with the other clamp face on said block, power means to engage and to move said bar and therethrough said block to clamp opposite edges of a workpiece between the respective pairs of said clamp faces, a platen, and fluid pressure responsive means supporting said platen on said block and operable to move dies on said platen to stretch a workpiece clamped between said faces.

4. A stretching press comprising a press block having a plurality of parallel cylinders, a plunger in each cylinder, a platen, a connection between the external end of each plunger and said platen, said block having a pair of clamp faces on opposite sides thereof, a frame having track means normal to said faces and a clamp face cooperable with one face on said block to form a pair therewith, said block being guided by said track means, a press bar guided by said track means and having a clamp face cooperable with the other clamp face on said block to form a second pair therewith, power means operable to force said pairs of clamp faces into work-clamping relation, and projections on said frame and bar adapted to move in recesses in said block to rigidly unite said frame, block and bar when said faces are in clamping relation.

5. In a stretching press, a cylinder block having clamp surfaces on opposite sides thereof and a plurality of cylinders with parallel bores, a plunger reciprocable in each bore, a platen, a

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pivotal connection between each plunger and said platen, a frame supporting and guiding said block for rectilinear movement thereon and having a clamp surface cooperable with one surface on said block, a bar supported and guided by said frame to move a clamp surface thereon into clamping relation with the other surface on said block, a plurality of parallel cylinders on said frame, a plunger in each cylinder engageable with said bar to reciprocate said bar and therethrough said block and force said faces into clamping relation, and a lost motion connection between said bar and block operable to retract said block after a predetermined retraction movement of said bar.

6. In a stretching press, a press bed having a fixed jaw, a movable jaw translatable on said bed toward and from said fixed jaw, a block freely slidable on said bed between said fixed and movable jaws and having jaws complementary to said fixed and said movable jaws to form jaw pairs between which the opposite edges of a sheet may be clamped as said movable jaw forces said block toward said fixed jaw, power means on said bed and operable to translate said movable jaw and therethrough said block, cylinders in said block, a platen, and plungers connected to said platen and operable by pressure fluid in said cylinders to move a die thereon for stretching action on a sheet clamped between said jaw pairs.

7. In a stretching press a first clamping element, a second clamping element, a member freely slidable between said elements and having clamping elements coacting with said first and second elements respectively when all elements are moved into clamping relation to grip opposite edges of a generally U-shaped workpiece therebetween, means operable on one of said first or second elements to so move said elements, a platen on said member, and force-exerting means between said member and platen to force a die carried by said platen into contact with intermediate portions of a work piece clamped between said elements.

8. In a stretching press, a frame having a first work-clamping surface, a member slidable on said frame in a first direction toward and from said surface, a bar slidable on said frame toward and from said member and having a second work clamping surface, said member having work clamping surfaces coacting with said first and second surfaces, respectively, power means to slide said bar in said first direction and thereby move said member and all said faces into work-clamping relation, a platen guided on said member for movement in a second direction at an angle to said first direction, power means for so moving said platen on said member, and power means for actuating said bar and therethrough said member to move all said faces into work-clamping relation.

9. In a stretching press, a frame having a first work-clamping face, a bar movable on said frame and having a second work-clamping face, a member freely movable on said frame between said faces, said member having gripping faces coacting with said first and second faces respectively to grip opposite edges of a workpiece, means moving said bar to force all of said faces into work-clamping position, a platen reciprocable relative to said member and between said faces, and motor means carried by said member connected with said platen and energizable to move said platen to stretch a workpiece clamped by said gripping faces and extending therebetween.

10. A stretching press comprising, in combination, a frame having guide surfaces determining a first direction and a first clamping face, a bar having a second clamping face and slidable on said surfaces toward and from said first face, a block member slidable on said surface and having third and fourth clamping faces, intermediate of and coacting with said first and second faces respectively to clamp opposite edges of a U-shaped workpiece therebetween, all of said faces being substantially normal to said direction, fluid pressure operated power means between said frame and bar operable to first move said bar into contact with said block and thereafter to move said bar and block to bring said faces into clamping relation, a platen on said block member, and fluid pressure means operable to move said platen to stretch a metal sheet clamped between said faces.

11. A stretching press comprising a press block, a platen, motor means for effecting relative movement between said block and platen, said block having a pair of clamp faces on opposite sides thereof, a press frame slidably supporting said block and having a clamp face cooperable with one of the faces on said block, a press bar slidable on said frame and having a clamp face cooperable with the other of the clamp faces of said block, motor means for forcing said cooperable clamp faces together to clamp a workpiece therebetween, and cooperating means carried by said frame, bar and block and operable when said clamp faces have been forced together to maintain the said frame, bar and block substantially rigid against the thrust of said platen on the clamped workpiece.

12. A stretching press comprising a press block, a platen, motor means in said block for actuating said platen, a pair of clamp faces on opposite sides of said block, a press frame slidably supporting said block and having a clamp face cooperable with one face on said block, a press bar slidable on said frame and having a clamp face cooperable with the other of said clamp faces on

said block, power means operable to force said cooperable clamp faces together to clamp a workpiece therebetween, and a plurality of recesses and dowels associated with said block, frame and bar adapted to engage during the clamping operation for guiding said clamp faces together and to maintain said clamp faces rigidly in alignment against the thrust of said platen on the workpiece after the clamping operation.

13. In a press, a press block having a central cylinder bore and a plurality of auxiliary bores on each side of said central bore, a plunger reciprocable in each of said bores, a platen, a pivotal connection between said platen and the plunger in said central bore, ways on said platen, slides movable in said ways, pivot means connecting the ends of each auxiliary plunger with a respective slide, clamp faces on opposite sides of said block, a frame slidably supporting said block, a clamp face on said frame on one side of said block, a movable clamp bar slidable on said frame on the other side of said block, and power means to move said bar against said block and said block against the clamp face on said frame in order to clamp marginal portions of a workpiece extending between said clamp faces, the said workpiece being formed when said platen is actuated upwardly by the plungers connected therewith.

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