Sept. 28, 1965 R. G. BACHELIER 3,208,373

CLOSING SYSTEM FOR PRESSES

Filed Feb. 6, 1963 3 Sheets-Sheet 1

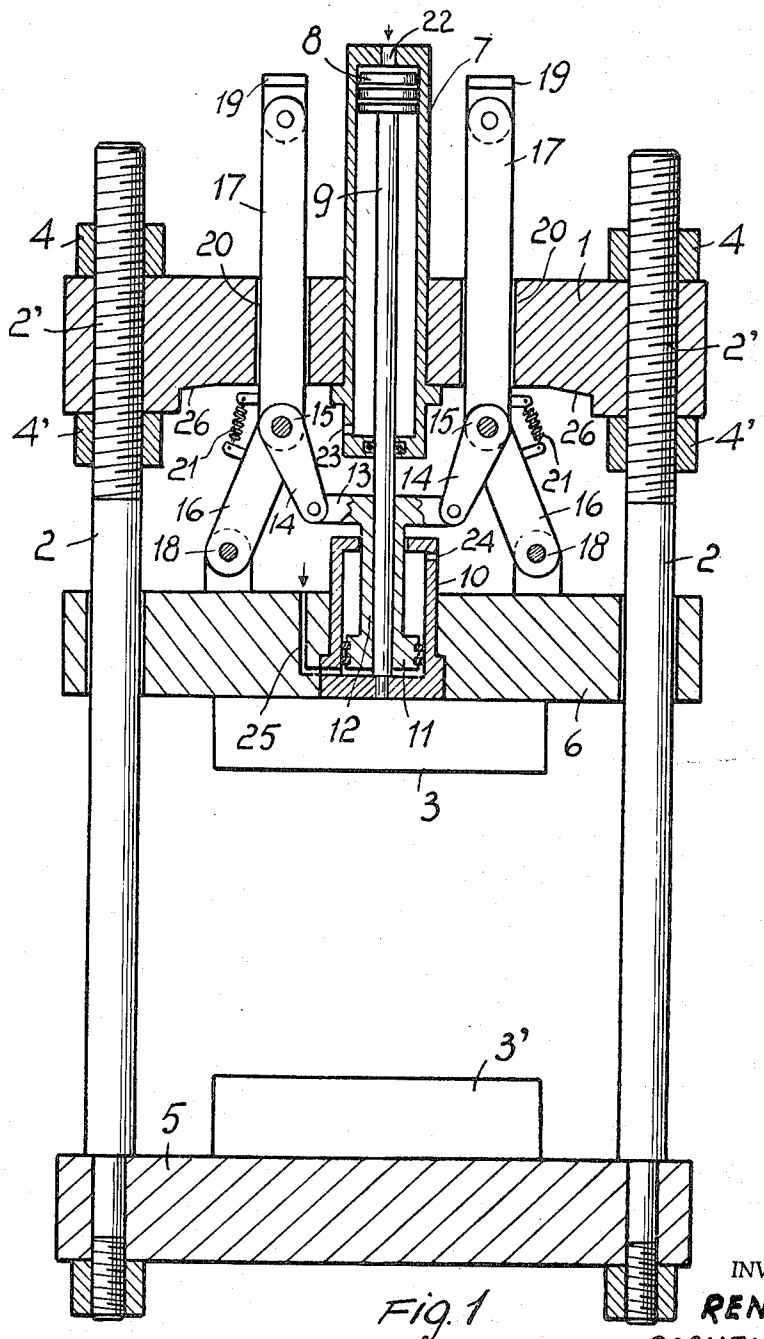


Fig. 1

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CLOSING SYSTEM FOR PRESSES

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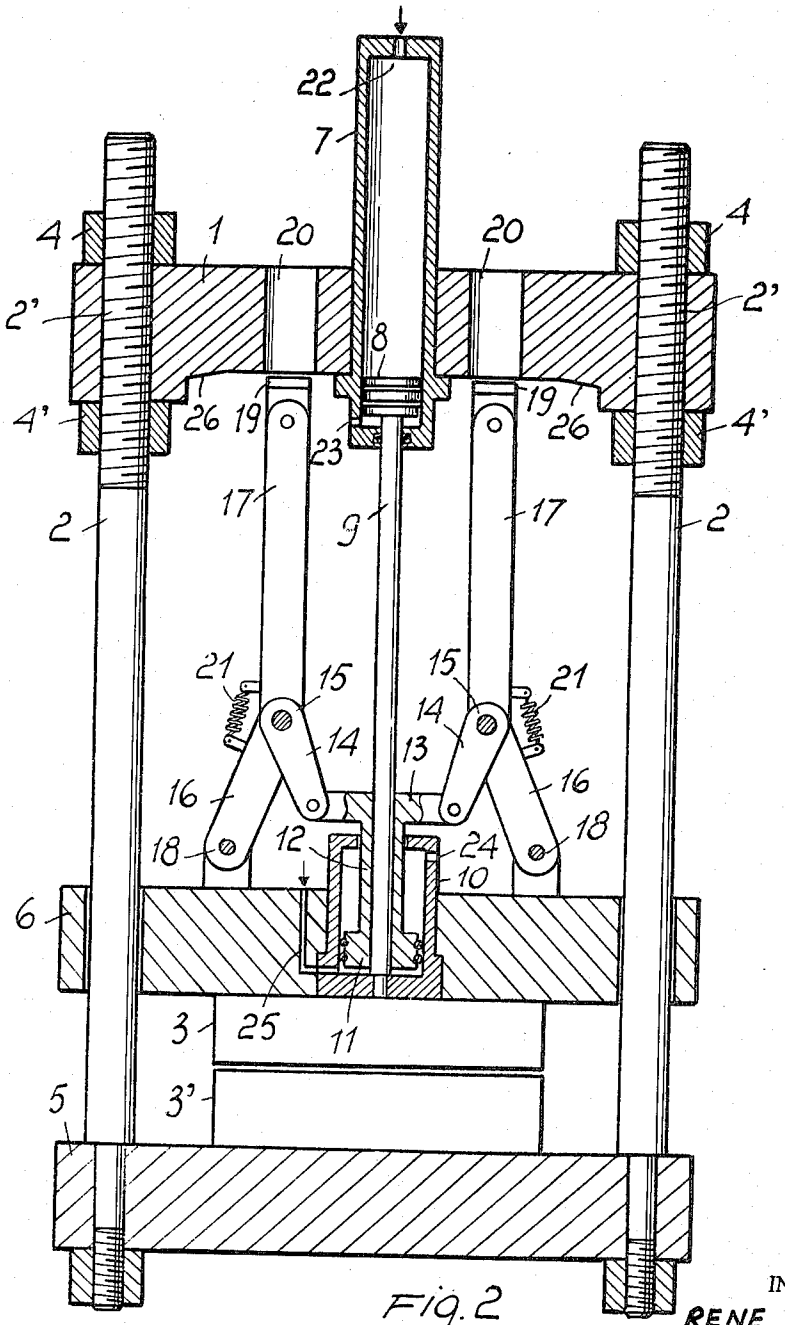


Fig. 2

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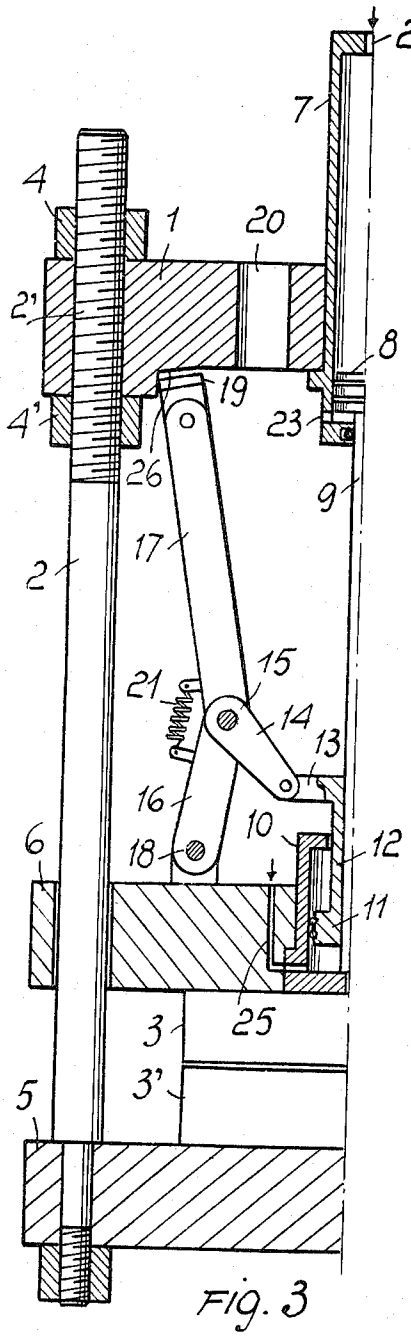


Fig. 3

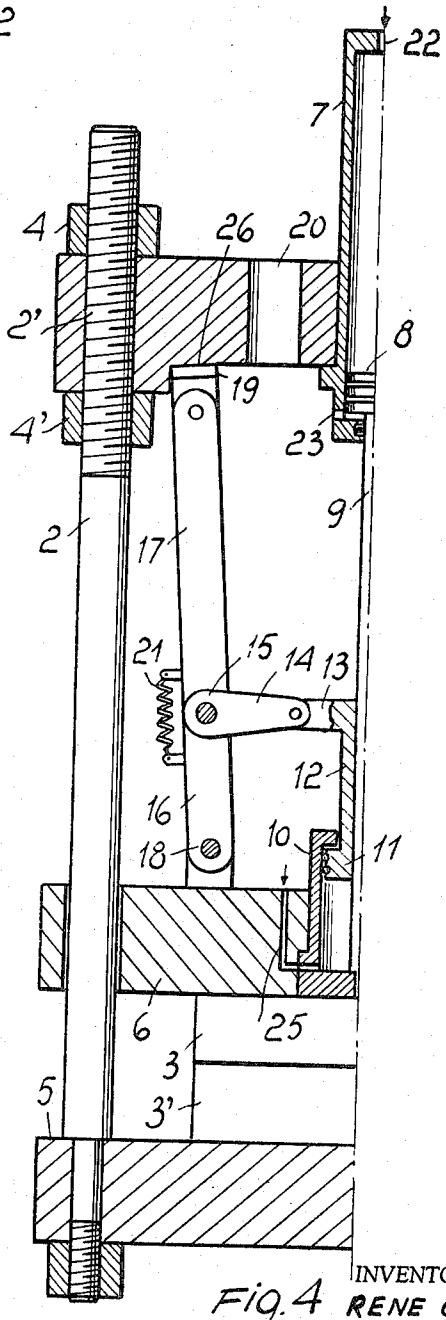


Fig. 4

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3,208,373

CLOSING SYSTEM FOR PRESSES

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Claims priority, application France, Feb. 12, 1962, 887,682, Patent 1,322,208
7 Claims. (Cl. 100—272)

The present invention relates to presses, and more specifically to presses used for closing molds as used in the manufacture of plastic articles and as used in casting of metals under pressure. Various press systems are used for such applications and one difficulty encountered in presses for such applications is that the press has to have a relatively great stroke for properly opening the mold to a considerable extent and that the press has to have a great closing pressure for maintaining the mold in closed condition under great pressure.

It is an object of the present invention to provide for a press which has a great opening stroke and which in turn is adapted to close under great pressure.

It is a further object of the present invention to provide for a press of the aforementioned kind which operates with a minimum of friction.

It is an additional object of the present invention to provide for a press of the aforementioned kind in which the press can move with a relatively great speed from a completely open to a nearly closed position and in which the final closing movement which closes the mold inserted in the press with great pressure is independent from the preceding movement which brings the mold to the nearly closed position.

With these objects in view, the press according to the present invention mainly comprises support means, a stationary press platen fixed to the support means, a movable press platen mounted on said support means for movement toward and away from the stationary press platen, stationary abutment means fixed to the support means above the movable platen, a toggle mechanism comprising a pair of toggle links pivotally connected at one of the ends thereof to each other and one of the toggle links pivotally connected at the other end thereof to the movable platen and the other toggle link having a free end adapted to abut against the aforementioned abutment means, the toggle links being tiltable between an inactive position inclined with respect to each other and an active position axially aligned with each other. The press includes further first moving means mounted on the support means and connected to the movable platen for moving the latter from a first position considerably spaced from the stationary platen to a second position in close vicinity of the stationary platen and back to the first position, resilient means connected to the toggle links and biased to yieldably maintain the toggle links in the inactive position thereof, and second moving means carried by the movable platen and operatively connected to the toggle links for moving, after the movable platen has been moved by the first moving means to the second position, the free end of the second toggle link into engagement with the abutment means and subsequently the toggle links to the active position so that the toggle mechanism presses the movable platen with a toggle action against the stationary platen. The second moving means are independently operable from the first moving means.

The aforementioned support means preferably comprise a pair of uprights and a transverse plate fixedly mounted on the upper ends of the uprights. In this case the stationary platen forms the base of the press and the uprights are fixed to the base projecting upwardly therefrom, whereas the movable platen is located between the base and the transverse plate and guided for movement toward and away from the base on the uprights. The first moving means are preferably mounted on the transverse plate and include a cylinder carried by the transverse plate, a piston movable in the cylinder, and a piston rod connected at one end thereof to the piston and at the other end to the movable platen. The second moving means preferably include a second cylinder axially aligned with the cylinder of the first moving means, an elongated piston movable in the second cylinder and having a reduced diameter portion upwardly extending beyond the second cylinder and being formed with a central bore therethrough through which the piston rod of the first moving means slidably extends, and link means connecting the reduced diameter portion of the elongated piston to the toggle links of the toggle mechanism.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

FIG. 1 is a sectioned side view of the press according to the present invention and showing the press in its fully open position;

FIG. 2 is a sectioned side view of the press shown in FIG. 1 and showing the press in the nearly closed position;

FIG. 3 is a partial side view of the press shown in FIG. 1 and showing the latter in a further position during its closing movement; and

FIG. 4 is a partial side view of the press and showing the same in its fully closed position.

Referring now to the drawings, and more specifically to FIG. 1 of the same, it will be seen that the press of the present invention comprises a base forming a stationary platen 5 and two uprights 2 projecting spaced from and parallel to each other upwardly from the base 5. Preferably, the uprights 2 extend with small diameter portions thereof through corresponding bores in the base 5 and are secured by nuts threadingly engaging threaded lower ends of the uprights 2 to the base. Each of the uprights 2 has an upper portion 2' provided with a screw thread, and these upper portions 2' extend through corresponding bores of a transverse plate 1. A pair of nuts 4 and 4' threadingly engage the upper threaded portion of each upright on opposite sides of the transverse plate 1 to secure the latter at a fixed distance upwardly spaced from the base 5 to the uprights. A movable platen 6 is located between the transverse plate 1 and the stationary platen 5 and the uprights 2 extend respectively through bores of the movable platen 6 so that the latter is guided on the uprights 2 for movement toward and away from the stationary platen 5.

First moving means are provided for moving the movable platen 6 toward and away from the stationary platen and these first moving means include a cylinder 7 extending parallel to the uprights 2 through a central bore of the transverse plate 1 and being fixedly connected thereto, a piston 8 slidably guided in the cylinder 7, and a piston rod 9 fixedly connected at the upper end thereof to the piston 8 and fixedly connected at the lower end thereof to the movable platen 6. The press includes further two toggle mechanisms, each comprising a pair of toggle links 16 and 17 each pair pivotally connected to each other at 15 and the lower of each toggle link, that is, the link 16, also pivotally connected at 18 to a lug projecting upwardly from the upper face of the movable platen 6. The upper one 17 of each pair of toggle links projects, in

the open position of the press as shown in FIG. 1, respectively through a corresponding opening 20 in the transverse plate 1. A pressure shoe 19 is pivotally connected to the upper end of each upper toggle link 17. Each toggle mechanism comprises further resilient means, preferably in the form of coiled tension springs 21 connected at opposite ends to the toggle links 16 and 17 adjacent to the ends thereof which are pivotally connected at 15 to each other and the spring means 21 are biased tending to keep each pair of toggle links 16 and 17 in a position inclined to each other, as shown in FIG. 1.

The press includes further second moving means preferably constituted by a cylinder 10 fixedly mounted in a central opening of the movable platen 6 coaxial with the axis of the cylinder 7 of the first moving means. An elongated piston 11 is slidably guided in the cylinder 10 and piston 11 extends with a reduced diameter portion 12 upwardly beyond the cylinder 10. The piston 11 and the reduced diameter portion 12 are formed with an axially extending bore therethrough through which the piston rod 9 of the first moving means slidably extends. A transverse member 13 is integrally connected with the upper end of the reduced diameter portion 12 of the piston 11 and a pair of additional links 14 are respectively pivotally connected at the lower ends thereof to opposite ends of the transverse member 13 and the upper ends of the links 14 are pivotally connected at 15 to the pairs of toggle mechanisms, respectively.

The cylinder 7 is provided at its upper and lower ends with openings 22 and 23, respectively, through which pressure fluid may be fed into the cylinder 7 and discharged therefrom by means of tubes, not shown in the drawings, which are to be connected in a known manner to a source of pressure fluid likewise not shown in the drawings. Corresponding passages 24 and 25 communicate with the upper and lower ends of the cylinder 10, respectively, for feeding and discharging pressure fluid into and from the latter. A mold half 3 is fixedly mounted on the bottom face of the movable platen 6 and a corresponding mold half 3' is mounted on the upper face of the stationary platen 5.

The press as described above will operate as follows:

FIG. 1 shows the press in the fully open position and in this position, the piston 8 of the first moving means is adjacent the upper end of the cylinder 7, whereas the piston 11 of the second moving means is adjacent to the bottom of the cylinder 10. The toggle links 17 extend upwardly through the openings 20 in the transverse plate 1 and the toggle links 16 and 17 are in an inactive position inclined to each other as shown in FIG. 1. The movable platen 6 and the mold half carried thereby is upwardly spaced to a considerable extent from the stationary platen 5 and the mold half 3' thereon. Pressure fluid is now fed through the opening 22 in the upper end of the cylinder 7 causing thereby the piston 8 slidably guided therein to move downwardly so that the movable platen 6 connected to the lower end of the piston rod 9 and the mold half 3 carried by the movable platen 6 is moved downwardly toward the stationary platen 5 and the mold half 3' mounted thereon. During this downward movement of the movable platen 6, the upper links 17 will slide in the openings 20 of the transverse plate 1 to reach finally the position as shown in FIG. 2 in which the upper ends of the links 17 and the pressure shoes 19 are located with the upper ends thereof a few millimeters downwardly of the bottom face of the transverse plate 1. In this position the toggle links 16 and 17 are still maintained in their inactive position inclined with respect to each other by the spring means 21 and the bottom face of the mold half 3 is fixedly spaced from the top face of the mold half 3'. After various components of the press have reached the position as shown in FIG. 2 pressure fluid is fed through the passage 25 into the cylinder 10 of the second moving means beneath the piston 11 slidably guided in the cylinder so that the piston 11 will start on its upward movement. During the upward movement of the piston 11, the lower ends of the links 14 pivotally connected to the transverse member 13 will move upwardly and the links 14 will thereby tilt to tilt the toggle mechanisms respectively in an outward direction, as shown in FIG. 3, so that the upper ends of the pressure shoes 19 will become aligned, respectively, with abutment faces 26 on the lower face of the transverse plate 1. During further upward movement of the piston 11, the links 14 will be further tilted to press the pivotally connected ends of each pair of toggle mechanisms outwardly, and since the upper ends of the pressure shoes 19 will engage the abutment faces 26, the toggle links 16 and 17 of each toggle mechanism will thereby be moved from the inactive position in which the toggle links 16 and 17 are inclined with respect to each other, to the active position in which the toggle links 16 and 17 are respectively aligned with each other so that the movable platen and the mold half 3 carried thereby is pressed with a toggle action, that is, with a considerable force, toward the stationary platen 5 and the mold half 3' carried thereby. This end position in which the mold halves 3 and 3' engage each other and are held with considerable pressure in this closed position is shown in FIG. 4.

If it is desired to open the mold again, pressure fluid is fed first through the passage 24 in the cylinder 10, while the passage 25 is opened to permit pressure fluid contained in the cylinder 10 beneath the piston 11 to be discharged therefrom so that the piston 11 will move downwardly in the cylinder 10 from the position shown in FIG. 4 to the position shown in FIG. 1. Subsequent thereto pressure fluid is fed through the passage 23 in the cylinder 7 while the passage 22 is opened to allow pressure fluid to be discharged therefrom so that the piston 8 will be moved from its lower position, as shown in FIGS. 2–4, to its upper position, as shown in FIG. 1. Movement of the piston 11 to its lower position will first disengage the pressure shoes 19 from the abutment faces 26 and subsequently swing the toggle links 17 in alignment with the bores 20 in the transverse plate 1, and movement of the piston 8 from its lower to its upper position will cause movement of the upper toggle links 17 through the bores 20 to the position as shown in FIG. 1.

The closing pressure produced by the press may be adjusted by adjusting the position of the transverse plate 1 on the uprights 2 with respect to the stationary platen 5. Since the upper ends of the shoes 19 engage, during closing movement of the mold, the abutment faces 26 before closing pressure is applied, and since during opening of the mold the upper ends of the pressure shoes 19 are disengaged from the respective abutment faces 26 before the shoes 19 are moved in transverse direction relative to the abutment faces, these movements will occur without any sliding friction and wear on the corresponding components is thereby considerably reduced.

It will be understood that each of the elements de-described above, or two or more together, may also find a useful application in other types of presses differing from the types described above.

While the invention has been illustrated and described as embodied in a press closing under toggle action, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. A press comprising, in combination, support means; a stationary press platen fixed to said support means; a movable press platen mounted on said support means for movement toward and away from said stationary platen; a stationary abutment means fixed to said support means above said movable platen; toggle means comprising a pair of toggle links pivotally connected at one of the ends thereof to each other, one of said toggle links being pivotally connected at the other end thereof to said movable platen and the other toggle link having a free end adapted to abut against said abutment means, said toggle links being tiltable between an inactive position inclined with respect to each other and an active position axially aligned with each other, said toggle means constructed so that said links normally stay in said inactive position; first moving means mounted on said support means and connected to said movable platen for moving the latter from a first position considerably spaced from said stationary platen to a second position in close vicinity of said stationary platen and back to said first position; and second moving means carried by said movable platen and operatively connected to said toggle links for moving, after said movable platen has been moved by said first moving means to said second position, said free end of said second toggle link into engagement with said abutment means and for moving subsequently thereto said toggle links to said active position so that said toggle means press said movable platen with a toggle action against said stationary platen, said second moving means being independent of said first moving means.

2. A press comprising, in combination, support means; a stationary press platen fixed to said support means; a movable press platen mounted on said support means for movement toward and away from said stationary press platen; stationary abutment means fixed to said support means above said movable platen; a toggle mechanism comprising a pair of toggle links pivotally connected at one of the ends thereof to each other, one of said toggle links being pivotally connected at the other end thereof to said movable platen and the other toggle link having a free end adapted to abut against said abutment means, said toggle links being tiltable between an inactive position inclined with respect to each other and an active position axially aligned with each other; first moving means mounted on said support means and connected to said movable platen for moving the latter from a first position considerably spaced from said stationary platen to a second position in close vicinity of said stationary platen and back to said first position; resilient means connected to said toggle links and biased to yieldably maintain said toggle links in said inactive position; and second moving means carried by said movable platen and operatively connected to said toggle links for moving, after said movable platen has been moved by said first moving means to said second position, said free end of the second toggle link into engagement with said abutment means and subsequently said toggle links to said active position so that said toggle mechanism presses said movable platen with a toggle action against said stationary platen, said second moving means being independent of said first moving means.

3. A press comprising, in combination, support means; a stationary press platen fixed to said support means; a movable platen mounted on said support means for movement toward and away from said stationary press platen; stationary abutment means fixed to said support means above said movable platen; a toggle mechanism comprising a pair of toggle links pivotally connected at one of the ends thereof to each other, one of said toggle links being pivotally connected at the other end thereof to said movable platen and the other toggle link having a free end adapted to abut against said abutment means, said toggle links being tiltable between an inactive position inclined with respect to each other and an active position axially aligned with each other; first moving means mounted on said support means and connected to said movable platen for moving the latter from a first position considerably spaced from said stationary platen to a second position in close vicinity of said stationary platen and back to said first position; resilient means connected to said toggle links and biased to yieldably maintain said toggle links in said inactive position; and second moving means carried by said movable platen and operatively connected to said toggle links for moving, after said movable platen has been moved by said first moving means to said second position, said free end of said second toggle link into engagement with said abutment means and subsequently said toggle links to said active position so that said toggle mechanisms press said movable platen with a toggle action against said stationary platen and for subsequently moving said free end of said other toggle link out of engagement with said abutment means to permit said first moving means to move said movable platen back to said first position, said second moving means being independent of said first moving means.

4. A press comprising, in combination, support means; a stationary press platen fixed to said support means; a movable press platen mounted on said support means for movement toward and away from said stationary press platen; stationary abutment means fixed to said support means above said movable platen; a pair of toggle mechanisms each comprising a pair of toggle links pivotally connected at one of the ends thereof to each other, one of said toggle links in each pair of said toggle links being pivotally connected at the other end thereof to said movable platen and the other toggle link having a free end adapted to abut against said abutment means, said toggle links of each toggle mechanism being tiltable between an inactive position inclined with respect to each other and an active position axially aligned with each other; first moving means mounted on said support means and connecteed to said movable platen for moving the latter from a first position considerably spaced from said stationary platen to a second position in closed vicinity of said stationary platen and back to said first position; resilient means connected to said toggle links of each toggle mechanism and biased to yieldably maintain said toggle links in said inactive position; and second moving means carried by said movable platen and operatively connected to said toggle links of each toggle mechanism for moving, after said movable platen has been moved by said first moving means to said second position, said free end of the second toggle link of each toggle mechanism into engagement with said abutment means and subsequently said toggle links to said active position so that said toggle mechanisms press said movable platen with a toggle action against said stationary platen and for subsequently moving said free end of said other toggle link out of engagement with said abutment means to permit said first moving means to move said movable platen back to said first position, said second moving means being independent of said first moving means.

5. A press comprising, in combination, support means; a stationary press plat enfixed to said support means; a movable press platen mounted on said support means for movement toward and away from said stationary press platen; stationary abutment means fixed to said support means above said movable platen; a pair of toggle mechanisms each comprising a pair of toggle links pivotally connected at one of the ends thereof to each other, one of said toggle links in each pair of said toggle links being pivotally connected at the other end thereof to said movable platen and the other toggle link having a free end adapted to abut against said abutment means, said toggle links of each toggle mechanism being tiltable be-

tween an inactive position inclined with respect to each other and an active position axially aligned with each other; first moving means mounted on said support means and connected to said movable platen for moving the latter from a first position considerably spaced from said stationary platen to a second position in close vicinity of said stationary platen and back to said first position, said first moving means including a cylinder carried by said support means, a piston movable in said cylinder, and a piston rod connected at one end to said piston and at the other end to said movable platen; resilient means connected to said toggle links of each toggle mechanism and biased to yieldably maintain said toggle links in said inactive position; and second moving means carried by said movable platen and operatively connected to said toggle links of each toggle mechanism for moving, after said movable platen has been moved by said first moving means to said second position, said free end of the second toggle link of each toggle mechanism into engagement with said abutment means and subsequently said toggle links to said active position so that said toggle mechanisms press said movable platen with a toggle action against said stationary platen and for subsequently moving said free end of said other toggle link out of engagement with said abutment means to permit said first moving means to move said movable platen back to said first position, said second moving means including a second cylinder axially aligned with said cylinder of first moving means, an elongated piston movable in said second cylinder and having a reduced diameter portion upwardly extending beyond said second cylinder, said elongated piston being formed with a central bore therethrough and said piston rod extending through said bore slidingly fitted therein for guiding said elongated piston, and link means connecting said reduced diameter portion of said elongated piston to said toggle links of each toggle mechanism, said second moving means being independent of said first moving means.

6. A press comprising, in combination, a base forming a stationary platen; a pair of uprights fixed to said base projecting upwardly therefrom; a transverse plate fixedly mounted on the upper ends of said uprights, said plate being formed with a pair of spaced apertures therethrough extending in direction of said uprights and said plate being formed laterally of said apertures with a pair of abutment means facing said stationary platen; a movable platen between said plate and said stationary platen and being guided on said uprights for movement from a rest position adjacent said transverse plate toward said stationary platen and back to said rest position; a pair of toggle mechanisms each comprising a pair of toggle links pivotally connected at one of the ends thereof to each other, one of said toggle links in each toggle mechanism being pivotally connected at the other end thereof to said movable platen and the other toggle link in each toggle mechanism extending, when said movable toggle is in said rest position, through one of the apertures and each having a free end adapted to abut against one of said abutment means when said movable platen has moved from said rest position toward said stationary platen; first moving means mounted on said transverse plate and connected to said movable platen for moving the latter from said rest position to a second position in close vicinity of said stationary platen and back to said rest position; resilient means connected to said toggle links in each toggle mechanism and biased to yieldably maintain said toggle links of each toggle mechanism in an inactive position inclined with respect to each other; and second moving means carried by said movable platen and operatively connected to said toggle links of each toggle mechanism for first moving, after said movable platen had been moved by said first moving means to said second position, the free end of the other toggle link of each toggle mechanism in engagement with the respective abutment means and for then moving said toggle links against the force of said resilient means to an active position in which the toggle links in each toggle mechanism are axially aligned with each other so that said toggle mechanisms press said movable platen with a toggle action against said stationary platen, and for subsequently moving said second toggle links out of engagement with said abutment means and in a position aligned with said apertures in said transverse plate to permit said first moving means to move said movable platen back to said rest position, said second moving means being independent of said first moving means.

7. A press comprising, in combination, a base forming a stationary platen; a pair of uprights fixed to said base projecting upwardly therefrom; a transverse plate fixedly mounted on the upper ends of said uprights, said plate being formed with a pair of spaced apertures therethrough extending in direction of said uprights and said plate being formed laterally of said apertures with a pair of abutment means facing said stationary platen; a movable platen between said plate and said stationary platen and being guided on said uprights for movement from a rest position adjacent said transverse plate toward said stationary platen and back to said rest position; a pair of toggle mechanisms, each comprising a pair of toggle links pivotally connected at one of the ends thereof to each other, one of said toggle links in each toggle mechanism being pivotally connected at the other end thereof to said movable platen and the other toggle link in each toggle mechanism extending, when said movable toggle is in said rest position, through one of the apertures and each having a free end adapted to abut against one of said abutment means when said movable platen has moved from said rest position toward said stationary platen; first moving means mounted on said transverse plate and connected to said movable platen for moving the lattern from said rest position to a second position in close vicinity of said stationary platen and back to said rest position, said first moving means inclining a cylinder carried by said transverse plate, a piston movable in said cylinder, and a piston rod connected at one end to said piston and at the other end to said movable platen; resilient means connected to said toggle links in each toggle mechanism and biased to yieldably maintain said toggle links of each toggle mechanism in an inactive position inclined with respect to each other; and second moving means carried by said movable platen and operatively connected to said toggle links of each toggle mechanism for first moving, after said movable platen has been moved by said first moving means to said second position, the free end of the other toggle link of each toggle mechanism in engagement with the respective abutment means and for then moving said toggle links against the force of said resilient means to an active position in which the toggle links in each toggle mechanism are axially aligned with each other, so that said toggle mechanisms press said movable plate with a toggle action against said stationary platen, and for subsequently moving said second toggle links out of engagement with said abutment means and in a position aligned with said apertures in said transverse plate to permit said first moving means to move said movable platen back to said rest position, said second moving means including a second cylinder axially aligned with said cylinder of first moving means, an elongated piston movable in said second cylinder and having a reduced diameter portion upwardly extending beyond said second cylinder, said elongated piston being formed with a central bore therethrough and said piston rod extending through said bore slidingly fitted therein for guiding said elongated piston, and link means connecting said reduced diameter portion of said elongated piston to said toggle links of each toggle mechanism, said second moving means being independent of said first moving means.

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