

Feb. 29, 1944.

D. E. BENCH

2,343,167

PRESS LEVELING MEANS

Filed June 21, 1941

4 Sheets-Sheet 1

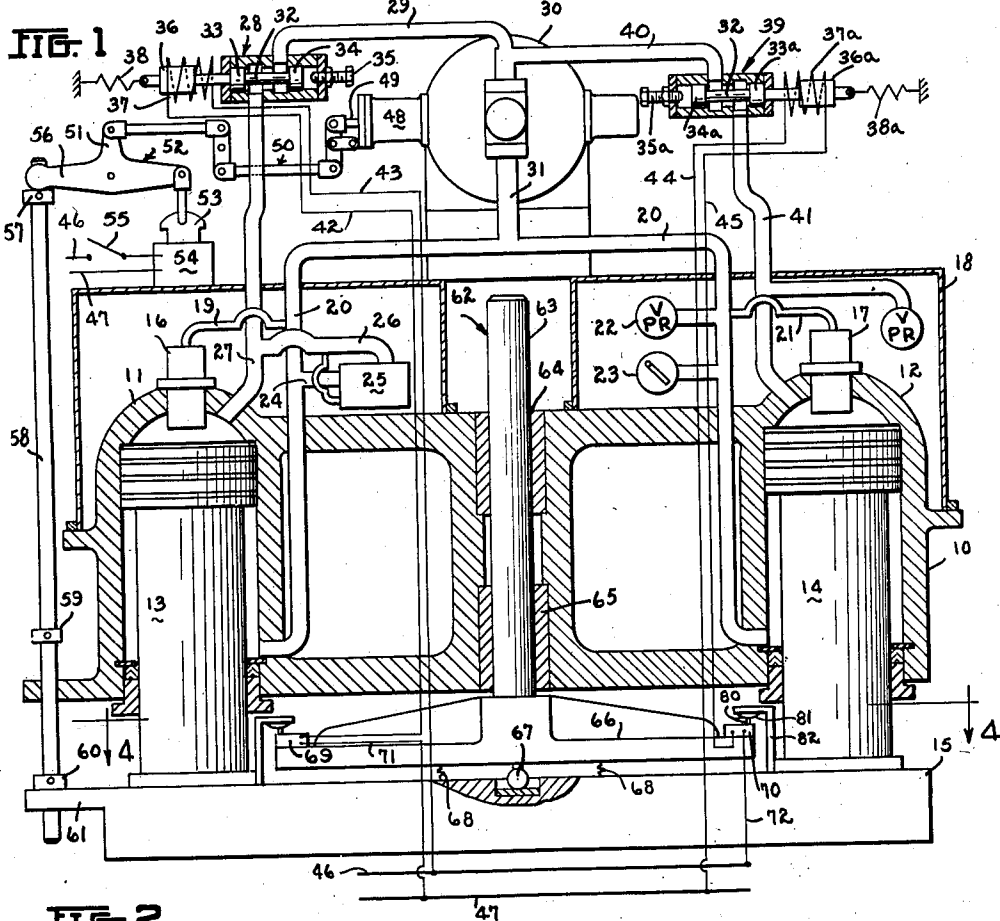


FIG. 2

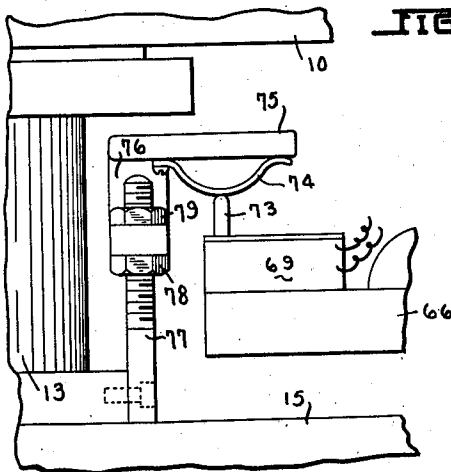
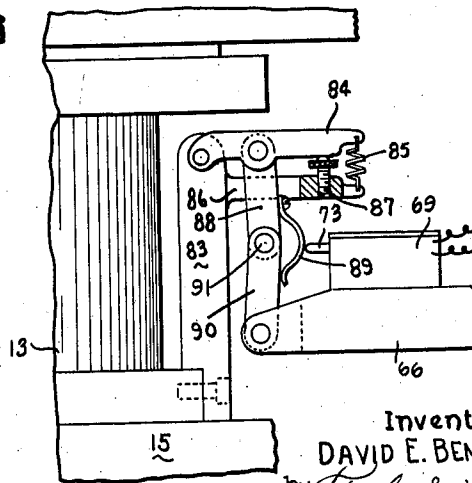


FIG. 3



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FIG. 5

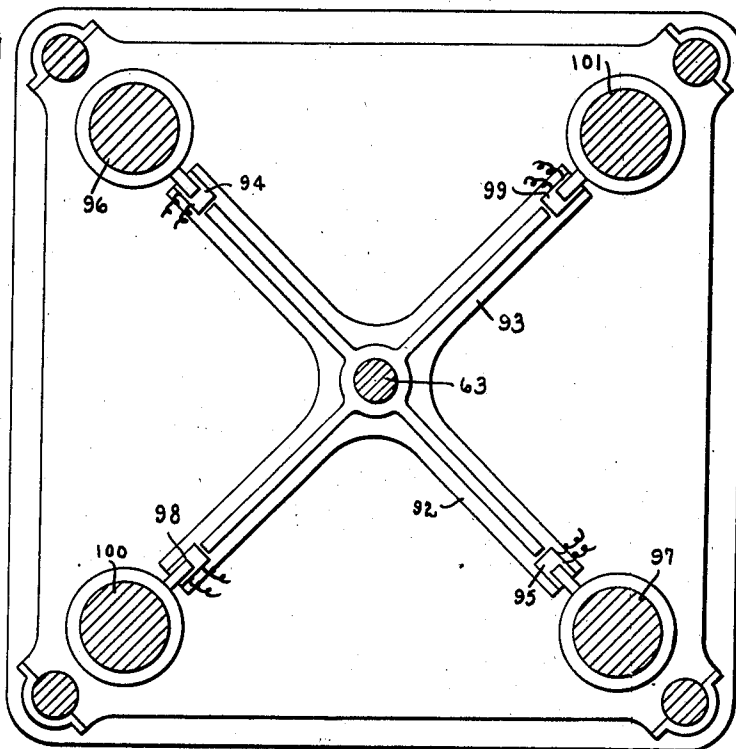
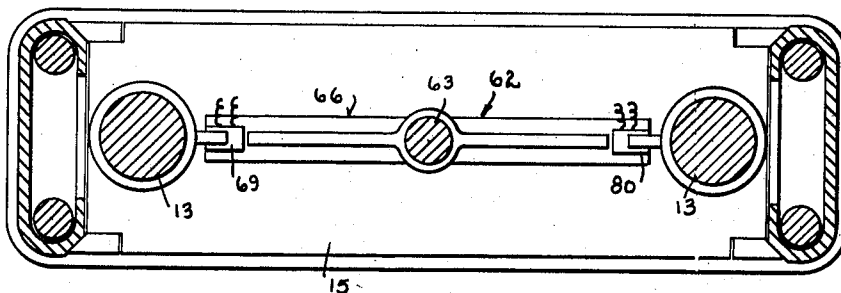


FIG. 4



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FIG. 6

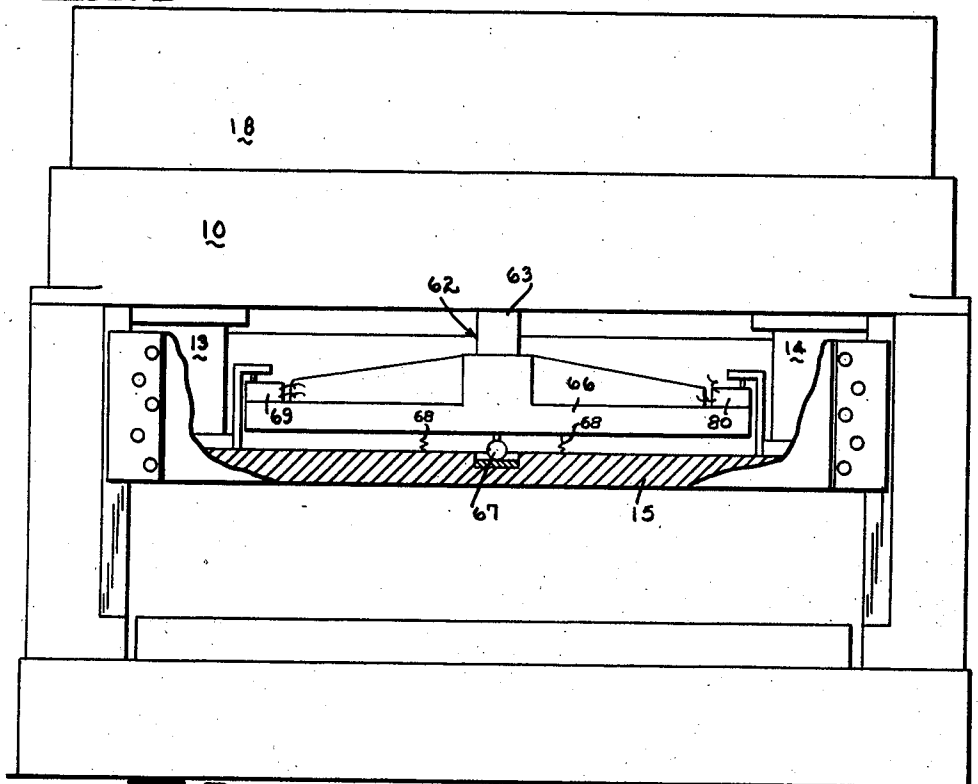


FIG. 7

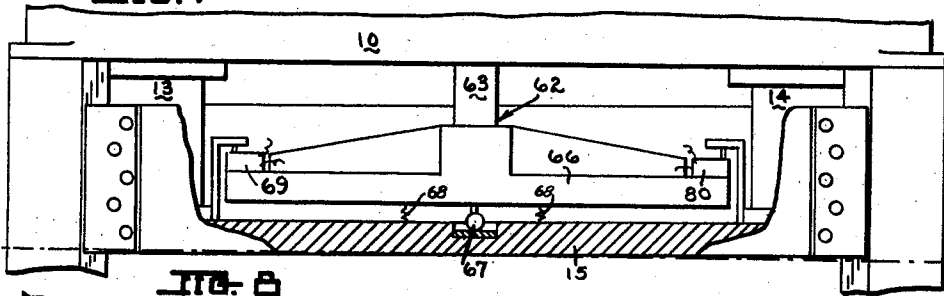
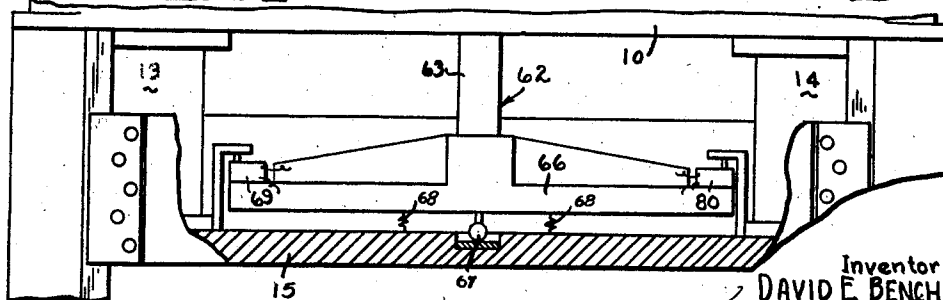


FIG. 8



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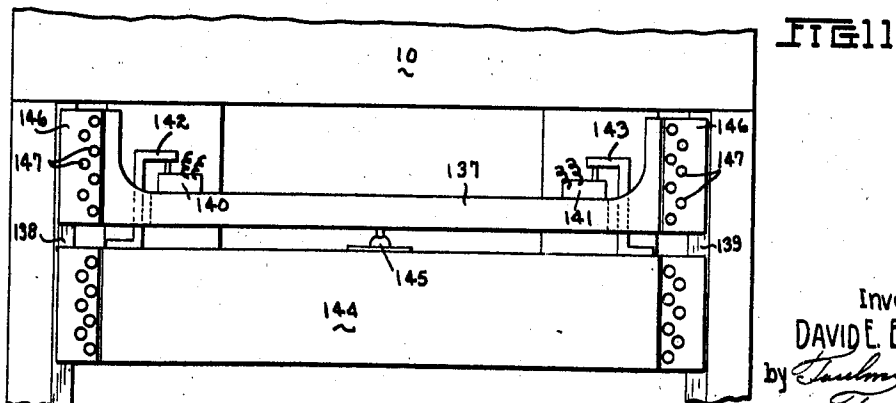
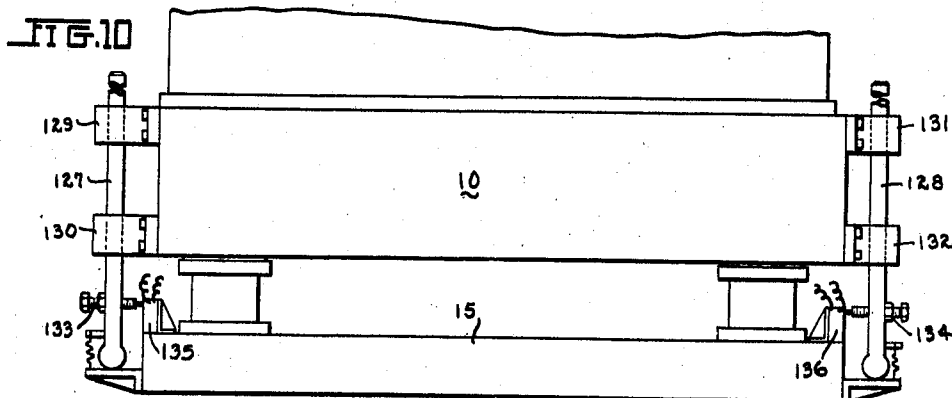
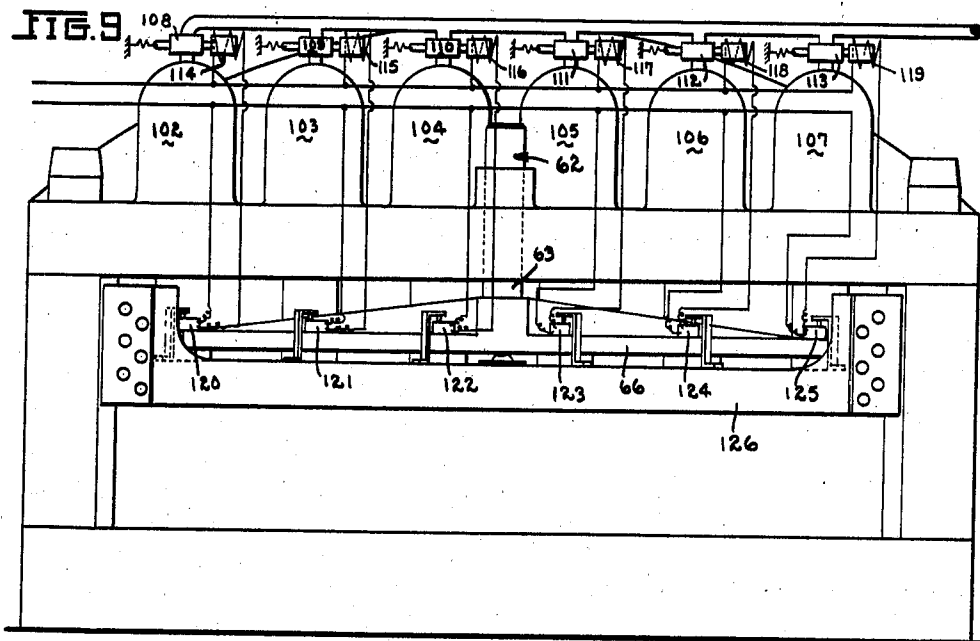
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PRESS LEVELING MEANS

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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

2,343,167

PRESS LEVELING MEANS

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Application June 21, 1941, Serial No. 399,168

11 Claims. (Cl. 100—71)

This invention relates to control means and, more particularly, to means responsive to deviations of a movable member from its normal plane while said member is in motion.

It is an object of this invention to provide a device which comprises a reference member arranged to move parallel to its starting position and, together with an element, to be controlled, which element is adapted to vary its angle relative to said reference member.

It is another object of the invention to provide a device having a reference member which is adapted to rest on a more or less tiltable element and to move in unison therewith, said reference member being arranged so as to move substantially parallel to its starting plane irrespective of the tilting movement of said tiltable element.

Another object of the invention consists in the provision of a device comprising a reference element guided in stationary means so as to remain parallel to its starting position and resting on and moving together with a member to be controlled, which member, when in motion, may vary its plane with regard to its starting plane.

It is a further object of the invention to provide a press in which the press platen has in constant engagement therewith an element movable in unison with said platen and guided in a stationary portion of the press so as, during its motion, to remain substantially parallel to its starting position, thereby serving as a reference element with regard to which any tilting or bending movement of said platen during the movement of the latter may be measured and corrected.

Still another object of the invention consists in the provision of a press as described in the preceding paragraph, which comprises means for translating the tilting or bending movement of the platen with regard to the reference member to a magnifying device.

It is a further object to provide a press comprising a press head and a press platen reciprocable by spaced hydraulically operable plungers, in which the press head has mounted therein a reciprocable element resting on the platen and guided in the press head so as to move substantially parallel to its initial position irrespective of the deflection or bending movement of the platen, and to cause a restriction of the supply of driving fluid to said plungers in accordance with tilting or bending forces deflecting the platen from its normal plane.

It is also an object of the invention to provide

a press having a reciprocable element resting on a press platen but moving parallel to its initial position irrespective of bending or tilting movements of the platen and adapted, in response to bending or tilting movements of the platen, to initiate the operation of electric means for correcting said bending or tilting movements.

It is another object to provide a press which has a platen reciprocable by a plurality of spaced fluid operable plungers and supporting a reference member which is reciprocable so as to move parallel to its initial position irrespective of deflections or bending movements of the platen, while the platen is provided with means responsive to a bending or tilting movement of the platen engaged as a contact member supported by the reference member for controlling the electric circuit of a control member controlling the delivery of pressure fluid to said plungers.

These and other objects and advantages of the invention will appear more clearly from the following specification in connection with the accompanying drawings, in which:

Figure 1 diagrammatically illustrates a device according to the present invention in connection with a hydraulic press.

Figure 2 shows a detail of Figure 1 on a larger scale.

Figure 3 is a modification of the arrangement shown in Figure 2.

Figure 4 is a section along the line 4—4 of Figure 1.

Figure 5 is a similar section through a modified arrangement of the invention.

Figures 6, 7 and 8 show a correcting movement of the device according to the invention.

Figure 9 shows a hydraulic press similar to that of Figure 1, with six press cylinder-piston-assemblies connected to a long platen.

Figures 10 and 11 show further modifications of the invention.

General arrangement

The device according to the invention comprises a reciprocable reference member movable in stationary guiding means so as to maintain the reference member continuously parallel to its initial position. The reference member rests upon a tiltable element, the tilting or bending movements of which are to be controlled.

Inasmuch as the reference member always maintains a position parallel to its initial position, any bending or tilting movement of the tiltable element respectively decreases and increases the space between a certain portion of the platen

and the adjacent portion of the reference member. This decrease or increase, when reaching a predetermined value, actuates an electric switch which in its turn shifts a flow-control member so as to restrict the flow of driving fluid to one or more plungers effecting the reciprocation of the platen.

According to a first embodiment of the invention, the reference member is arranged centrally of the platen, whereas according to a second embodiment, a plurality of reference members is supported by the ends of the press platen.

According to a further embodiment of the invention, a mechanism is interposed between the reference member and the switch, controlling the flow control member, which mechanism is adapted to impose upon an element of the switch a movement larger than the change in distance between two predetermined points on said reference member and said platen respectively in response to which change the said mechanism operates.

Structural arrangement

Referring first to Figure 1, the press shown therein merely comprises those parts which are necessary for a proper understanding of the invention.

In Figure 1 the press head 10 comprises two cylinders 11 and 12 having reciprocably mounted therein plungers 13 and 14 respectively, connected with the press platen 15. Each cylinder 11, 12 is provided with a surge valve 16, 17, extending into the fluid reservoir or surge tank 18 and adapted, when open, to admit fluid from the tank into the cylinders 11 and 12, or vice versa.

The surge valves 16 and 17 serve primarily to prefill the cylinders 11 and 12 at the first portion of the pressing stroke when the plungers 13 and 14 move downwardly. The surge valve 16 communicates with a pilot conduit 19 which leads to a conduit 20 connected to the lower portion of the cylinders 11 and 12 and communicating with a pilot line 21 leading to the surge valve 17. Also connected to the conduit 20 are a pressure relief valve 22 and a check valve 23.

Branching off from the conduit 20 is a conduit 24 leading to a main cylinder release and pump by-pass valve 25, which communicates through conduit 26 with a conduit 27 leading to the upper portion of the press cylinder 11. The main cylinder release and pump by-pass valve 25 is provided for releasing the pressure in the upper portion of the press cylinder 11 at the initiation of the retraction stroke of the press platen. The surge valve 16 and the valve 25 do not form a part of the present invention and for a more detailed description thereof reference may respectively be had to U. S. Patent 2,193,248 and U. S. Patent 2,268,205.

The conduit 27 leads to a two-way valve 28 which is connected by conduit 29 to one side of a reversible variable delivery pump 30, the other side of which is connected by conduit 31 to the conduit 20.

Reciprocably mounted in the two-way valve 28 is a valve member 32 with two spaced pistons 33 and 34, which in their left hand position establish communication between the conduits 27 and 29 while, when the valve member 32 moves toward the right, the piston 33 is adapted to restrict or even to interrupt the flow of fluid between the conduits 29 and 27. The extent to which the valve member 32 may be moved toward the right is variable by an abutment screw 35 adapted to

engage the piston 34. The valve member 32 is connected with an armature 36, the movement of which is controlled by the solenoid 37. Also connected with the armature 36 is a spring 38 continuously urging the armature and, thereby, also the valve member 32 toward the left.

The valve 28 controls the flow of fluid from the pump 30 to the cylinder 11. Similarly, a valve 39 is provided for controlling the flow of fluid from the pump 30 through conduits 40 and 41 to the cylinder 12. Inasmuch as all the parts pertaining to the valve 39 correspond to those pertaining to the valve 28, the elements pertaining to the valve 39 have been provided with the same reference numerals as those of the valve 28, however, with the additional letter *a*.

The solenoids 37 and 37*a* are adapted electrically to communicate by lines 42, 43 and 44, 45, respectively, with the main supply lines 46 and 47.

The pump 30 is provided with a servomotor 48 having reciprocably mounted therein a control member 49 for varying the delivery of fluid of the pump. The servomotor 48 of the pump 30 cooperates with a pilot pump (not shown) and comprises a spring which is adapted to shift the pump from full delivery forward stroke position to full delivery retraction stroke position. The pump 30 does not form a part of the present invention and for a more detailed description thereof reference may be had to U. S. Patent No. 2,184,665 to Ernst.

The control member 49 is connected by a lever system 50 with the arm 51 of a three-arm lever 52, having one arm thereof pivotally connected with an armature 53 pertaining to a solenoid 54 adapted to be energized by closure of the starter switch blade 55, thereby electrically connecting the solenoid 54 with the main supply lines 46 and 47.

The third arm 56 of the three-arm lever 52 is adapted to be engaged by the collar 57 adjustably mounted on the push rod 58 which carries an adjustable stop collar 59 and a further collar 60 adapted to be engaged by the platen arm 61.

Arranged in the center of the press head 10 is a reference member generally designated 62 and comprising a shaft 63 reciprocably mounted in bushings 64 and 65 and rigidly connected to a beam 66 resting, by means of a ball 67, on the platen 15. Normally, the weight of the reference member 62 is sufficient to maintain the reference member continuously in contact with the platen 15. However, if desired, springs 68 may be arranged for maintaining the reference member in constant contact with the platen 15.

The beam 66 carries, at its ends, electric switches 69, 70, of which the switch 69 communicates through line 71 with the main supply line 47, while the switch 70 communicates through line 72 with the main supply line 46. The switch member 73 pertaining to the switch 69 is adapted to be actuated by spring 74 carried by an arm 75. The arm 75 in its turn is supported by a bracket 76 which is adjustable on the screw 77 and held in its desired place by nuts 78 and 79. The screw 77 is carried by the platen 15. The switch 70, similarly, cooperates with a switch member 80 and a spring 81 supported by the arm 82, which is carried by the platen 15. In this way it is possible at all times of operation to eliminate any play, thereby maintaining the desired precision of the device according to the invention. It should be noted that normally spring 74 does not deflect during the operation

of the device but, in case of emergency, acts as a yielding member, thereby preventing destruction of the switch 69. The switches 69, 70 are responsive to very minute deflections, e. g., $1/1000$ of an inch, and are preferably of the type known under the trade name of "Micro-switch."

Operation

Assuming that all parts of the press occupy the position shown in Figure 1, and that it is now desired to carry out a working cycle, the operator starts the pump 30 in any convenient manner. Then he closes the starter switch 55, thereby energizing the solenoid 54 which now pulls the armature 53 downwardly so that the three-arm lever 52, by means of the linkage 50 and the control member 49 shifts the pump into full delivery forward stroke position. Pressure fluid from the pump is then supplied through conduit 29, the valve 28 and conduit 27 into the upper portion of the cylinder 11. Similarly, fluid from the pump 30 passes through conduit 40, valve 39 and conduit 41 into the upper portion of the cylinder 12. On the other hand, fluid is withdrawn through conduits 20 and 31 from the lower portion of the cylinders 11 and 12.

While the rams 13 and 14 and, thereby, the platen 15 move downwardly by gravity as fast as fluid is withdrawn from the lower portion of the cylinders 11 and 12, the fluid delivered by the pump 30 into the cylinders 11 and 12 is supplemented by fluid from the tank 18 passing respectively through the now open surge valves 16 and 17.

As soon as the platen 15 engages the work piece to be shaped, pressure starts to build up in the cylinders 11 and 12, with the result that the surge valves 16 and 17 close. While the platen 15 moves downwardly, the reference member 62 follows the platen 15 and is held in constant contact therewith.

Supposing that, during the actual pressing stroke which starts as soon as the platen 15 engages the work piece, the resistance encountered by the left end of the platen 15 and, thereby, of the ram 13 is less than the resistance encountered by the right end of the platen 15 and, thereby, of the ram 14, it will be obvious that the left end of the platen 15 tends to run ahead of the right end of the platen 15. In other words, the platen 15 has deviated from its normal plane shown in Figure 6 to that shown in Figure 7. As a result thereof and due to the fact that the beam 66 of the reference member 62 remains parallel to its starting position, the distance between the left end of the beam 66 and the arm 75 supporting the spring 74 decreases, thereby depressing the switch member 73 and closing the switch 69.

Current now flows from the main supply line 47 through line 71, switch 69, line 42, solenoid 37 and line 43 back to the main supply line 46. This causes energization of the solenoid 37 so that the armature 36 and the valve member 32 connected thereto are moved against the thrust of the spring 38 toward the right until the piston 34 engages the abutment member 35.

Depending on the adjustment of the abutment member 35, the flow of fluid from the pump 30 to the cylinder 11 will be more or less restricted, thereby reducing the pressure exerted on the ram 13 and also on the left end of the platen 15. In other words, since the fluid pressure exerted on the ram 14 is now higher than that exerted on

the ram 13, the platen 15 tends to return to its level position, as shown in Figure 8.

When the platen 15 has reached its level position, the arm 75 has receded with regard to the switch member 73 so as to allow a spring (not shown) of the switch 69 to open the latter again. This breaks the energizing circuit for the solenoid 37 so that the spring 38 returns the valve member 32 to its Figure 1 position, thereby establishing the previous full connection between the pump 30 and the conduit 27. If, during the pressing stroke, the ram 14 tends to run ahead of the ram 13, the switch 70 will be closed in the manner described above, thereby energizing the solenoid 37a and reducing the fluid connection between the conduits 40 and 41 until the platen 15 has resumed its level position.

As will be clear from the above, the adjustment of the abutment screws 35 and 35a allows any desired variation of the fluid connections between the pump 30 and the cylinders 11 and 12 respectively when one platen end runs ahead of the other platen end, thereby controlling the correcting or leveling operation and time required therefor. The springs 74 and 81 are so adjusted that, in level position of the platen, they just engage the corresponding members 73 and 80. The adjustable arrangement of the arms 75 and 82 and springs 74 and 81 also makes it possible to take up any play between the respective spring and switch members.

When the press platen 15 has reached the end of its pressing stroke, the energizing circuit for the solenoid 54 is interrupted by any convenient means well known to anyone skilled in the art, so that the spring in the servomotor 48 shifts the pump 30 to full delivery retraction position.

Fluid now flows through conduits 31 and 20 into the lower portions of the cylinders 11 and 12, whereas fluid is withdrawn from the upper portions of the cylinders 11 and 12 through conduits 27 and 41 respectively. Pressure fluid also passes from the conduit 31 through pilot lines 19 and 21, thereby opening the surge valves 16 and 17 and enabling fluid expelled from the cylinders 11 and 12 in excess of the fluid required by the pump 30 to return to the tank 18.

When the platen 15 approaches the end of its retraction stroke, the platen arm 61, by engagement with the collar 60, lifts the push rod 58 to such an extent that the collar 57 shifts the arm 56 in anti-clockwise direction, thereby moving the pump 30 by means of the linkage 50 into substantially neutral or no delivery position. The press then comes to a halt and is ready for a new cycle.

Modifications

While, according to the embodiment of Figures 1 and 2, the amount of movement of the switch members 73 and 81 during their engagement equals the amount of deflection of the corresponding platen portions from their leveling positions, the arrangement of Figure 3 is adapted to translate the amount of deflection of the platen into a greater movement of the switch members 73 and 81, thereby still further increasing the precision or sensitiveness of the device according to the invention.

According to the arrangement of Figure 3, the platen 15 is connected with a support 83 for pivotally connecting thereto one end of the arm 84, the other end of which is connected by a tension spring 85 to an arm 86 rigidly connected to the support 83. In this way, the arm 84 is con-

stantly urged toward the arm 86. The space between the arm 84 and the arm 86 is controlled by an adjustable screw 87.

Pivotaly connected to the arm 84 is an arm 88 carrying a spring 89 for engagement with the switch member 73 and being pivotaly connected with the arm 90 which in its turn is pivotaly connected to the beam 66. It will now be obvious that when the distance between the left end of the beam 66 and the adjacent platen portion increases, the pivot 91 will be moved toward the right with regard to Figure 3, and moved through a distance greater than the increase in distance between the left end of the beam 66 and its adjacent platen portion, so that the switch 73 of the Figure 3 arrangement will either be actuated at a smaller deviation of the platen 15 from its level position than is the case with the switch 73 of the Figures 1 and 2 arrangement, or the switch member 73 in Figure 3 will carry out a larger stroke than the switch member 73 in Figures 1 and 2. While Figure 3 illustrates a translating device for the switch 73, 69, it is, of course, understood that a corresponding arrangement is provided for the switch 70, 80.

Although the reference member 62 so far has been described as having only one beam 66, it is, of course, understood that the reference member may have a plurality of beams, for instance, two beams 92 and 93, as shown in Figure 5. In this particular instance the beam 92 with its switches 94, 95 controls the proper movement of the rams 96 and 97, whereas the beam 93 with its switches 98 and 99 controls the proper movement of the rams 100 and 101.

In case a very long platen or shear is provided, the platen or shear may be actuated by a plurality of cylinders 102, 103, 104, 105, 106 and 107, as shown in Figure 9. In this instance each cylinder may have associated therewith a valve 108, 109, 110, 111, 112 and 113, similar in construction to the valves 28 and 39 of Figure 1, and controlled by a solenoid 114, 115, 116, 117, 118 and 119, which solenoids correspond to the solenoids 37 and 37a of Figure 1.

The reference member 62 in this construction is provided with a plurality of switches 120, 121, 122, 123, 124 and 125 which correspond to the switches shown in Figures 2 and 3, and of which each switch controls one of the solenoids 114 to 119.

The operation of the press in Figure 9 substantially corresponds to that described in connection with the press of Figure 1. However, it will be understood that when the platen or shear 126 of Figure 9 deviates from its level position to a certain extent so that one end of the platen goes up while the other end goes down and the platen as a whole does not bulge out anywhere, only one valve, for instance, the valve 108 will be moved into its flow-restricting position. If this valve movement does not return the shear or platen 126 to its level position, due to particular circumstances which further increase the deviation of the platen or shear 126 from its normal level position, the next valve, in this instance the valve 109, will be moved to its flow-restricting position to cause the ram pertaining to the cylinder 103 to slow down its movement.

If, in spite of the actuation of the valve 108, due to particular circumstances, the platen or shear 126 should still increase its deviations, the valve 110 will come into action for supporting the valves 108 and 109 in their leveling operation.

The arrangement of Figure 9 is also adapted to correct any local deflection or bulging out of the platen, and also simultaneous deflections on each end of the platen in the same direction, since the flow of fluid to respective cylinders will automatically be decreased, while the remaining cylinder-piston-assemblies continue their normal pressing action.

It will be appreciated that the shaft 63 of the reference member 62 need by no means be in a perfect vertical position, and that a slight deviation of the vertical position of the shaft 63 will not affect the proper functioning of the reference member 62, since the only thing that matters is that the reference member moves in such a manner that it remains parallel to its starting position. For this reason it is also by no means necessary that the angle between the beam 66 or the beams 92 and 93 and the shaft 63 at a right angle, nor is it necessary that the beam 66 or the beams 92 and 93 are parallel to the platen 15.

It is also understood that the reference member 62 is not limited to the particular shape shown in Figures 1, 4 and 5, but may be replaced, for instance, by a plurality of rods 127, 128 (Figure 10) resting on the platen 15, preferably the end portions thereof. Also in this instance, the reference rods 127, 128 are properly guided in stationary guiding means 129, 130 and 131, 132.

According to the structure of Figure 10, the springs 74 and 81 are replaced by adjustable abutment members 133 and 134 carried by the reference rods 127, 128 respectively and cooperating with the switches 135 and 136. Otherwise, the operation is the same as that described above in connection with Figure 1.

According to a further modification (Figure 11), the reference member 62 consists of a beam, 137 guided on stationary guiding members 138 and 139 which, if desired, may be the same guiding members used for guiding the platen 144. The beam 137 is preferably provided with gibs 140 and adjusting screws 147 for assuring a proper guiding of the beam 137. The gib and screw arrangement 146, 147 may be of the type described in U. S. patent application No. 332,178, filed by Paul E. Flowers.

The beam 137 carries, adjacent its ends, the switches 140 and 141, corresponding to the switches 69 and 70 of Figure 1. These switches cooperate with actuating members 142 and 143 carried by the platen 144 on which the beam 137 rests by means of a ball 145. Also in this instance the operation of the reference member, in connection with the press, is the same as described with regard to Figure 1.

It is, of course, understood that while the reference member 62 according to the present invention has been described in cooperation with electric means, the employment of the reference member is by no means limited to such an arrangement, but it is also possible to use the reference member in connection with mechanical or hydraulic control means instead of the said electric means.

It will be understood that I desire to comprehend within my invention such modifications as come within the scope of the claims and the invention.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In combination in a press, a reciprocable press platen, spaced hydraulic motor means for

reciprocating said platen, a reciprocable reference member separate from said motor means and resting on said platen so as to be movable in unison therewith, stationary guiding means for maintaining said reference member parallel to its starting position when moving with said platen, first contact means provided adjacent two opposite ends of said platen, second contact means supported by said reference member opposite said first contact means and adapted to engage the latter in response to tilting or bending movements of said platen, a fluid source for supplying pressure fluid to said motor means, and means responsive to the engagement of said contact means for controlling the supply of fluid to said hydraulic motor means.

2. In combination in a press, a press head comprising a plurality of spaced fluid operable cylinder-piston-assemblies, a press platen movably connected with said cylinder-piston-assemblies, a fluid source for supplying pressure fluid to said cylinder-piston-assemblies, valve means for controlling the supply of fluid from said fluid source to said cylinder-piston-assemblies, a reference member resting on said platen and movable in unison therewith, guiding means for guiding said reference member and maintaining the same in a position parallel to its starting position when said reference member moves with said platen, and controlling means associated with said platen and said reference member and responsive to tilting or bending movements of said platen for initiating actuation of said valve means to vary the supply of pressure fluid to said cylinder-piston-assemblies.

3. In combination in a press, a press head comprising a plurality of spaced fluid operable cylinder-piston-assemblies, a press platen movably connected with said cylinder-piston-assemblies, a fluid source for supplying pressure fluid to said cylinder-piston-assemblies, valve means for controlling the supply of fluid from said fluid source to said cylinder-piston-assemblies, electric means operable to control the movement of said valve means, a reference member resting on said platen and movable in unison therewith, guiding means for guiding said reference member and maintaining the same in a position parallel to its starting position when said reference member moves with said platen, and contact means arranged on spaced opposite portions of said platen and adapted in response to tilting or bending movements of said platen to engage contact members on said reference member for energizing said electric means to move said valve means into a flow-restricting position for restricting the supply of fluid of the cylinder-piston-assembly adjacent the respective actuating contact means and contact members.

4. In combination in a press, a press head comprising a plurality of spaced fluid operable cylinder-piston-assemblies, a press platen movably connected with said cylinder-piston-assemblies, a fluid source for supplying pressure fluid to said cylinder-piston-assemblies, valve means for controlling the supply of fluid from said fluid source to said cylinder-piston-assemblies, a reference member resting on said platen and movable in unison therewith, guiding means for guiding said reference member and maintaining the same in a position parallel to its starting position when said reference member moves with said platen, controlling means associated with said platen and said reference member and responsive to tilting or bending movements of said platen for initiating

actuation of said valve means to restrict the supply of pressure fluid to one of said cylinder-piston-assemblies to correct a tilting or bending movement of said platen, and adjustable means operable for predetermining the restriction of the flow of fluid to said respective cylinder-piston-assembly.

5. In combination in a press, a press platen, a reciprocable reference member resting on said platen and movable in unison therewith, means for maintaining said reference member parallel to the starting position of said reference member when the latter is in motion, contact means arranged at two spaced portions on said platen and adapted, in response to deflecting or tilting movements of said platen, to engage adjacent contact members on said reference member for closing a circuit, control means in said circuit responsive to the closure thereof for slowing down the movement of one platen end tending to run ahead of the opposite platen end, and means operable selectively for adjusting the respective position of said contact means relative to the respective contact members pertaining thereto.

6. In combination, a reciprocable element adapted when moving to deviate from its level position, means for reciprocating said element, a reference member separate from said means and arranged to move in unison with and to rest on said element, said reference member comprising a shaft having rigidly connected thereto a plurality of beams transverse to said shaft and at an angle with respect to each other, and guiding means for guiding said shaft to maintain said transverse beams parallel to their starting plane, when said reference member moves with said element, irrespective of tilting or bending movements of said element.

7. In combination in a press, a press head, a press platen, a plurality of reference members resting on opposite portions of said platen but not subjected to the pressure acting on said platen during the pressing operation thereof, guiding means in said head for maintaining said reference members parallel to their starting positions when said reference members are moved with said platen, and a plurality of control means operable independently of each other and respectively associated with said reference members, each of said control members being responsive to tilting or bending movements of said platen for initiating a correcting movement of said platen to return the same to level position.

8. In combination in a press, a vertically movable press platen, a reference beam resting on said platen and movable therewith, horizontally spaced stationary guiding means for guiding said reference beam and to maintain the same parallel to its starting position when said beam moves together with said platen irrespective of tilting or bending movements of the latter, and control means adjacent the ends of said reference beam and responsive to a tilting or bending movement of said platen for initiating a correcting operation to return said platen to level position.

9. In combination, a reciprocable platen beam or shear member, at least four spaced fluid operable cylinder-piston-assemblies arranged substantially in a row for reciprocating said platen beam or shear member, a fluid source for supplying pressure fluid to said cylinder-piston-assemblies, a reference member resting on and movable in unison with said platen beam or shear member, guiding means for guiding said reference member and maintaining the same in a position

parallel to its starting position when said reference member moves with said platen beam or shear member, a plurality of controlling means corresponding in number to said cylinder-piston-assemblies and operable to effect a restriction of flow of fluid from said fluid source to said cylinder-piston-assemblies, means responsive to a predetermined tilting or bending movement of said platen beam or shear member relative to said reference member for actuating the controlling means pertaining to one of the outermost cylinder-piston-assemblies to restrict the flow of fluid from said fluid source to said cylinder-piston-assemblies, and means responsive to a larger predetermined tilting or bending movement of said platen beam or shear member for causing restriction of the flow of fluid from said fluid source to the cylinder-piston-assembly adjacent the last mentioned cylinder-piston-assembly.

10. In combination in a press, a platen, fluid operable press plungers rigidly connected to said platen for operating the same, a reference member resting on said platen and being movable in unison therewith, means for maintaining said reference member in a position parallel to its starting position while said reference member is moving with said platen, correcting means operable to vary the supply of pressure fluid to said plungers for correcting a deflecting or tilting movement of said platen, actuating means responsive

to a change in distance between two predetermined points of said reference member and said platen respectively for initiating operation of said correcting means, and means associated with said actuating means and responsive to said change for imposing upon said actuating means a stroke larger than the change in distance between said two predetermined points.

11. In combination in a press, a platen, fluid operable means for actuating said platen, a reference member separate from said fluid operable means and resting on said platen so as to move in unison therewith, means for maintaining said reference member in a position parallel to its starting position when said reference member is moving with said platen, correcting means for correcting a deflecting or tilting movement of said platen to restore the latter to its level position, and actuating means operable to actuate said correcting means, said actuating means comprising a lever system interconnecting said reference member and said platen and responsive to the relative movement of two adjacent portions of said platen and said reference member respectively for causing a control element, associated with said correcting means, to move over a distance greater than the stroke defined by the relative movement of said adjacent portions.

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