May 27, 1969 C. L. FERRIS ET AL 3,446,106

PUNCH PRESS WITH SLIDING BOLSTER PLATE

Filed Feb. 16, 1967

Sheet 1 of 5

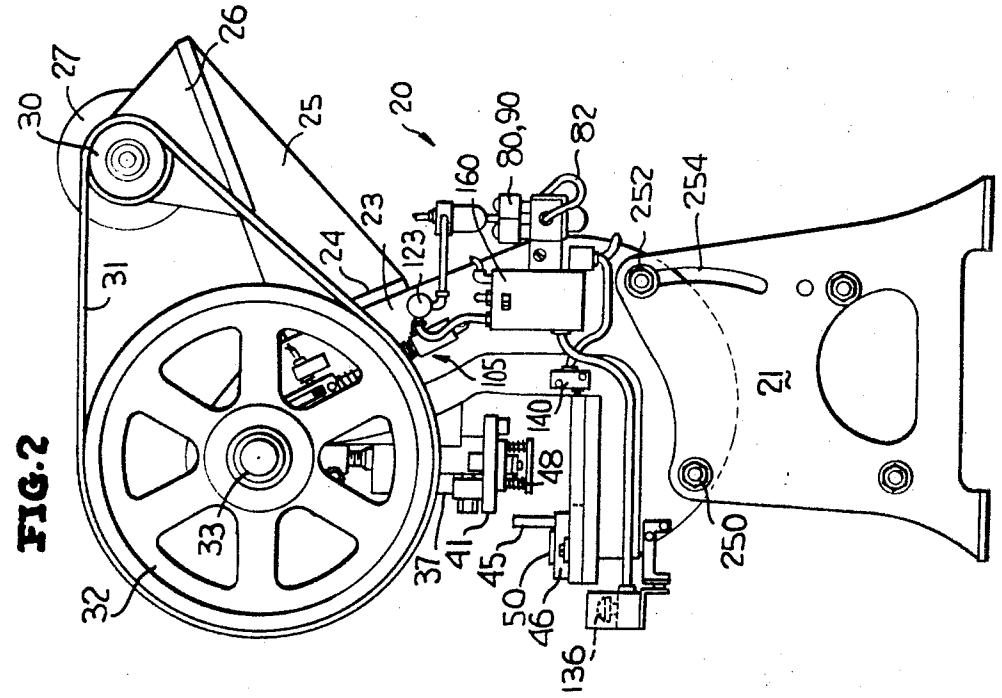


FIG. 2

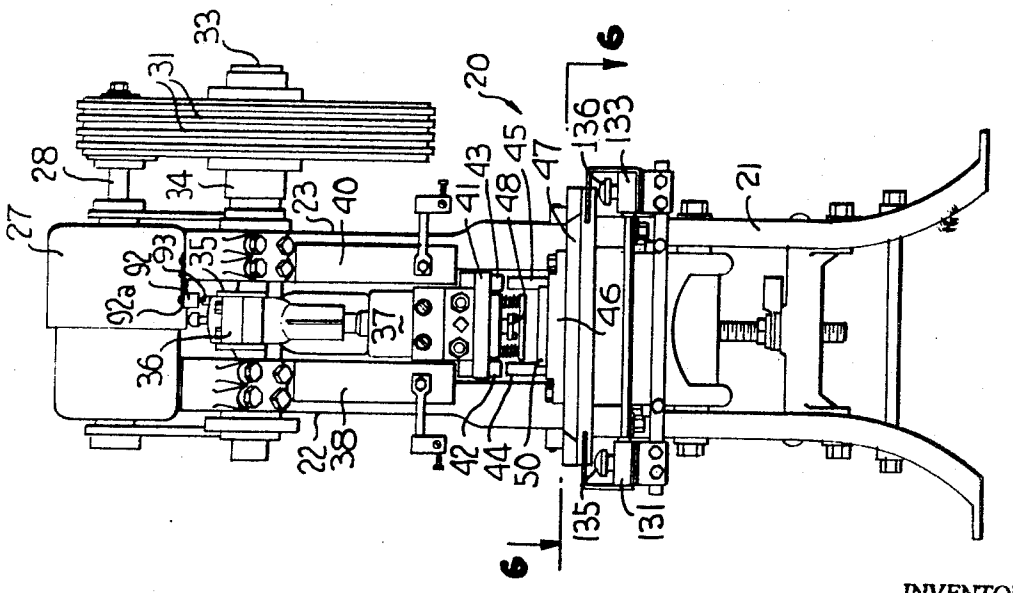


FIG. 1

INVENTORS
CHARLES L. FERRIS,
ROBERT J. BABECKI,
FINN N. BRAATHEN &
GEORGE J. SIROVATKA

BY
Mason, Porter, Diller & Brown
ATTORNEYS

May 27, 1969 C. L. FERRIS ET AL 3,446,106

PUNCH PRESS WITH SLIDING BOLSTER PLATE

Filed Feb. 16, 1967

Sheet 2 of 5

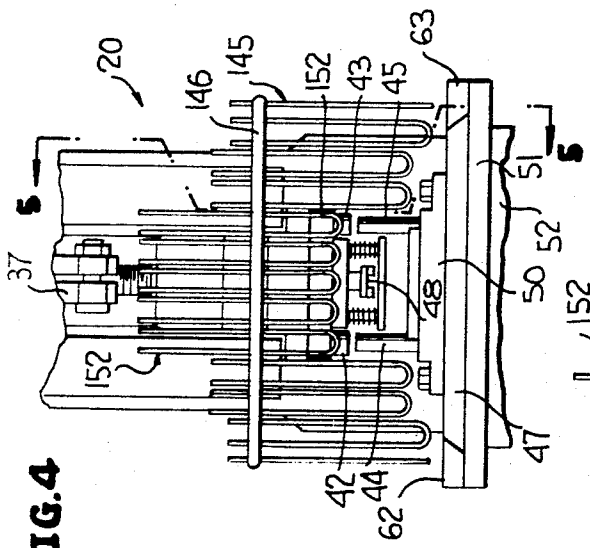


FIG.4

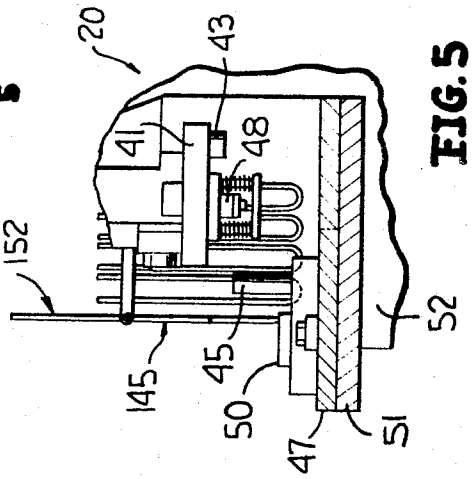


FIG.5

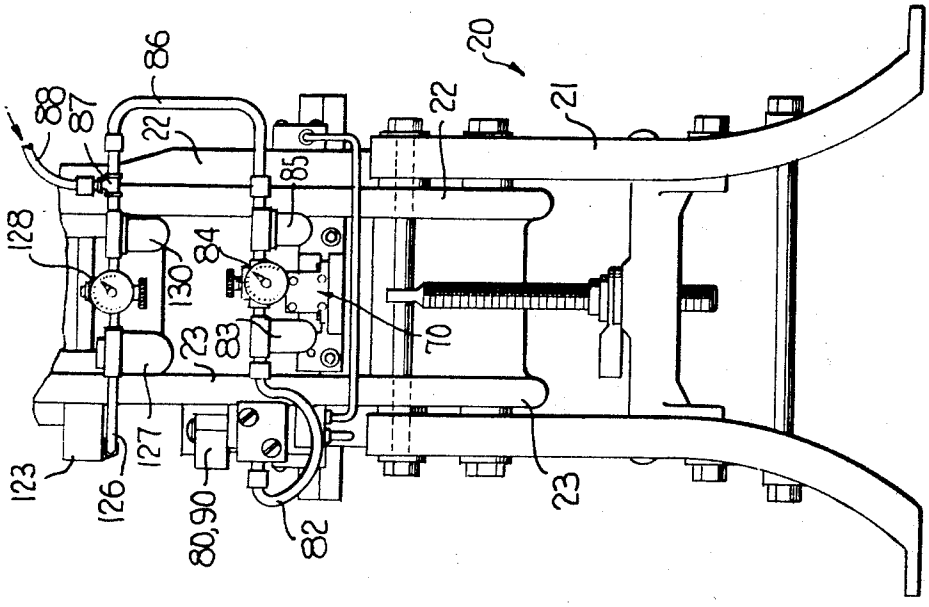


FIG.3

INVENTORS
CHARLES L. FERRIS,
ROBERT J. BABECKI,
FINN N. BRAATHEN &
GEORGE J. SIROVATKA

BY

Mason, Porter, Miller & Brown
ATTORNEYS

May 27, 1969 C. L. FERRIS ET AL 3,446,106

PUNCH PRESS WITH SLIDING BOLSTER PLATE

Filed Feb. 16, 1967

Sheet 3 of 5

FIG.6

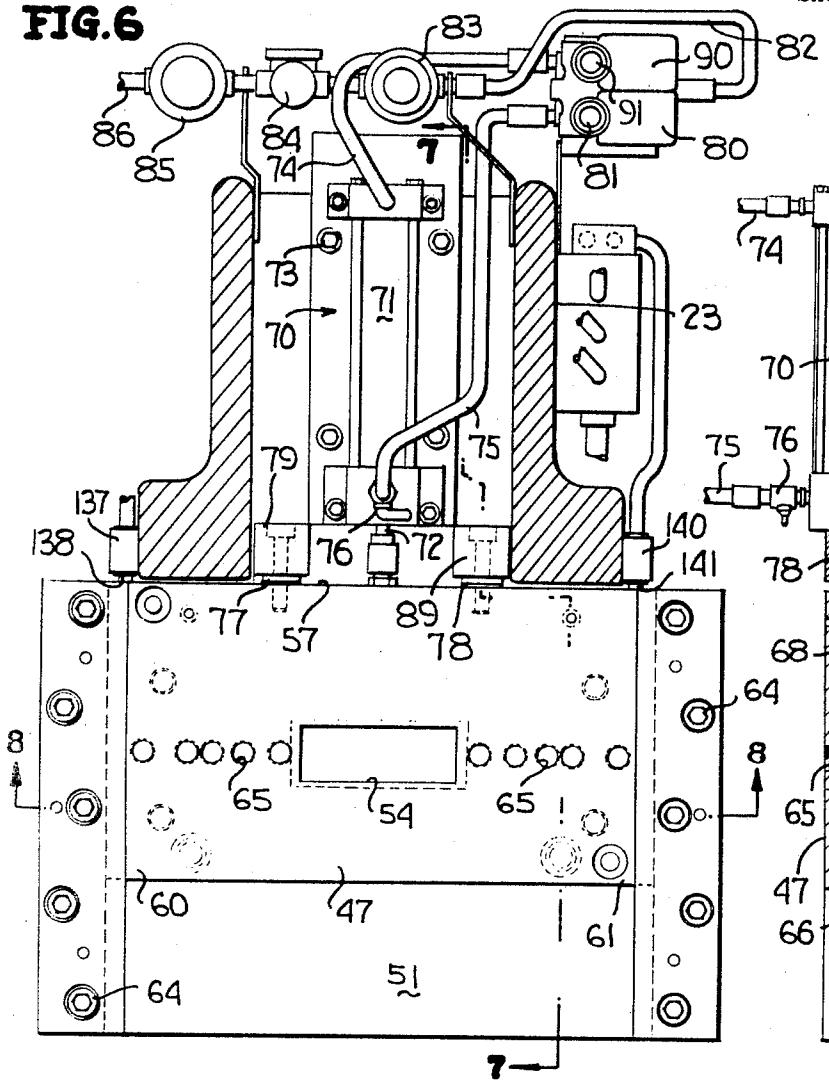


FIG.7

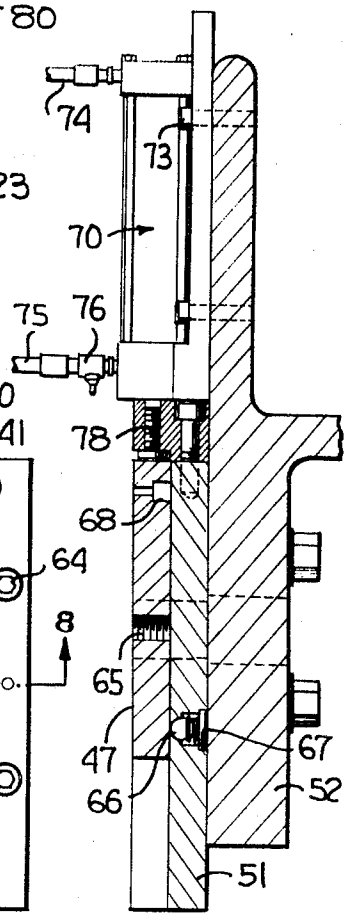
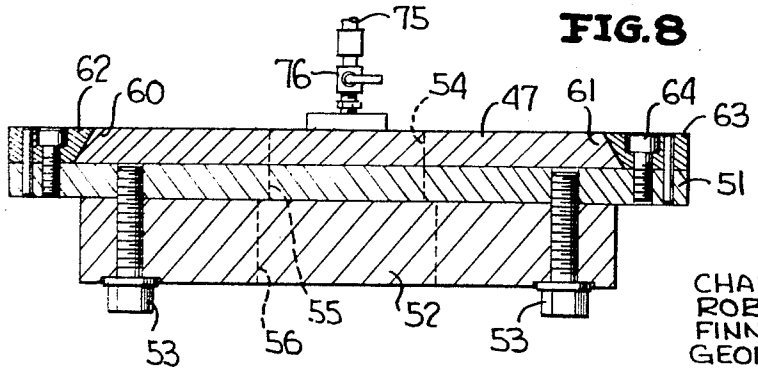


FIG.8



INVENTORS
CHARLES L. FERRIS,
ROBERT J. BABECKI,
FINN N. BRAATHEN &
GEORGE J. SIROVATKA

BY
Mason, Porter, Miller & Brown
ATTORNEYS

May 27, 1969 C. L. FERRIS ET AL 3,446,106

PUNCH PRESS WITH SLIDING BOLSTER PLATE

Filed Feb. 16, 1967

Sheet 4 of 5

FIG.10

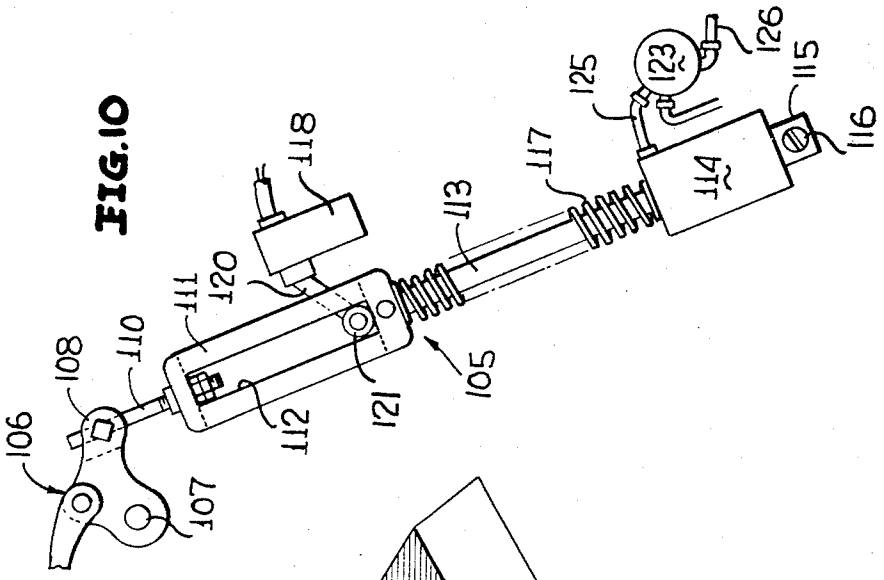
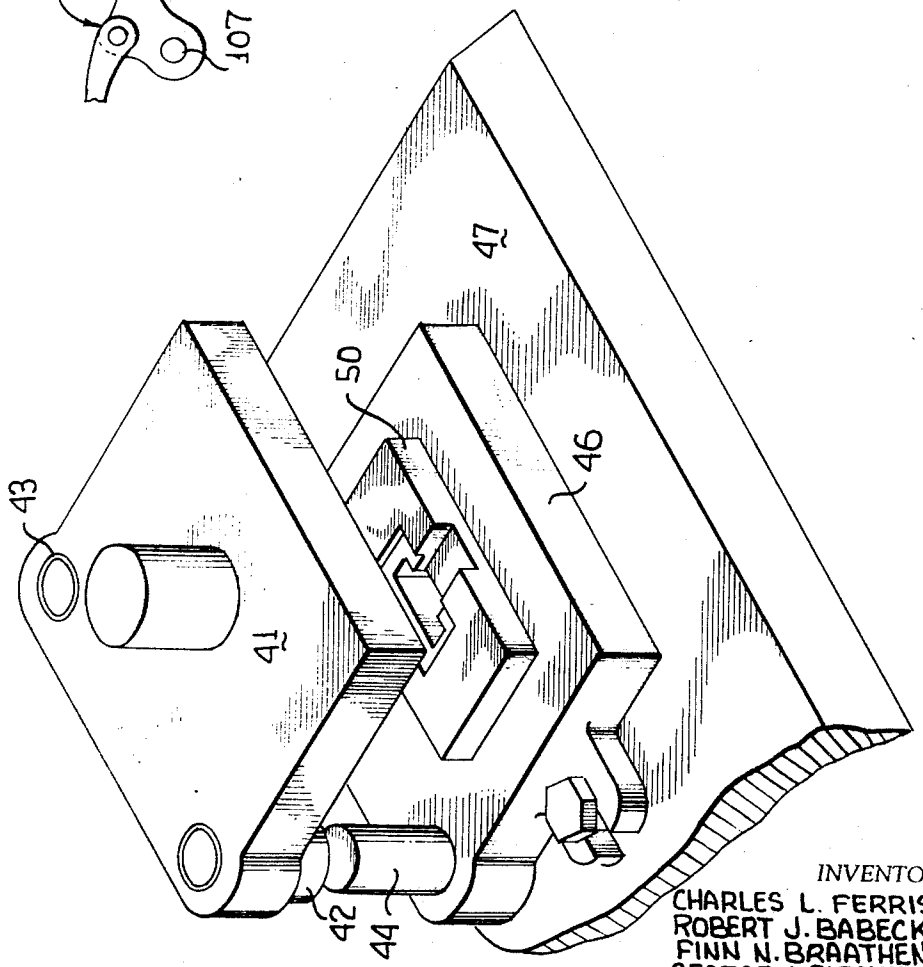


FIG.9



INVENTOR
CHARLES L. FERRIS,
ROBERT J. BABECKI,
FINN N. BRAATHEN &
GEORGE J. SIROVATKA

BY
Mason, Porter, Diller & Brown
ATTORNEYS

May 27, 1969 C. L. FERRIS ET AL 3,446,106

PUNCH PRESS WITH SLIDING BOLSTER PLATE

Filed Feb. 16, 1967 Sheet 5 of 5

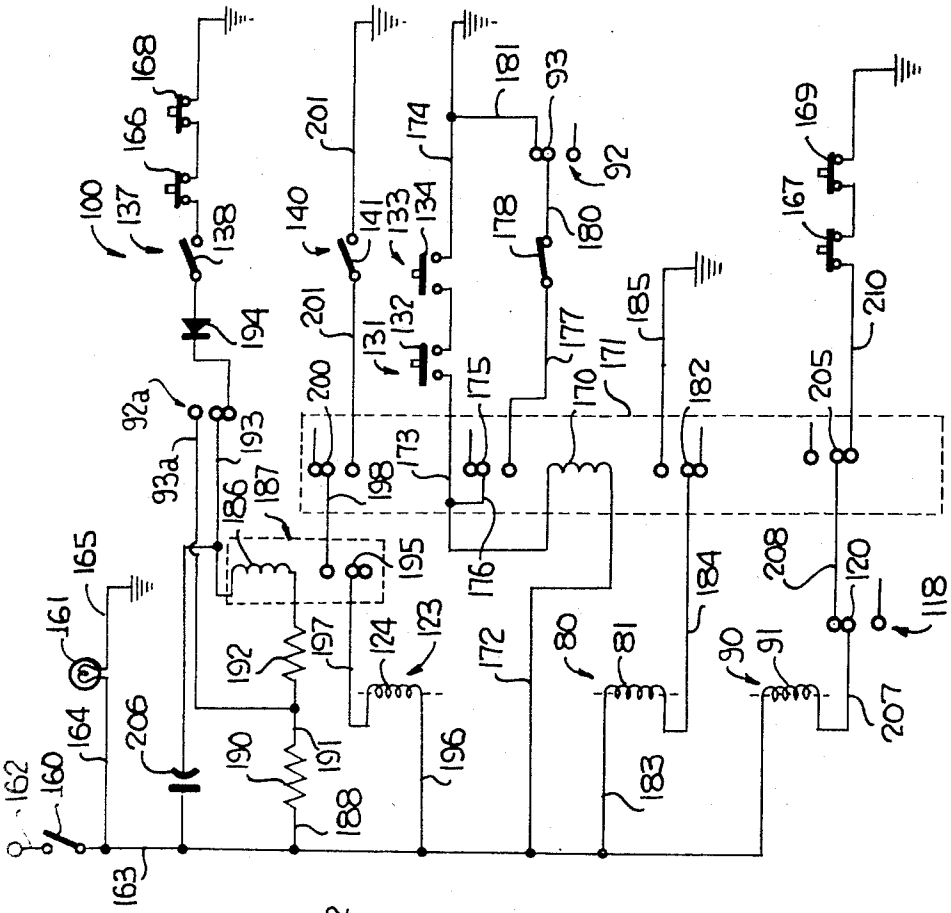


FIG. 12

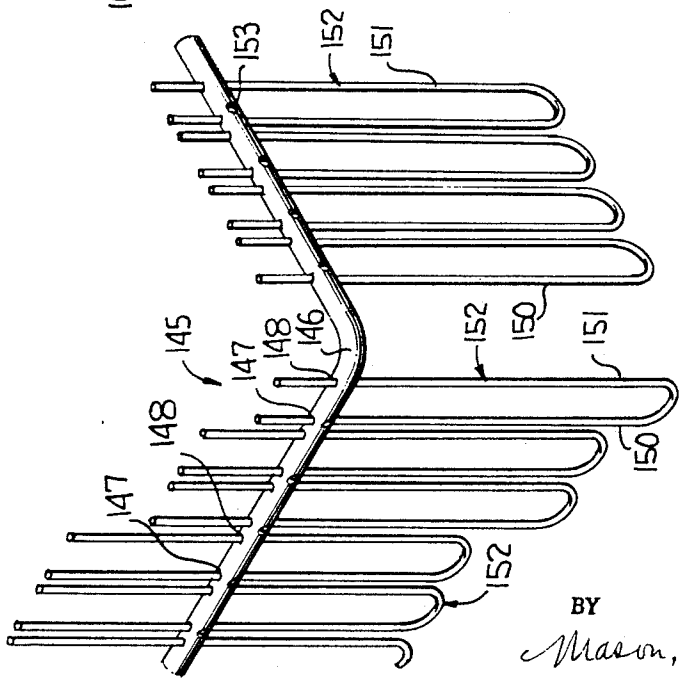


FIG. 11

INVENTORS
CHARLES L. FERRIS,
ROBERT J. BABECKI,
FINN N. BRAATHEN &
GEORGE J. SIROVATKA

BY
Mason, Porter, Weller & Brown
ATTORNEYS

United States Patent Office 3,446,106
Patented May 27, 1969

3,446,106

PUNCH PRESS WITH SLIDING BOLSTER PLATE

Charles L. Ferris, Robert J. Babecki, and Finn N. Braathen, Chicago, and George J. Sirovatka, Berwyn, Ill., assignors to Union Special Machine Company, Chicago, Ill., a corporation of Illinois

Filed Feb. 16, 1967, Ser. No. 616,620
Int. Cl. B26d 5/08, 5/22, 5/28
U.S. Cl. 83—400 17 Claims

ABSTRACT OF THE DISCLOSURE

This disclosure relates to a novel punch press, and is particularly directed to a punch press which includes a bolster plate mounted for reciprocal movement between loading and work positions or stations whereby an operator can load a die block carried by the bolster plate with an appropriate workpiece remote from the work position to preclude physical harm and/or dismemberment upon accidental or inadvertent "tripping" of the associated press ram.

A primary object of this invention is to provide a novel punch press which includes first means for reciprocating a bolster plate in a generally horizontal plane between a loading position and a work position, second means for reciprocating a ram for movement in a generally vertical plane between first and second positions remote from and adjacent the work position, die means carried by the bolster plate and the ram, control means for operating the first and second reciprocating means, the control means including first and second actuating means for respctively operating the first and second reciprocating means, and the second actuating means including means responsive to the movement of the bolster plate from the loading to the work position whereby the second actuating means actuates the second reciprocating means only upon the proper positioning of the bolster plate at its work position.

A further object of this invention is to provide a novel punch press of the type heretofore described wherein the responsive means includes switch means closed by contact thereof with the bolster plate when the latter is properly at its work position.

Still another object of this invention is to provide a novel punch press which includes additional switch means associated with the first and second actuating means for operating the second actuating means only after the additional switch means has been at least once both closed and opened.

Yet another object of this invention is to provide a novel punch press of the type described wherein the bolster plate is guided during its reciprocal movement by dove-tail guide means, means are provided for slidably guidably connecting the bolster plate to a ram during at least a portion of the movement of the ram toward the work position for accurately relatively guiding the die members during a work cycle of the press, and the latter-mentioned connecting means is defined by an axially registerable guide post and opening of the bolster plate and ram.

A further object of this invention is to provide a novel punch press of the type heretofore defined wherein guard means are provided for preventing the introduction of an operator's hands into an area at the work position, access means in the guard means through which the die member carried by the bolster plate passes when the latter moves between the first and second positions thereof, means for preventing the bolster from moving beyond its load position, and the last-mentioned means being in the form of a biased pin carried by a frame of the press

adapted for reception in a relieved area of the bolster plate upon attempted movement of the latter beyond the load position.

Still another object of this invention is to provide a novel punch press of the type heretofore described wherein the first reciprocating means includes a fluid motor, the fluid motor is defined by a cylinder and an associated piston coupled to the bolster plate, means for selectively introducing and withdrawing fluid from opposite ends of the piston cylinder, and a control circuit which includes means for regulating the operation of the fluid motor to prevent the premature return of the bolster plate from the work position to the load position.

With the above and other objects in view that will hereinafter appear, the nature of the invention will be more clearly understood by reference to the following detailed description, the appended claimed subject matter, and the several views illustrated in the accompanying drawings.

In the drawings:

FIGURE 1 is a front elevational view of a punch press constructed in accordance with this invention, and illustrates a reciprocal bolster plate and ram carrying cooperative die members.

FIGURE 2 is a side elevational view of the punch press of FIGURE 1, and illustrates a mechanism for operating a clutch to initiate the downward movement of the ram.

FIGURE 3 is a fragmentary elevational view of the rear of the press of FIGURES 1 and 2, and illustrates a fluid-motor and associated conduits for effecting the reciprocal movement of the bolster plate.

FIGURE 4 is a fragmentary schematic front view of the punch press of FIGURES 1 through 3, and illustrates a guard through which the bolster plate passes during its reciprocal movement between loading and work stations.

FIGURE 5 is a fragmentary sectional view taken generally along line 5—5 of FIGURE 4, and illustrates the manner in which the guard surrounds the area at the work station.

FIGURE 6 is an enlarged sectional view taken generally along line 6—6 of FIGURE 1, and illustrates the bolster plate at the work station and switches actuated thereby to control the operation of the ram.

FIGURE 7 is a sectional view taken generally along line 7—7 of FIGURE 6 and illustrates a spring biased pin adapted for reception in a relieved area of the bolster plate when the latter is at the load station.

FIGURE 8 is a sectional view taken generally along line 8—8 of FIGURE 6, and illustrates the sliding dovetail connection between the bolster plate and guide rails of the press.

FIGURE 9 is a top perspective view of a die set of the press, and illustrates aligned guide posts and openings for registering the die members during the downward stroke of the ram.

FIGURE 10 is a side elevational view of a mechanism for operating the ram clutch, and illustrates a spring biased member for operating a switch through a solenoid.

FIGURE 11 is a fragmentary front perspective view of the press guard, and more clearly illustrates the construction thereof.

FIGURE 12 is a circuit diagram illustrating the circuitry for controlling the operation of the ram and the bolster plate.

A novel punch press constructed in accordance with this invention is generally illustrated in FIGURES 1 through 3 of the drawings, and is designated by the reference numeral **20**. The punch press **20** includes a frame **21** to which is conventionally pivotally and adjustably mounted two upright support or frame members **22, 23.**

A plate 24 (FIGURE 2) bridges the frame members 22, 23 and is secured thereto by conventional means (not shown). A plate 25 is secured to the plate 24 and in turn carries a support 26 for an electric motor 27 which is energized by a conventional electrical source (not shown). The motor 27 includes an output shaft 28 (FIGURE 1) to which is secured a drive pulley 30. A plurality of pulley belts 31 are entrained about the drive pulley 30 and a flywheel 32 freely rotatably journalled on a shaft 33. The shaft 33 is journalled for rotation by conventional means (unnumbered) in the frame members 22, 23. A conventional clutch 34 is operated by a mechanism to be described more fully hereafter for selectively coupling the flywheel 32 to the shaft 33 thereby imparting rotation to the latter.

The portion of the shaft 33 between the frame members 22, 33 (FIGURE 1) includes an eccentric 35. A split housing 36 couples the eccentric 35 to a press ram 37 which is in turn guided for reciprocal movement in a vertical plane by conventional guides 38, 40. Each time the clutch 34 is actuated the shaft 33 and the eccentric 35 are rotated one revolution and in turn reciprocate the ram 37 through one cycle.

A plate 41 (FIGURES 1 and 9) is connected to the ram 37 and includes a pair of openings (unnumbered) in which are fixed downwardly directed tubular guide sleeves 42, 43. The lowermost internal surfaces of the guide sleeves or bushings 42, 43 are chamfered for facilitating the introduction of guide posts 44, 45 into the respective sleeves 42, 43. The guide posts 44, 45 are carried by a die holder 46 attached to a bolster plate 47. The progressive sliding engagement between the guide posts 44, 45 and the sleeves 42, 43 during the downward movement of the press ram 37 assures the accurate alignment between die members 48, 50 carried by the plate 41 and the die holder 46, respectively.

The bolster plate 47 is mounted for sliding movement in a horizontal plane atop a plate 51 which is in turn secured to a platform portion 52 (FIGURES 6, 7 and 8) of the frame members 22, 23 by conventional bolts 53. The bolster plate 47 is provided with a generally rectangular opening 54 which is in alignment with openings 55, 56 of the plate 51 and the platform portion 52, respectively, when the bolster plate is at its innermost or working position (FIGURE 6). The purpose of the openings 54 through 56 is to permit metal chips to pass therethrough when the punch press 20 is employed to perform a trimming or similar metal-removing operation on workpieces.

The bolster plate 47 includes an innermost edge or face 57 and opposite edge portions 60, 61 having edges (unnumbered) in downwardly diverging relationship, as is best illustrated in FIGURE 8 of the drawings. The edges of the edge portions 60, 61 of the bolster plate 47 are in mating sliding engagement with similar edges of a pair of rails 62, 63 secured to the plate 51 by conventional fasteners 64, such as bolts. The dove-tail sliding connection between the guide rails 62, 63 and the edges 60, 61 of the bolster plate 47 permit the latter to reciprocate in a horizontal plane but vertical movement thereof is prevented. The bolster plate 47 is also provided with a plurality of threaded apertures 65 for receiving bolts (unnumbered) which secure any one of a variety of different types of die holders upon the bolster plate 47.

The plate 51 is provided with a pair of bores (unnumbered) which each receive a pin 66 biased upwardly as viewed in FIGURE 7 by a compression spring 67. Each of the pins 66 is adapted to be received in a relieved area or opening 68 of the bolster plate 47. (FIGURE 7). The interlocked pins 66 and openings 68 thereby serve as locking means to prevent injury to an operator should the bolster plate break free of a piston rod 72 during its return from the work position or station to the loading position or station.

The bolster plate 47 is reciprocated by means of a fluid motor, generally designated by the reference numeral 70. The fluid motor 70 includes a cylinder 71 in which is reciprocally mounted a piston (not shown) carrying the piston rod 72 connected to the bolster plate 47 by conventional means. The fluid motor 70 is secured to the platform portion 52 of the frame members 22, 23 by conventional fasteners 73, and fluid conduits 74, 75 open into the interior of the chamber (unnumbered) of the cylinder 71 at opposite sides of the piston (not shown). A valve 76 in the line 75 is manually adjusted to regulate the incoming fluid (air under pressure) which through the piston and piston rod 72 draws the bolster plate 47 inwardly against stops 77, 78 threadedly secured in bores (unnumbered) of a pair of stop blocks 79, 89, respectively, secured to the platform portion 52 in a conventional manner. By regulating the incoming fluid pressure such that it is slightly greater than the build-up of back pressure on the other side of the piston a quiet and very quick stop of the bolster plate 47 is obtained.

The conduit 75 is placed in fluid communication with a conventional source of pressurized fluid, such as compressed air, by means of a solenoid valve 80 having a solenoid 81 (FIGURE 12), a conduit 82, a conventional lubricator 83, a conventional valve 84 having a pressure gauge (unnumbered), a filter 85, a conduit 86, a T-coupling 87 and a conduit 88. The conduit 74 is also placed in fluid communication with the fluid pressure source by means of a solenoid actuated valve 90 having a coil 91 (FIGURE 12), the conduit 82, the lubricator 83, the valve 84 the filter 85, the conduit 86, the T-coupling 87 and the conduit 88. The operation of the punch press, particularly with respect to the operation of the solenoid valves 80, 90, will be described more fully hereafter in conjunction with a control circuit 100 (FIGURE 12) of the press 20.

Switches 92, 92*a* (FIGURE 1) having switch arms 93, 93*a* (FIGURE 12) are located above the split housing 36 of the ram 37 by a conventional bracket (unnumbered). The switch arms 93, 93*a* are positioned for actuation by contact with the split housing 36 during the movement of the latter as the shaft 33 rotates in a manner and for a purpose which will be described hereinafter.

The clutch mechanism 34 corresponds to the clutch mechanism disclosed in Letters Patent 1,604,598 in the name of Herman Osswald issued Oct. 26, 1926. The clutch 34 is actuated by a mechanism 105 (FIGURES 2 and 10). The mechanism 105 includes a hook latch 106 corresponding to the latch 15 of the latter-noted Letters Patent. The latch 106 is mounted for pivoting movement about a conventional pivot pin 107 secured to the frame member 23. An arm 108 of the latch 106 is secured to a rod 110 which is in turn conventionally connected to a member 111 having an elongated slot 112. The member 111 is connected to one end of a piston rod 113 whose opposite end includes a piston (not shown) housed in a cylinder 114. The cylinder 114 includes a bracket 115 secured to the frame member 23 by a screw 116. A compression spring 117 surrounds the piston rod 113 and is positioned between the cylinder 114 and the member 111 to normally bias the latter upwardly as viewed in FIGURE 10 of the drawings.

A switch 118 (FIGURES 10 and 12) includes a switch arm 120 having a roller 121 received in the slot 112 of the member 111. The switch 118 is secured by conventional bracket means and fasteners (not shown) to the frame member 23.

The mechanism 105 is shown in FIGURE 10 of the drawings in the position in which the latch 106 maintains clutch portions of the clutch 34 disengaged whereby the flywheel 32 rotates freely upon the motionless shaft 33. The latch 106 is disengaged to activate the clutch 34 and rotate the shaft 33 by means of a solenoid actuated valve 123 (FIGURES 2, 3, 10 and 12) which includes a coil 124 (FIGURE 12). When the solenoid valve 123 is energized fluid under pressure is introduced into the cylinder 114 above the piston (not shown) to draw the rod 113

downwardly which in turn pivots the latch **106** about the pivot pin **107** and actuates the clutch **34** to rotate the shaft **33** through one revolution, as will be more apparent hereafter.

The interior of the cylinder **114** is placed into fluid communications with the fluid pressure source by a conduit **125**, the solenoid **123**, a conduit **126** (FIGURE 3), a lubricator **127**, a conventional valve **128** having a pressure gauge, a filter **130**, the T-coupling **87** and the conduit **88**.

The punch press **20** further includes a pair of switches **131**, **133** (FIGURES 1 and 12) having respective switch arms **132**, **134** which are normally open but can be closed by an operator of the press by depressing respective push buttons **135**, **136**.

Two additional switches **137**, **140** (FIGURES 6 and 12) having switch arms **133**, **141**, respectively, are mounted above the platform portion **52**, (FIGURE 6) of the frame members **22**, **23** in alignment with the edge portions **60**, **61**, respectively, of the bolster plate **47**. The switches **137**, **140** are normally open and are closed when the bolster plate **47** reaches the position illustrated in FIGURE 6 of the drawings.

The punch press **20** is preferably though optionally provided with a guard **145** (FIGURES 4, 5 and 11) which includes a generally U-shaped horizontally disposed tubular member **146** provided with a plurality of vertically disposed pairs of apertures **147**, **148**. Legs **150**, **151** of an elongated U-shaped member **152** are received in respective openings **147**, **148** of the member **146**. A set screw **153** seats against the leg **150** of each of the members **152** and maintains the members **152** in any position of vertical adjustment depending for the most part upon the size of the die holder **46**, the die member **50** and the size of the workpiece. In the illustrated embodiment of the invention the five centermost members **152** (FIGURE 4) are shown raised above the remaining members **152** to define an access opening (unnumbered) through which the bolster plate **47**, the die holder **46**, the die member **50** and the workpiece can pass during the reciprocation of the bolster plate between the loading and working stations thereof (FIGURES 5 and 6) respectively.

The operation of the punch press **20** is initiated by first closing a main switch **160** of the control circuit **100** (FIGURE 12) which illuminates a lamp **161** over a circuit traced from a power input line **162**, the now closed switch **160**, a conductor **163**, a conductor **164**, the lamp **161** and a conductor **165** to ground. The lamp **161** is preferably mounted at a readily visible location at the front of the press.

Assuming the bolster plate **47** is at the loading station (FIGURE 5), the operator places a suitable workpiece upon the die member **50** and depresses the push buttons **135**, **136** to close the normally open contacts of switch arms **132**, **134** of the respective switches **131**, **133**. The contacts **132**, **134** arec onnected to normally closed contacts **166**, **167** and **168**, **169**, respectively. Thus, when the contacts **132**, **134** are closed the contacts **166** through **169** are opened. The closing of the contacts **132**, **134** also energizes a coil **170** of a relay **171** over the conductor **163**, a conductor **172**, the coil **170**, a conductor **173**, the now closed switches **132**, **134**, a conductor **174** and ground. The energized coil **170** closes a switch **175** to provide a holding circuit for the relay **171** over the conductor **163**, the conductor **172**, the coil **170**, the conductor **173**, a conductor **176**, the now closed switch **175**, a conductor **177**, a normally closed switch **178**, a conductor **180**, the normally closed switch arm **93** of the switch **92**, a conductor **181**, the conductor **174** and ground.

The energized coil **170** of the relay **171** closes a switch arm **182** to energize the coil **81** over a path traced from the conductor **163**, a conductor **183**, the coil **81**, a conductor **184**, the now closed switch **182** and a conductor **185**. The coil **81** actuates the solenoid valve **80** and fluid pressure from the pressure source over the flow path heretofore described enters the cylinder **71** through the conduit **75** to pull the bolster plate **47** from the load position through the access area in the guard **145** to the work position (FIGURE 6) beneath and in vertical alignment with the ram **37**. The end face **57** (FIGURE 6) of the bolster plate **47** closes the contact arms **138**, **141** of the respective switches **137**, **140**. However, since the switches **131**, **133** have not yet been released the contacts **166** through **169** remain open until the operator releases the switches **131**, **133**. Upon the release of the switches **131**, **133** the contacts **132**, **134** open, the coil **170** of the relay **171** remains energized over the holding circuit heretofore described, and a coil **186** of a relay **187** is energized over a path traced from the conductor **163**, a conductor **188**, a resistor **190**, a conductor **191**, a resistor **192**, the coil **186**, a conductor **193**, switch **92***a*, a rectifier **194**, the now closed contact **138** of the switch **137**, and the closed contacts **166**, **168**.

The energized relay **187** closes a switch **195** to energize the coil **124** of the solenoid valve **123** over a circuit traced from the conductor **163**, a conductor **196**, the coil **124**, a conductor **197**, the now closed switch **195**, a conductor **198**, a now closed switch **200** of the relay **171**, a conductor **201**, the closed contact **141** of the switch **140**, and a conductor **201**. Upon the operation of the solenoid valve **123** fluid pressure from the source enters the cylinder **114** (FIGURE 10) over the flow path heretofore described to draw the piston rod **113** downwardly or inwardly causing the latch **106** to pivot in a clockwise direction whereupon the clutch **34** is actuated to couple the rotating flywheel **32** to the shaft **33** which in turn reciprocates the ram through one cycle and the workpiece is appropriately operated upon by the cooperative die members **48**, **50**.

At the same time the solenoid valve **123** is actuated to initiate the movement of the ram **37** the normally closed switch arm **120** opens switch **118** (FIGURE 10) by the downward movement of the member **111**. This prevents the bolster plate **47** from prematurely leaving the work station upon the de-energizing of the relay **171** when the contact **93** of the switch **92** opens. That is, during the initial energizing of the coil **170** of the relay **171** a normally closed contact or switch **205** is opened to prevent the coil **91** from being energized when the switch **120** is in its normally closed position. In the absence of opening the switch **118** during the energizing of the solenoid valve **123** the coil **170** of the relay **171** could de-energize prematurely upon the opening of the switch **92** as the ram **37** beings to descend whereupon the switch **205** would close prematurely and begin withdrawing the bolster plate **47** toward its load position prior to the complete cycling of the ram **37**.

The closing of the switch **120** energizes the coil **91** of the solenoid **90** over a circuit traced from the conductor **163**, the coil **91**, a conductor **207**, the now closed switch **120**, a conductor **208**, the switch **205** of the de-energized coil **171**, a conductor **210** and the normally closed switches **167**, **169**. The coil **91** actuates the solenoid valve **90** to introduce fluid into the cylinder **71** in the manner heretofore described through the conduit **74** to move the bolster plate **47** to its loading position at which point the cycle just described can be repeated. The movement of the bolster plate **47** toward the loading station opens the contacts or switches **138**, **141** while the return of the ram **37** closes the switches **92**, **92***a* to restore the circuit **100** to its initial condition. The operation of the punch press and its related circuitry as just described results in the continuous reciprocation of the bolster plate **47** and the ram **37** each time the switches **131**, **133** are depressed and released. However, it is at times desirable, particularly when operating upon long strips of sheet metal, to lock the bolster plate **47** in the work position thereof against the stops **77**, **78**. This is accomplished by opening the normally closed switch **178** and cutting off fluid flow from the pressure sounce to the

solenoid valves **80**, **90** by conventional valve means (not shown). With the bolster plate **47** holding the contacts **138**, **141** closed and with the switch **178** open the energizing of the coil **170** of the relay **171** is ineffective to reciprocate the bolster plate due to the cutting-off of fluid pressure to the cylinder **71** and a holding circuit is not established. Strip material can therefore be fed sideways to the punch press in a continuous fashion so long as the switches **131**, **133** are closed. To insure positive action when the sliding action of the bolster plate **47** is not used, a feed-back circuit is provided which maintains the coil **124** of the solenoid valve **123** energized after the relay **171** has been de-energized by the opening of the normally closed contact **93** of the switches **92**, **92***a* upon the downward movement of the ram **37**. During the same time the coil **186** of the relay **187** is energized the rectifier **194** charges a capacitor **206** across the conductors **163**, **193**. When the switch **92** opens breaking the holding circuit and de-energizing the relay **171**, coil **186** of the relay **187** remains energized as current from the capacitor bleeds into the coil **186** of the relay **187** resulting in the continued energizing of the coil **124** over the conductor **196**, the coil **124**, the conductor **197**, the still closed switch **195** to positively insure that the relay **187** and the coil **124** will remain activated for as long as the relay **171** is energized. After the coil **186** de-energizes current to the coil **124** of the solenoid **123** is cut off and the spring **113** (FIGURE 12) forces the member **111** upwardly to close the contact **120** of the switch **118**. The rotation of the shaft **33** opens the switch **92** breaking the holding circuit **170**, **172**, **175**, **176**, **177**, **178**, de-energizing the relay **171**. In addition, rotation of the shaft **33** also opens the switch **92***a* opening circuit **163**, **190**, **192**, **186**, **193**, **92***a*, **194**, **138**, **166** and **168**.

We claim:

1. A punch press comprising a frame, means mounting a bolster plate for movement upon said frame, first means for reciprocating said bolster plate between a first loading position and a second work position, a first die member carried by said bolster plate and movable therewith, a ram mounted for movement relative to said frame, second means for reciprocating said ram between first and second relatively displaced positions respectively remote from and adjacent said work position, a second die member carried by said ram and cooperative with said first die member, said die members being in offset relationship in said first positions and in alined relationship in said second positions, control means for operating said first and second reciprocating means, said control means including first actuating means for actuating said first reciprocating means to move said bolster plate from the first to the second position thereof, and second actuating means for actuating said second reciprocating means to move said ram at a time the bolster plate is at its second position thereby altering a work piece positioned between said die members.

2. The punch press as defined in claim **1** wherein said second actuating means includes means responsive to the movement of said bolster plate during the movement thereof from the first toward the second position whereby said second actuating means actuates said second reciprocating means only when said bolster plate is at its second position.

3. The punch press as defined in claim **1** wherein said second actuating means includes means responsive to the movement of said bolster plate, and said responsive means includes contactable switch means positioned for operation by the movement of said bolster plate at said work position.

4. The punch press as defined in claim **1** including switch means associated with said first and second actuating means for operating said second actuating means only after said switch means has been at least once closed and opened.

5. The punch press as defined in claim **1** including means slidably guidably connecting said bolster plate to said ram during at least a portion of the movement of said ram toward its work position for accurately relatively guiding said die members during a work-cycle of the press.

6. The punch press as defined in claim **1** including means slidably guidably connecting said bolster plate to said ram during at least a portion of the movement of said ram toward its work position for accurately relatively guiding said die members during a work-cycle of the press, and said connecting means being in the form of an axially registerable guide post and opening.

7. The punch press as defined in claim **1** including guard means for preventing the introduction of an operator's hands into an area at the work position of the bolster plate, and access means in said guard means through which said first die member passes when moving with said bolster plate between the first and second positions thereof.

8. The punch press as defined in claim **1** wherein abutment means are provided for accurately positioning said bolster plate at said second position, and said second actuating means include switch means adjacent said abutment means for operation by the movement of said bolster plate toward the second position thereof.

9. The punch press as defined in claim **1** wherein said mounting means includes a pair of spaced rails between which said bolster plate is located, adjacent edges of said rails are undercut, and remote edges of said bolster plate are receieved beneath said undercut edges.

10. The punch press as defined in claim **1** including means for preventing said bolster plate from moving beyond said first position and said last-mentioned means being in the form of a biased pin carried by said frame adapted for reception in a relieved area of said bolster plate.

11. The punch press as defined in claim **1** wherein said first reciprocating means includes a fluid motor, said fluid motor includes a piston having a rod connected to said bolster plate, means for selectively introducing and withdrawing fluid from opposite ends of a poston cylinder of said fluid motor, abutment means for accurately positioning said bolster plate at said second position, and said second actuating means include switch means adjacent said abutment means for operation by the movement of said bolster plate toward the second position thereof.

12. The punch press as defined in claim **1** wherein said first reciprocating means includes a fluid motor, said fluid motor includes a piston having a rod connected to said bolster plate, means for selectively introducing and withdrawing fluid from opposite ends of a piston cylinder of said fluid motor, abutment means for accurately positioning said bolster plate at said second postion, said second actuating means include switch means adjacent said abutment means for operation by the movement of said bolster plate toward the second position thereof, said mounting means includes a pair of spaced rails between which said bolster plate is located, adjacent edges of said rails are undercut, and remote edges of said bolster plate are received beneath said undercut edges.

13. The punch press as defined in claim **1** wherein said first reciprocating means includes a fluid motor, said fluid motor includes a piston having a rod connected to said bolster plate, means for selectively introducing and withdrawing fluid from opposite ends of a piston cylinder of said fluid motor, abutment means for accurately positioning said bolster plate at said second position, said second actuating means include switch means adjacent said abutment means for operation by the movement of said bolster plate toward the second position thereof, said mounting means includes a pair of spaced rails between which said bolster plate is located, adjacent edges of said rails are undercut, remote edges of said bolster plate are received beneath said undercut edges, means slidably guidably connecting said bolster plate to said ram during at least a portion of the movement of said ram toward its work position for accurately relatively guiding said die

members during a work-cycle of the press, and said connecting means being in the form of an axially registerable guidepost and opening.

14. The punch press as defined in claim **1** wherein said first reciprocating means includes a fluid motor, said fluid motor includes a piston having a rod connected to said bolster plate, means for selectively introducing and withdrawing fluid from opopsite ends of a piston cylinder of said fluid motor, abutment means for accurately positioning said bolster plate at said second position, said second actuating means include switch means adjacent said abutment means for operation by the movement of said bolster plate toward the second postion thereof, said mounting means includes a pair of spaced rails between which said bolster plate is located, adjacent edges of said rails are undercut, remote edges of said bolster plate are received beneath said undercut edges, means slidably guidably connecting said bolster plate to said ram during at least a portion of the movement of said ram toward its work position for accurately relatively guiding said die members during a work-cycle of the press, said connecting means being in the form of an axially registerable guide post and opening, guard means for preventing the introduction of an operator's hands into an area at the work position of the bolster plate, and access means in said guard means through which said first die member passes when moving with said bolster plate between the first and second positions thereof.

15. The punch press as defined in claim **1** wherein said first and second actuating means form portions of a control circuit of said control means, and said control circuit includes means for temporarily preventing the premature return of said bolster plate from said work position to said first position during and after one complete cycle of movement of said ram.

16. The punch press as defined in claim **1** wherein said first and second actuating means form portions of a control circuit of said control means, first and second relay means for operating said first and second reciprocating means respectively, first solenoid means energized by said first relay means for effecting the movement of said bolster plate from said first toward said second position, second solenoid means energized by said first relay means for effecting the movement of said bolster plate from said second to said first position, third solenoid means energized by said second relay means for effecting the operation of said second reciprocating means, and switch means associated with said second solenoid means for energizing the latter only upon the return of said second reciprocating means to said first position.

17. The punch press as defined in claim **1** wherein said first and second actuating means form portions of a control circuit of said control means, first and second relay means for operating said first and second reciprocating means respectively, first solenoid means energized by said first relay means for effecting the movement of said bolster plate from said first toward said second position, second solenoid means energized by said first relay means for effecting the movement of said bolster plate from said second to said first position, third solenoid means energized by said second relay means for effecting the operation of said second reciprocating means, and bleed-back circuit means for maintaining said second relay and said third solenoid energized after input to said relay is discontinued, switch means associated with said second solenoid means for energizing the latter to effect the movement of the bolster plate from the second to the first position, and said switch means is coupled to said third solenoid and maintained open until said second relay is de-energized through said bleed-back circuit means.

References Cited

UNITED STATES PATENTS

Re. 18,162	8/1931	Freeman	83—221
2,176,543	10/1939	Norton	83—563
2,566,243	8/1951	Nyquist	83—221 X
2,910,727	11/1959	Salbeck et al.	100—229 X
2,988,234	6/1961	Barothy et al.	

ANDERW R. JUHASZ, *Primary Examiner.*

FRANK T. YOST, *Assistant Examiner.*

U.S. Cl. X.R.

083—370, 412, 563; 100—043, 229.