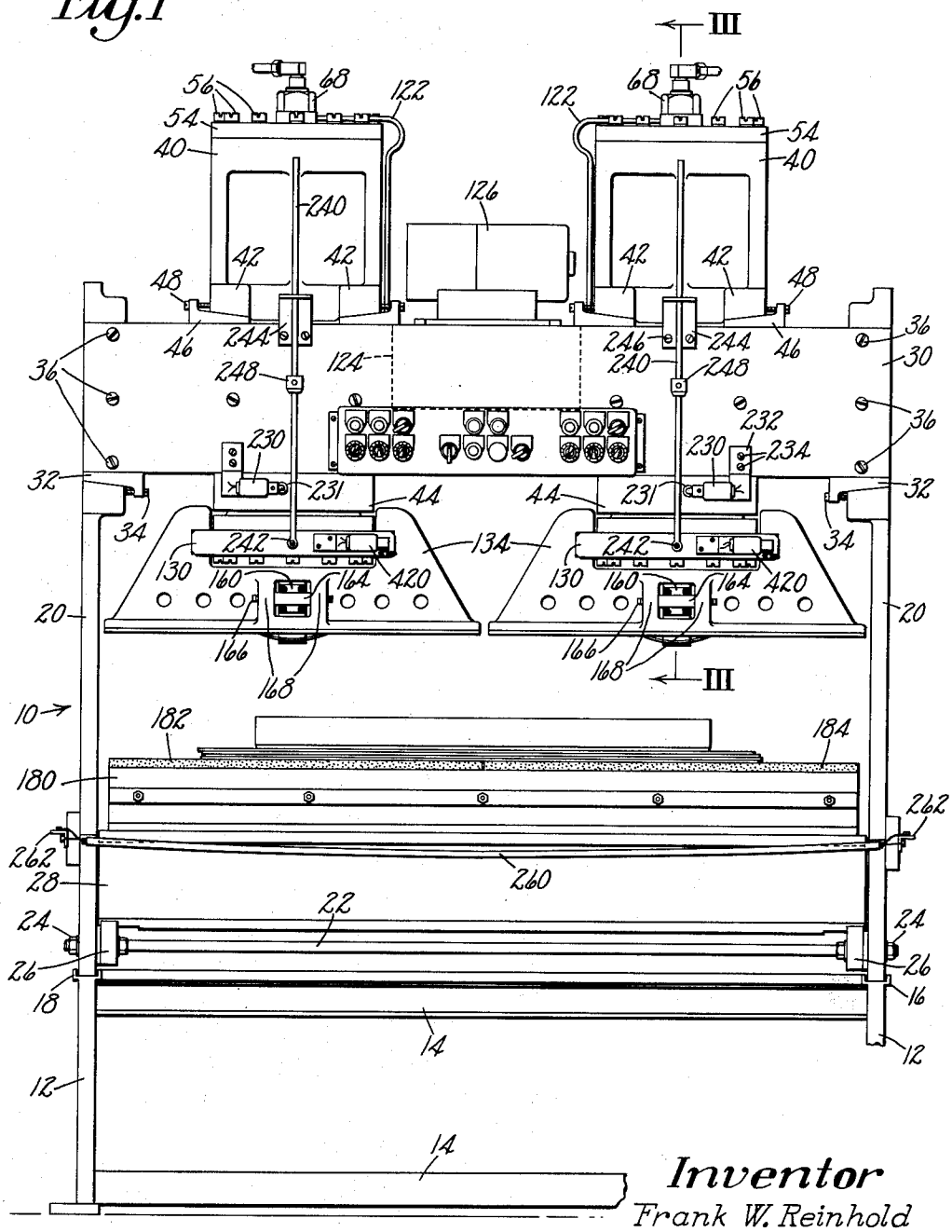
Sept. 7, 1965 F. W. REINHOLD 3,204,506

DIE CUTTING PRESS HAVING HYDRAULIC MEANS TO MOVE THE UPPER PLATEN TRANSVERSELY OF THE WORK SUPPORT

Filed Jan. 9, 1963 7 Sheets-Sheet 1

Fig. 1



Inventor

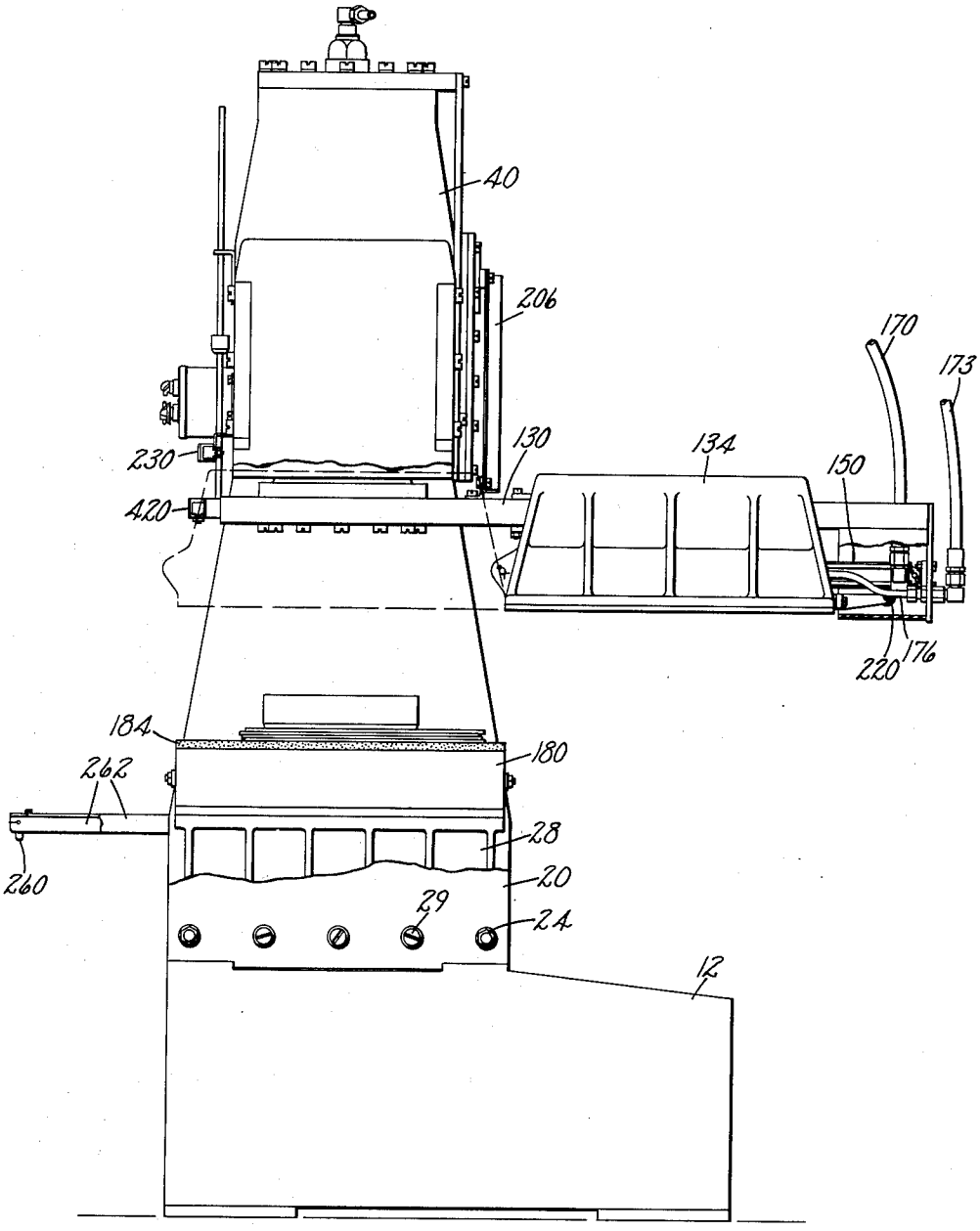
Frank W. Reinhold

By his Attorney

George C. Fuller

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Fig. 2

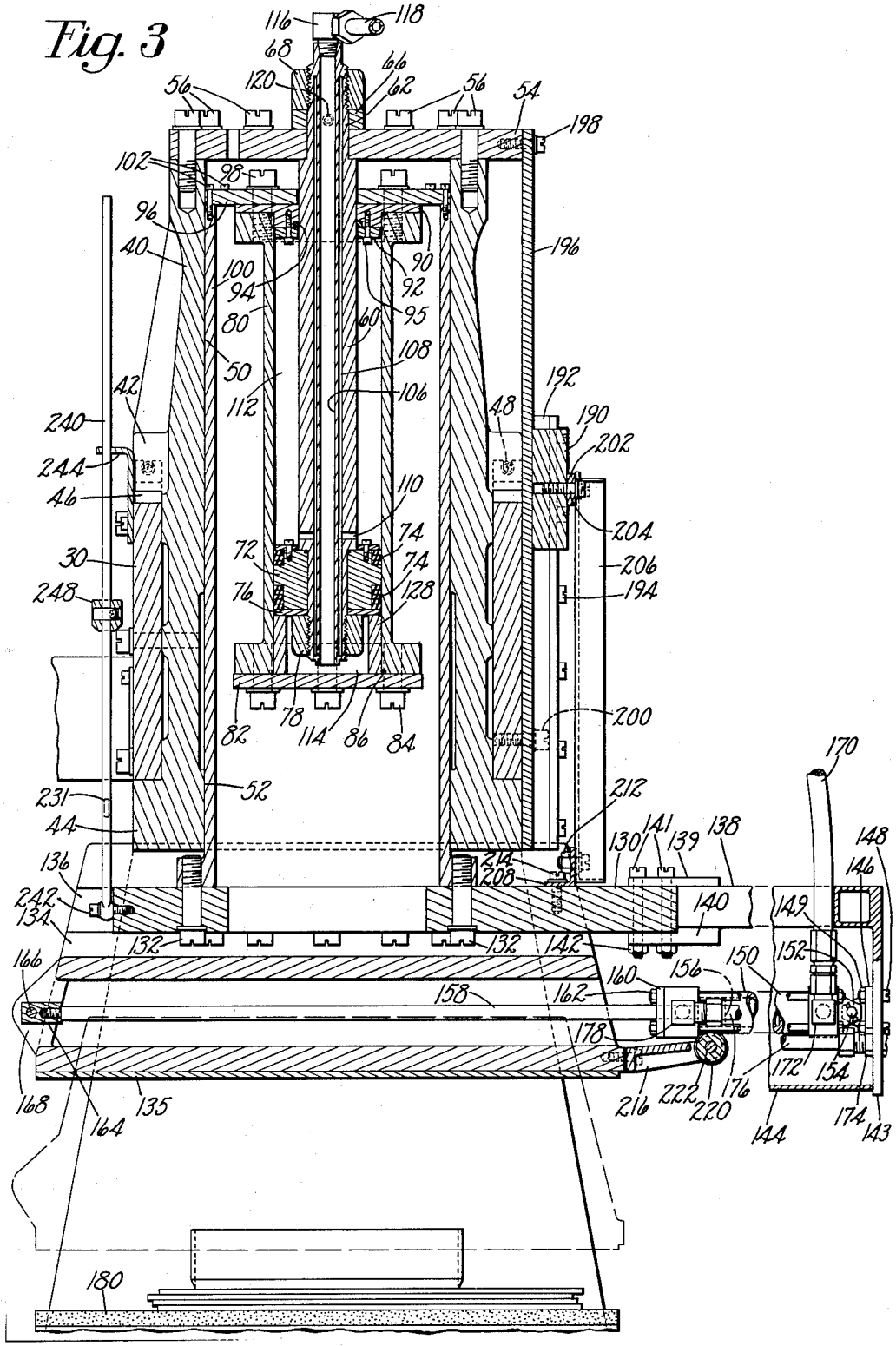


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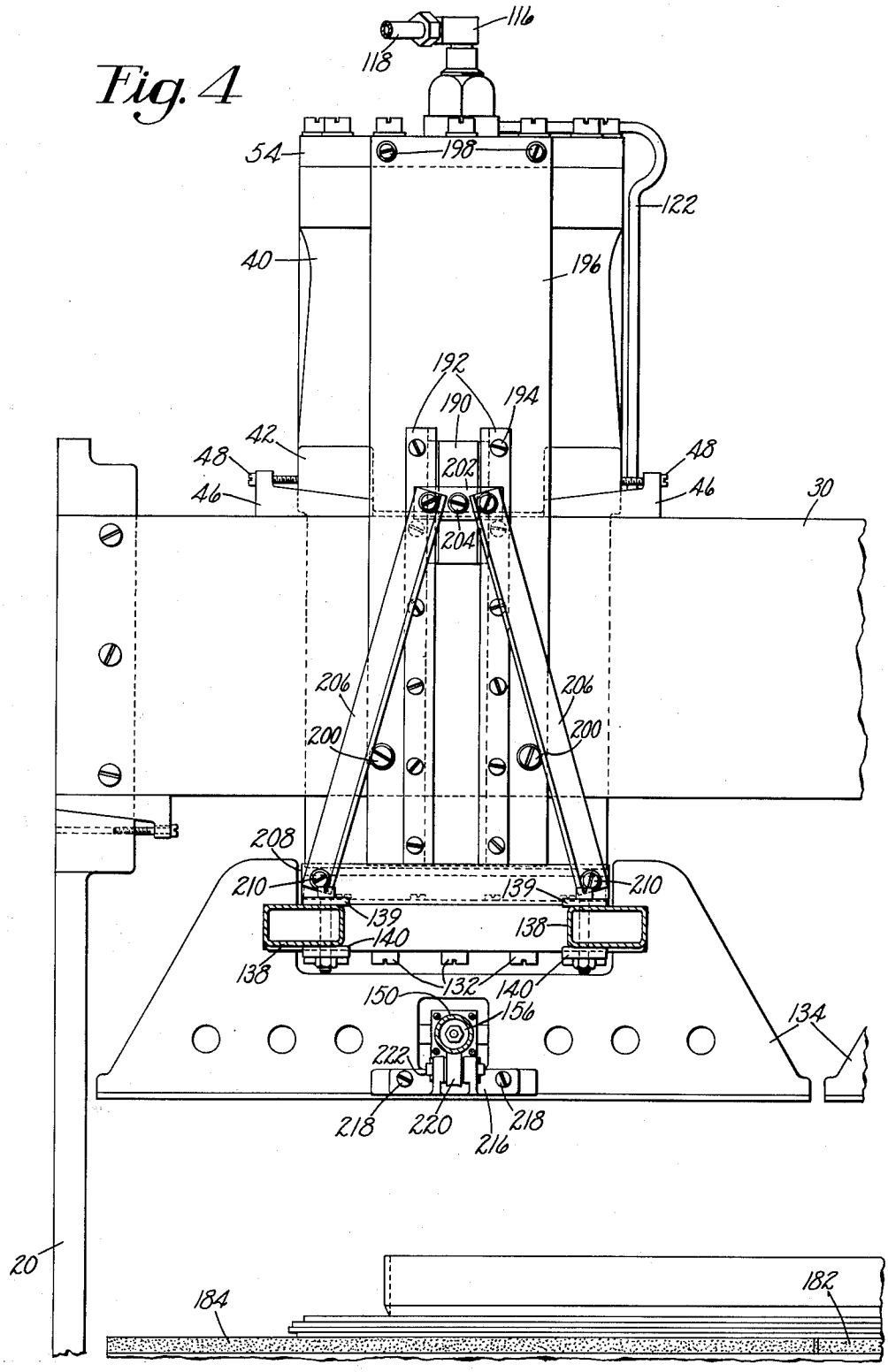
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Fig. 3



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Fig. 4

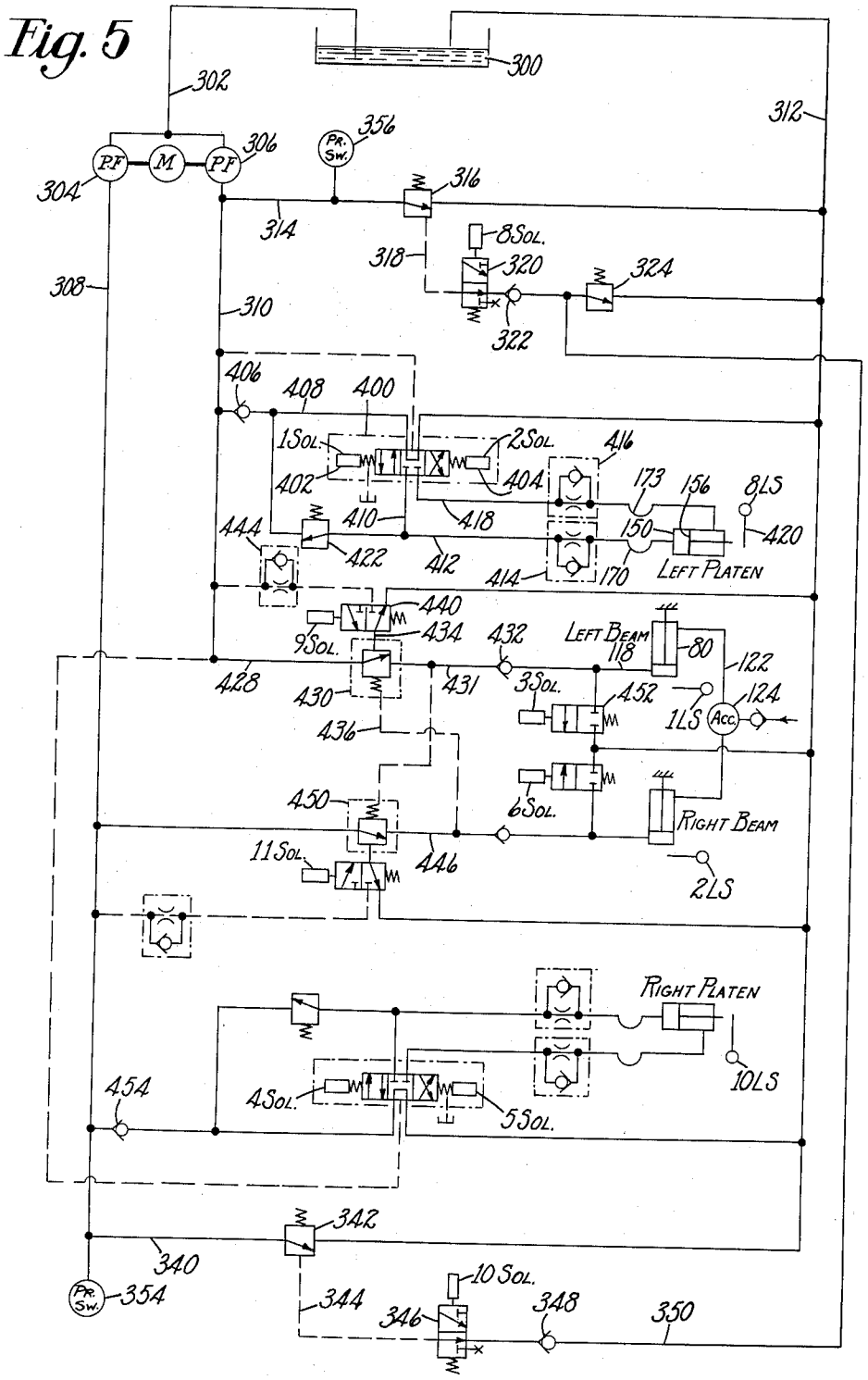


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DIE CUTTING PRESS HAVING HYDRAULIC MEANS TO MOVE THE UPPER PLATEN TRANSVERSELY OF THE WORK SUPPORT

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Fig. 5



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DIE CUTTING PRESS HAVING HYDRAULIC MEANS TO MOVE THE UPPER PLATEN TRANSVERSELY OF THE WORK SUPPORT

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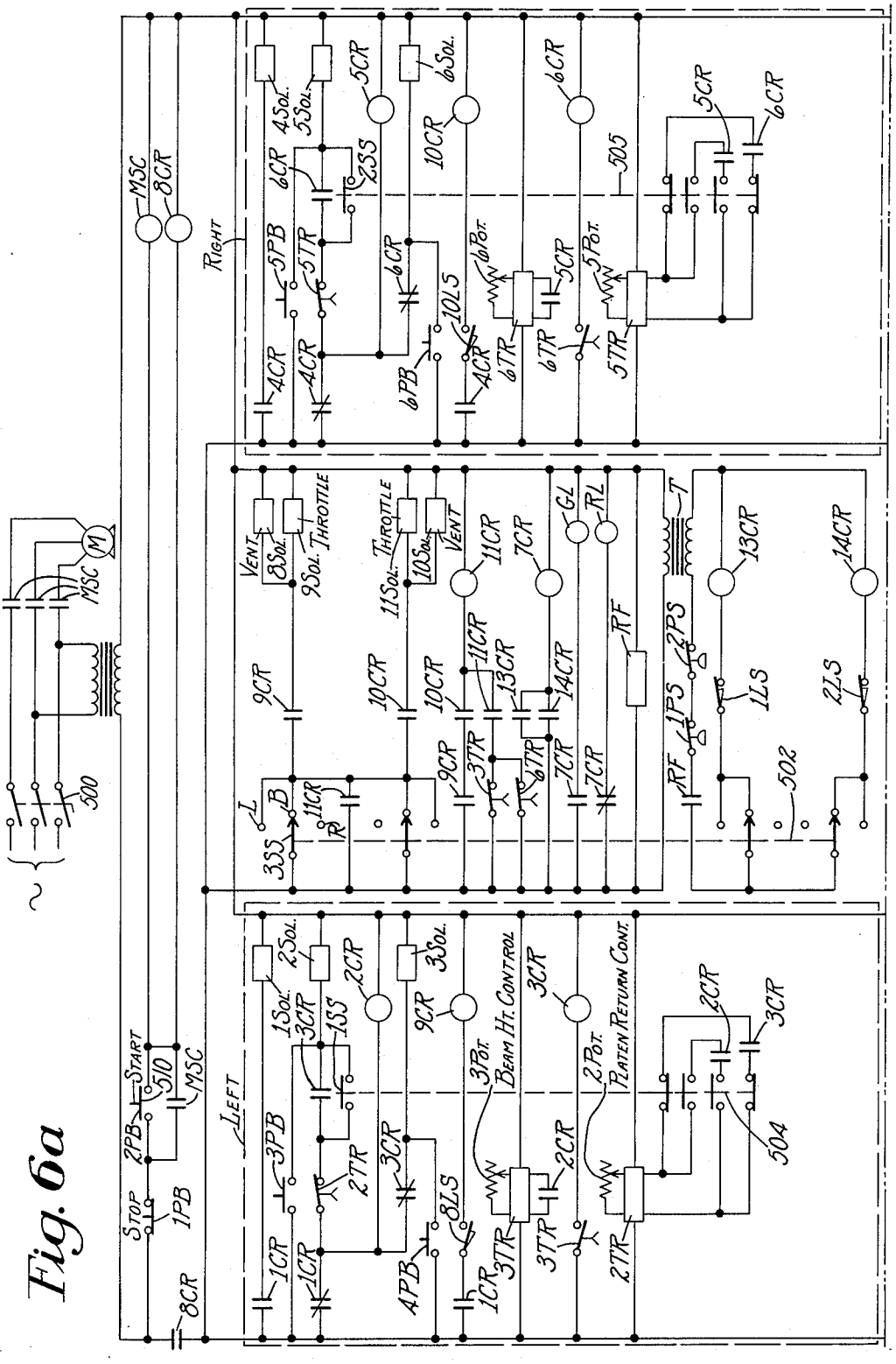


Fig. 6a

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DIE CUTTING PRESS HAVING HYDRAULIC MEANS TO MOVE THE UPPER PLATEN TRANSVERSELY OF THE WORK SUPPORT

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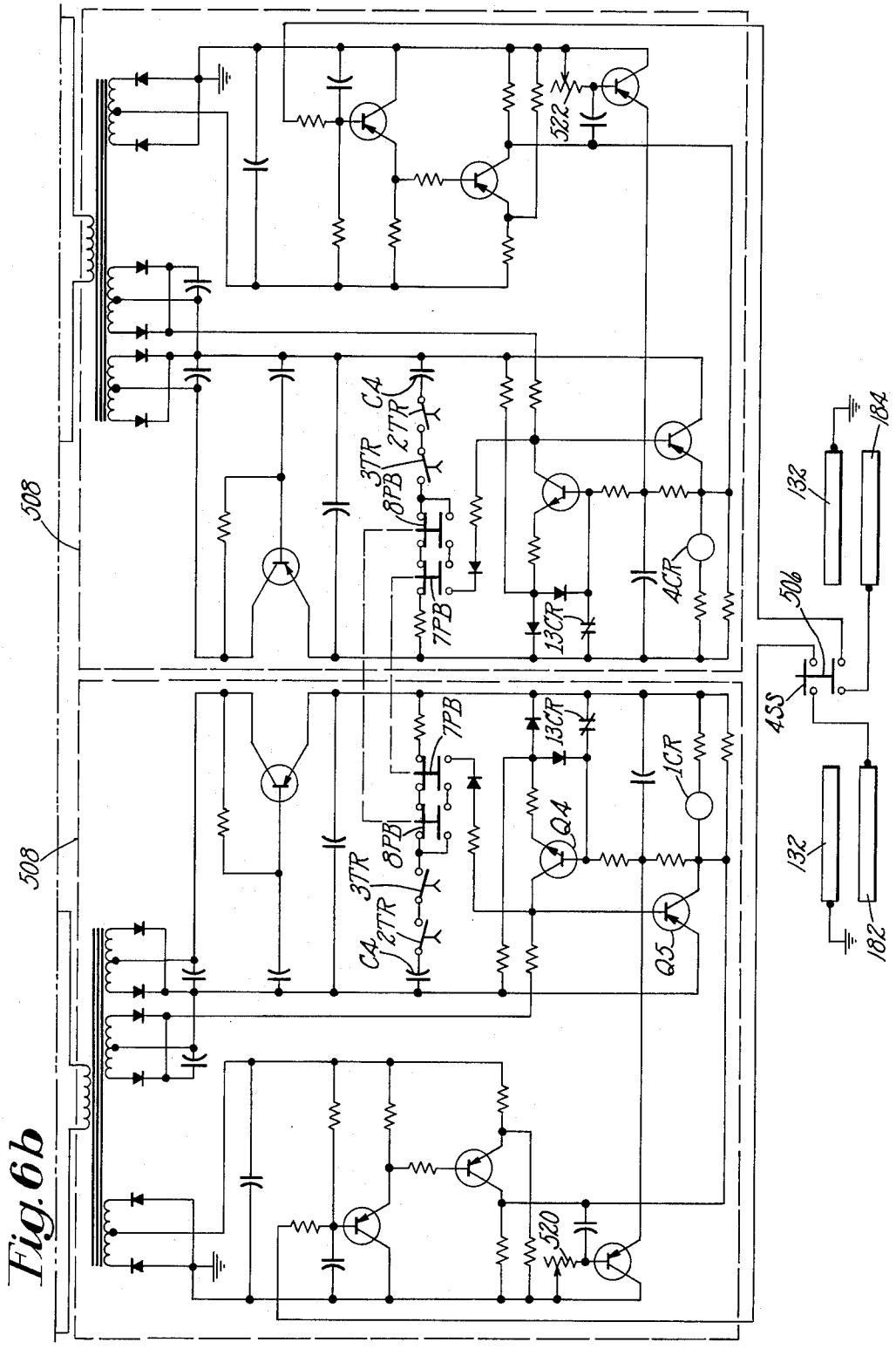


Fig. 6b

United States Patent Office 3,204,506 Patented Sept. 7, 1965

3,204,506

DIE CUTTING PRESS HAVING HYDRAULIC MEANS TO MOVE THE UPPER PLATEN TRANSVERSELY OF THE WORK SUPPORT

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Filed Jan. 9, 1963, Ser. No. 250,288
2 Claims. (Cl. 83—534)

This invention relates to improvements in cutting apparatus and more particularly to improvements in die cutting presses of the heavy duty type.

Heavy duty die cutting presses commonly assume one of two forms, a form in which a single large platen is supported above a work support on four posts attached to its corners and during a cutting stroke is pulled down by these posts, and a form in which a work head comprising a hydraulic motor and a platen smaller than the surface of the work support is supported for bodily movement of translation above the work support.

The requirements for the manipulation of dies and large work pieces on the work support make it highly desirable that the platen of a cutting press not only be able to press the die accurately to the requisite depth for cutting cleanly but also that in its rest position it be disposed so as to hinder neither the view of the work area nor the manipulations of the die and the work piece.

It is accordingly an object of the present invention to provide a cutting press for die cutting which is organized to move in a pressing stroke a platen from, and return it to, a rest position wherein it hinders neither the view nor the manipulations as aforesaid.

To this end, and in accordance with a feature of the present invention, a cutting press is provided comprising a lower platen arranged to support a cutting block on which sheet metal and a superposed cutting die can be positioned, a platen support movable up and down, an upper platen mounted on the support to move forwardly over the lower platen and rearwardly from such forward position, and hydraulic means arranged, on actuation by the operator, to advance the upper platen from a rearward position in which it leaves the work exposed for easy manipulation of the die to a forward position over the lower platen and to lower the platen support to cause the upper platen, in its forward position, to bear upon the cutting die and cut the work, and thereafter to return the platen to its upper and rearward position.

It has been known heretofore to mount a four-post platen for swinging bodily about a horizontal axis beneath the work support so that it will be disposed out of overlapping relation with the work support in its rest position. Such an arrangement, however, has numerous disadvantages in heavy duty cutting in that it is difficult to provide a large platen of adequate stiffness without requiring a massive structure movement of which is slow and clumsy. It will be seen that because the pull down force is applied at the corners or edges of the platen that large bending moments are involved in such a design. In the case of a cutting press having a cutting head, including a platen and a coaxial hydraulic motor, which is movable transversely of the work support, the same problem of moving mass is involved. In both cases the mass slows the effective operating stroke rate of the press where the operator needs to move the platen aside from the cutting support in order to see and manipulate the die on the work piece for his next cut. Additionally, it is difficult in such a structure to devise means for mounting the platen on the frame so that the guide means or bearings by which the platen is mounted for movement in its cutting stroke path will not permit excessive misalinement between the work engaging surfaces of the platen and the work support. A principal reason for this difficulty is that the bearing means itself is mounted for movement along the frame and any freedom of movement of such mounting means is transmitted to the bearing.

Accordingly, it is another object of the present invention to provide a heavy duty cutting press for die cutting which is organized to provide a simple rugged and accurate means for supporting a platen for movement toward and away from the work support together with means for moving the platen transversely of the work engaging surface of the work support to afford free visibility and access of the operator thereto in the rest position of the platen, which press will have a minimum transversely movable mass and which, accordingly, will accommodate a correspondingly high cutting stroke rate.

To this end and in accordance with a feature of the invention, a cutting press is provided in which a platen is supported for heightwise movement by means comprising fixed bearing means attached to the frame above the work support, and slide means movable heightwise in the bearing means and to which the platen is mounted for movement transversely of the work support whereby only the mass of the platen itself is involved in transverse movement. As a further feature, power means carried by the slide means is provided for moving the platen transversely of the work surface.

Another object of the present invention is to provide a die cutting press in which platen bending stresses are minimized and which provides a high degree of flexibility and convenience with respect to the use of the apparatus with dies of different sizes and location on the work support and which will minimize requirements for the manipulation of work pieces on the work support without involving large and massive structures.

To this end and in accordance with another feature of the invention, the illustrative apparatus comprises a plurality of platens supported for movement perpendicular to the work engaging surface of the work support by means including bearing means carried by the frame above the work support, the platens having work engaging surfaces adjacently disposable to overlap different portions of the work engaging surface of the work support and means operable selectively to cause one or more platens to be operated in a cutting stroke. Preferably, the work engaging surfaces of the work support and platens are so proportioned that the platens will overlap substantially the entire engaging surface of the work support.

Another object of the present invention is to provide, in a press organization having a platen mounted for movement perpendicular to the work engaging surface of the work support and for movement transversely of the said surface, means operable sequentially to move the platen into overlapping relation with the said surface, then perpendicularly of said surface toward the work support, means for terminating the movement in response to a predetermined signal and means operative in response to said signal for effecting movement of the platen simultaneously upward from and transversely of the work support. Another object of the present invention is to provide a press organization comprising a plurality of platens individually movable toward and away from the work support, and means for terminating the movement of the platens toward the work support individually in response to the formation of a conductive path between an individual platen and the portion of the work engaging surface of the work support which is overlapped thereby. Other objects and features of the invention will best be understood from the following description taken together with the accompanying drawings in which:

FIG. 1 is a front elevation of apparatus embodying the present invention;

FIG. 2 is a side elevation of the apparatus as shown in FIG. 1 with a portion of a frame member broken away;

FIG. 3 is a section taken on line III—III of FIG. 1;

FIG. 4 is a partial rear elevation on an enlarged scale of the apparatus shown in FIG. 1;

FIG. 5 is a schematic of the hydraulic circuits of the apparatus shown in FIG. 1; and

FIGS. 6*a* and 6*b* together comprise a schematic of the electric control circuits of the said apparatus.

Referring to FIGS. 1, 2, 3 and 4 of the drawings, the press comprises a frame generally designated 10, which is divided into a base section and an upper section. The base comprises lower side members 12, which are connected by transverse channel iron cross member 14. There is a section of channel iron 16 at the top of each of the side members 12, these sections of channel iron having upwardly directed lips 18 between which rest the bottoms of upper side members 20. The side members 20 are held together at their bottoms by tie rods 22 secured on the outside of the side members by nuts 24. The tie rods also pass through and support horizontal sills 26 which extend from the back to the front of the machine for supporting a table 28 carrying a work support or cutting block 180. These sills are also supported by bolts 29 (FIG. 2) which pass through the side members 20 intermediate the tie rods.

The upper side members 20 converge upwardly to parallel edges which are notched to receive head casting locating bars 30. For convenience in assembly, the bars 30 rest on wedges 32 which are secured in place by screws 34 which pass through a downwardly extending boss at the head of the wedges and threadedly engage the side members. The bars 30 are held in place with their upper edges in engagement with the side members 20 at the upper shoulder of the notches by screws 36 which pass through the bars into the side members 20.

The frame so far described carries above the work support 180 left and right platen stations. The stations are symmetrical and only one station will be now described in detail. Each station comprises a platen bearing head casting 40 supported from the locating bars 30 by upper lugs 42 and lower lugs 44 integral with the casting, so that these lugs extend from the castings on the upper and lower sides of the locating bars 30 to receive the main stress of bending and pressure. Here again assembly is facilitated by the employment of wedges 46 between the lugs 42 and the upper edges of the bars 30, the wedges being held in place by screws 48 which threadedly engage the castings 40.

Referring now particularly to FIG. 3 showing the right station, each casting 40 is bored to provide upper and lower cylindrical bearing surfaces 50, 52, respectively. The top of the casting is closed by means of a head casting cover 54 having an air vent or port formed therein. Since the cover 54 transmits the pressure force of the machine, it is held on by twelve heavy bolts 56.

Hydraulic motor means in each casting comprise a piston rod 60 having an upper end portion 62 of reduced diameter extending through a hole in the head casting cover 54. The reduced portion 62 extends through a collar 66 and threadedly engages a nut 68, tightening of which seats the piston rod 60 firmly in the cover 54.

The lower end portion of the piston rod, which portion is also of reduced diameter, extends through a piston 72 carrying upper and lower piston rings 74, 74, through a retaining ring 76 for the lower piston rings and threadedly engages a nut 78. The fluid pressure motor means additionally comprises a cylinder 80 closed at its bottom by a cylinder cover held against the bottom of the cylinder by screws 84, thus clamping an O ring 86 between the cylinder and the cover. The upper end of the cylinder is closed by a cover 90 carrying between a re-entrant portion thereof and a retaining ring 92 a packing ring 94, clamping pressure being applied by screws 95. The upper cylinder cover is surmounted by a platen bearing cylinder

cover 96, both these members being attached to the cylinder 80 by heavy bolts 98, which pass through the two covers and into the cylinder. A platen bearing cylinder 100 which constitutes slide means slidably engaging the surfaces 50 and 52 of the platen bearing head casting 40 which constitutes bearing means, is attached to the platen bearing cylinder cover 96 by screws 102 which pass through the cover adjacent its outer edge and into the cylinder.

The piston rod 60 has an axial passage through which passes a high pressure fluid supply pipe 106 smaller than the axial passage. Weldments at both ends of the piston rod between it and the supply pipe 106 enclose a coaxial outer passage 108 between the pipe and the piston rod 60 which passage communicates through bores 110 with an upper chamber 112 of the fluid pressure motor while the lower end of the pipe 106 opens into a lower chamber 114 of the motor. At the upper end of the pipe 106 there is provided a high pressure fitting 116 for connecting the supply conduit 118 to the pipe. A port 120 through the outer wall of the reduced portion 62 communicates through a channel in the collar 66 with an air supply pipe 122 (FIG. 1) from an accumulator 124 supplied by an electric motor driven compressor 126. During the normal operation of the press, air is maintained in the accumulator 124 under pressure. Since this air communicates through the coaxial outer passage 108 and bores 110 with the upper chamber 112, there is maintained at all times an upwardly directed pressure against the exposed under surface of the cylinder cover 90. This pressure is made sufficient so that in the absence of opposing pressure on the other side of the piston the cylinder 100 together with all attachments thereto, will be held in an upper position limited positively by an internal collar 128 which engages the ring 76 and the cover 82 in the limiting position.

A platen support plate 130 is attached to the cylinder 100 at its bottom by screws 132 which pass through the plate 130 and into the cylinder. A platen 134 having a striking plate 135 providing a work engaging surface is formed with a deep central notch provided with opposed grooves 136 which receive the side edges of the platen support plate 130, and hollow rectangular rails 138 forming an extension of such edges. These rails are secured to the platen support plate by brackets 140, bolts 141 and nut 142 and extend to a rear plate member 143 having a stiffening apron 144. A bracket 146 is secured to the rear plate member 143 by means of screws 148 and nuts 149. A fluid pressure motor cylinder 150 is formed at one end with a boss 152, the boss being apertured and connected to the bracket 146 by means of a pin 154. The piston 156 is slidable within the cylinder 150 and has the piston rod 158 extending through a cylinder head 160 attached to the cylinder 150 by means of screws 162. At the outer end of the piston rod 158 is an end fitting 164 formed with a transverse aperture through which passes a pin 166 which also extends through bosses 168 formed at the forward edge of the platen. The rear end of the cylinder 150 is supplied with pressure fluid through a forward motion pressure conduit 170 and a cylinder fitting 172. The forward end of the cylinder 150 is supplied with fluid through a rear motion pressure conduit 173, an elbow and through plate fitting 174, a tube 176 and a cylinder fitting 178. Accordingly, by applying fluid under pressure to one or the other of the conduits 170 and 173 while exhausting the other, the platen may be caused to move horizontally between a position in which it overlaps a cutting block 180 on the table 28 and a position in which the working surface of the platen is completely out of overlapping relation with the cutting block and the upper surface of the block is completely exposed. A pair of conductive cutting pads 182, 184 are embodied in the block 180 each providing a work engaging surface coextensive with the striking plate 135 of a platen.

Rotation of the platen and its horizontal actuating assembly is prevented by connecting the rear corners of

the platen support plate 130 to a slide member 190 supported for vertical movement between undercut guideways 192 which are attached by screws 194 to an upright plate 196 bolted to the casting 54 by screws 198 and to the rear bar 30 by screws 200. The slide member 190 carries a cross arm 202 attached thereto by a bolt 204. To the ends of the cross arm 202 angle iron links 206 extend to brackets 208 to which they are attached by screws 210 and nuts 212 while the brackets are attached to the plate 130 by screws 214. At the same time a bracket 216 attached at the rear of the platen 134 by screws 218 carries a roll 220 on a transverse pin 222, the roll engaging the cylinder 150 to support it during horizontal movement of the platen.

At the front of the press is mounted limit switch mechanism comprising a pair of normally closed contact switches 230 (1LS and 2LS in FIG. 6*a*), each mounted on an L bracket 232 by screws 234 and also comprises actuating mechanism for each switch 230 including a rod 240, one end of which is attached to the plate 130 by a screw 242 while a guide bracket 244 attached to the front bar 30 by screws 246 supports the rod for relative sliding movement. The rod 240 carries an adjustable actuating collar 248 which may be positioned as desired on the rod for actuating the switch 230 at a predetermined height of the platen work surface.

An electric cable 260 is suspended by insulating arms 262 across the press about six inches in front of the cutting block 180. As hereinafter detailed, the cable is connected to an RF relay to inhibit tripping of a stroke if the operator is too near the cable. Two hand stroke trip switches 7PB and 8PB (FIG. 6*b*) are provided as separate units spaced from the press.

Referring to FIG. 5 of the drawings, pressure fluid from a sump 300 is drawn through an intake conduit 302 by two pumps 304, 306, suitably vane rotary pumps of similar rated capacity, each being connected to an end of the main shaft of a motor M. From the pumps 304, 306 issue two delivery lines 308, 310, respectively. The delivery line 310 is connected to a return line 312 through a branch line 314 and a pilot controlled relief valve 316 having a pilot line 318 connected thereto. The valve 316 has internal relief means (not shown) which operate at a predetermined pressure to open the valve to connect the line 314 to the line 312. This pressure, established at a safe value, is the maximum attainable delivery line pressure. The valve 316 also opens when the delivery line pressure exceeds the pressure in the pilot line 318. An internal bypass passage in the valve 316 admits fluid at a small limited flow rate from the line 314 to the line 318 so that when the latter line is closed the pressure therein is equal to the pressure in the line 314 and the valve remains closed through internal spring bias. Accordingly, up to the maximum pressure, the pressure in the pilot line 318 governs the pressure in the line 310.

The pilot line 318 is connected with the return line 312 through a two-position, two-way solenoid valve 320 controlled by No. 8 solenoid (FIG. 6*a*), a check 322 and a relief valve 324. When the solenoid of the valve 320 is energized, the line 318 is closed and when the solenoid is deenergized, as shown, the maximum pressure in the pilot line 318 is determined by the relief valve 324.

Similarly the delivery line 308 is connected to the line 312 through a branch line 340 and a piloted relief valve 342 having a pilot line 344 connected through a two-position, two-way solenoid valve 346 controlled by No. 10 solenoid (FIG. 6*a*) and a check valve 348, a line 350 and the relief valve 324 which thereby also controls the pilot pressure for the valve 342 when the valve 346 is open. The valve 324 is set to establish in the lines 308, 310, when the valves 320 and 346 are open, working pressures, suitably about 400 p.s.i., for operating the horizontal platen motors.

A normal maximum operating pressure below the maximum established by the valves 316 and 342 in the lines 308, 310 is established by two pressure operated switches 354, 356 which are interconnected with the electric control system to shut off the pump motor and relieve the operating pressure if either switch is operated.

For controlling the supply of fluid to the left horizontal platen motor, a two-stage, four-way, three-position solenoid valve 400 having left and right solenoids 402, 404 (respectively, solenoid No. 1 and solenoid No. 2 in the electric schematic) is connected for controlling the flow of pressure fluid from the line 310 through a check valve 406 and a branch line 408, so that in the illustrative center position with neither one of solenoids 402, 404 energized the fluid is directed from the line 408 to the return line 312. The valve 400 is operated by fluid pressure from the line 310 piloted by the solenoids 402, 404 which pressure, suitably about 65 p.s.i., is provided by the check valve 406.

Energization of the solenoid 402 (solenoid No. 1) shifts the valve element of the valve 400 schematically to the right as seen in FIG. 5; (1) to admit fluid from the line 408 and direct it through the lines 410, 412, a restrictor check 414 and the pressure conduit 170 to the rear end of the motor cylinder 150, and (2) to exhaust fluid from the cylinder 150 forward of the piston 156 through a restrictor check 416 and a line 418 and direct it to the line 312. The platen 132 is thus moved forward at a speed controlled by the restrictor check 414 until it engages the actuating roll of a plunger switch 420 (FIG. 1) mounted on the support plate 130 which switch as hereinafter described provides a "platen forward" signal.

When the solenoid 404 is energized and the valve element moved to the left; (1) pressure fluid is admitted from the line 408 to the forward part of the cylinder 150 through the valve, the line 418, the restrictor check 416 and the conduit 173 while (2) pressure fluid is exhausted from the rear of the cylinder to the line 312 through the conduit 170, the restrictor check 414, the lines 412, 410 and the valve. Accordingly, the platen 132 is caused to be moved rearwardly until the solenoid 404 is deenergized. Instead of locking up the oil in the cylinder 150 upon such closure of the valve 400, which because of the velocity of the platen would cause undue shock to the platen support and moving members, dynamic braking is provided, that is, a part of the kinetic energy of the platen is absorbed within a short braking distance by allowing exhaust of oil to take place through a relief valve 422 and back through the line 408 and the valve 400 to the line 312. It will be seen that this expedient causes some cavitation since the line 418, but with the short braking distance this has proven to be of no operational significance.

The delivery line 310 is connected to the lower chamber 114 of the left beam vertical cylinder 80 through a branch line 428, a piloted throttle valve 430, a cylinder feed line 431, a check valve 432, the supply conduit 118 and the pipe 106 inside the piston rod 60. The valve 430 has a spool piloted at each end through pilot lines 434 and 436, the spool being spring biased into the illustrative closing position wherein it is disposed during the deenergized condition of a three-way solenoid valve 440 which then, as illustrated, exhausts the pilot line 434 to the line 312. When the solenoid (solenoid No. 9, FIG. 6*a*) of the valve 440 is energized, fluid from the line 310 is admitted through a damping restrictor check 444 to the pilot line 434, effecting the opening of the valve 430 to admit fluid from the line 310 to the cylinder 80. The pressures in the line 310 and the line 431 will then be approximately equal in the absence of pressure in the pilot line 436 equal to or greater than that in the line 434. Since the pilot line 436 is connected to the feed line 446 of the opposite or right motor, the feed pressure of this opposite motor appears in the line 436. If this pressure now becomes greater than the pressure in the line 310 because, for example, the right platen is more heavily loaded than the left platen, the spool of the valve 430 will be moved to-

ward the closing position and will finally take a position where obstruction to the flow of pressure fluid equalizes the pressures in the lines 310 and 436. Since under these conditions the right piloted throttle valve 450 will be wide open, the pressures in the lines 308 and 310 will be equalized to equalize pump slip and platen speed in accordance with an invention disclosed and claimed in copending United States application Serial No. 250,362, filed Jan. 9, 1963, now Patent No. 3,154,925, in the name of Raymond A. De Vita.

When the valve 430 is open, the cylinder 80 is driven down against air pressure until the solenoid (solenoid No. 9) of the valve 440 is deenergized. To cause the cylinder 80 and the platen 132 to move upwardly, pressure fluid is exhausted from the cylinder 80 through the line 118 and a solenoid valve 452 to the line 312 when the solenoid (solenoid No. 3) is energized. The operation of the remaining illustrative components will not be described in detail since their function and operation is obvious from the foregoing description. It will be noted, however, that the pressure for operating the right two-stage valve is derived from the line 310 and, accordingly, the right-hand check valve 454 may be set to a low value, suitably 5 p.s.i. to minimize the idling pressure in the line 308.

Referring now to FIGS. 6*a* and 6*b*, these figures taken together constitute a schematic of the electric controls of the press. The schematic is based on symbols such as those used by the J.I.C. standards and is tied into the hydraulic circuit of FIG. 5 by appropriate labels. Accordingly, reference numerals will be used chiefly for identifying the main operating components and assemblies.

The control circuit comprises a disconnect switch 500, a three-position platen selector switch 502 (3SS) for selectively determining whether the right or the left or both platens are operated in a given stroke, a pair of two-position mode selector switches 504, 505 (1SS, 2SS) for selectively determining whether, on the return portion of the stroke, the platen is moved simultaneously or sequentially upward and rearward. Other controls include a stroke termination selector switch 506 for determining whether the movement of each platen toward the work support is terminated by the formation of a conductive path between the platen and the work support or on the other hand by the actuation of a limit switch.

The controls for each platen also comprise a transistorized control circuit 508 of the type disclosed in United States application Serial No. 231,240, filed October 17, 1962 in the name of Robert W. Bradley.

In operation, for employing both platens together in the simultaneous mode with the cutting stroke terminated by actuation of the limit switches 230 (1LS and 2LS), the sequence of operations is as follows:

(1) The operator finds the disconnect switch 500 open.

(2a) The operator closes the disconnect switch, sets the selector switch 3SS to the illustrative position for the use of both platens, positions the switches 1SS and 2SS (504, 505) for simultaneous movement in which their contacts are transferred from the illustrative positions, and momentarily presses the start button 510 (2PB) to energize the motor switch MSC and the coil 8CR which starts the motor and supplies 110 volts to the control circuit. This energy is also supplied to the safety circuit RF, timers 2TR, 3TR, 5TR and 6TR, the two panels 508 and control relays 2CR, 5CR, 13CR and 14CR, energizing solenoid valves No. 3, No. 6, No. 2 and No. 5. Both platens move up and back depending upon their previously set positions.

(2b) The timing relays start to time out. At the end of their respective time settings 3CR is energized and solenoid valves 3, 6, 2 and 5 are deenergized and both platens stop all movement.

(3a) The stroke terminating control 4SS (506) is set in its illustrative position disconnecting the cutting pads from the control panels.

(3b) Having disposed the workpiece and cutting die to his satisfaction, the operator actuates the two-handed trip switches 7PB and 8PB momentarily. This fires the left transistor panel 508 through the firing circuit comprising the capacitor C4 and the now closed contacts 2TR and 3TR so that the power transistor Q5 conducts and energizes 1CR and is locked up by conduction of Q4. Similarly, 4CR in the right panel 508 is energized. This deenergizes 2CR, 5CR and solenoids 1 and 4.

(3c) The platens move forward actuating and closing both platen switches 420 (8LS and 10LS). This energizes 9CR and 10CR which results in 11CR also being energized. Solenoid valves 8, 9, 10 and 11 are energized.

(3d) The platens now move down until the limit switches 230 (1LS and 2LS) are actuated. Actuation of 1LS deenergizes 13CR which closes its contact in the panel 508 to cut off transistors Q4 and Q5 and deenergize 1CR which closes its normally closed contact to energize 2CR and energize solenoid valves 2 and 3. Similarly, the actuation of 2LS operates through 14CR and 4CR to energize 5CR and energize solenoid valves 5 and 6.

(3e) The platens stop their downward movement and start to return to their initial positions. The "platen up" timing relays 3TR and 6TR time out stopping the upward movement. Control relays 13, 14, 3 and 6 are thereby energized and solenoid valves 1, 4, 3 and 6 are deenergized.

(3f) The "platen back" timing relays 2TR and 5TR time out stopping backward movement of the platen, 8LS and 10LS being released as soon as the platen starts to move back and the cycle is completed, solenoid valves 8, 9, 10, 11, 2 and 5 being deenergized.

(4) Where the operator wishes to have the stroke of the platens terminated by conductivity from the platen to its cutting pad, he sets the switch 4SS to connect the cutting pads with the electronic control panels 408. The control sequence is the same as in 3 except the limit switches 230 are actuated and 13CR and 14CR remain energized. The grounding of the pads by contact with die and platen deenergizes 1CR and 4CR as described in detail in the aforesaid Bradley application.

(5a) Where the operator wishes to operate only with the left platen with conductivity control of stroke termination he sets the selector switch 3SS in its upper position as shown in FIG. 6*a*.

(5b) After disposing the workpiece and die to his satisfaction, he actuates the trip switches 7PB and 8PB momentarily energizing 1CR and deenergizing 2CR and energizing solenoid valve No. 1.

(5c) The platen moves forward actuating its limit switch 230 (8LS) energizing 9CR and solenoid valves 8 and 9.

(5d) The platen moves down until the striking plate moves the die through the material and grounds itself on the left-hand cutting pad. This deenergizes 1CR, energizes 2CR and solenoid valves 2 and 3, deenergizing solenoid valve 1.

(5e) The platen stops and starts to return to its initial position, 3TR times out and stops the upward movement of the platen by deenergizing solenoid valve 3.

(5f) As the platen moves back the limit switch 8LS is released, 2TR times out and stops the back movement of the platen by deenergizing the solenoid valves 8, 9 and 2.

(6) Operation of the right side platen only is identical with 5 except that duplicate controls are used.

(7a) When the selector switch 3SS is set on "left," the circuit to 14CR is open preventing the energization of 14CR. This prevents the energization of 4CR and thus the right side is inoperative.

(7b) When the selector switch 3SS is set on "right," the circuit to 13CR is open preventing the energization

of 13CR. This prevents the energization of 1CR and thus the left side is inoperative.

(8) When 1SS is positioned as illustrated for sequential movement of the platen upward and rearward, the control sequence is the same as 5 except that 2TR does not time out until 3TR has timed out. Consequently, the platen will move up to its preset height before the platen starts to move back.

(9) Sequential return of the right platen is similar to 6 except that 5TR does not start timing until 6TR has timed out.

(10) Any one entering the RF field surrounding the RF cable 260 causes the deenergization of the RF relay and the opening of the circuit to 13CR and 14CR. 1CR and/or 4CR are immediately deenergized and the platens return to their initial positions if they were in the cutting half of the cycle. Operation of the trip switches will not initiate a stroke where the RF relay is deenergized.

(11a) Potentiometers 2POT and 3POT govern the length of time delay in 2TR and 3TR, and thus determining the left platen return height and extent of backward movement.

(11b) Potentiometers 5POT and 6POT govern the length of time delay in 5TR and 6TR, thus determining the right platen return height and extent of backward movement.

(12a) Where the cutting stroke is terminated by conductivity to the cutting pads, the depth of die penetration into the left pad is determined by a potentiometer 520 in the left control panel 508 which controls the length of delay before the deenergization of 1CR.

(12b) Similarly the depth of die penetration into the right pad is controlled by a potentiometer 522 which controls the length of delay before the deenergization of 4CR.

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

1. In a die cutting press, in combination, a frame, a work support carried by the frame and having a flat work engaging surface, a platen having a flat work engaging surface, means supporting said platen for movement perpendicular to the work engaging surface of the work

support, said means comprising bearing means carried by the frame above the work support, and slide means connected to the platen, first fluid pressure operated motor means for effecting movement of said platen in said path, means carried by said slide means for supporting said platen for bodily movement transversely of the surface of the work support, second fluid pressure operated motor means carried by said slide means for effecting transverse movement of said platen, means for supplying fluid under pressure to said first and second fluid pressure motor means, and a control means for controlling the admission of fluid to said motor means, said means comprising trip means arranged for actuation to initiate movement of said platen toward the work support, stroke termination means responsive to a predetermined electric signal for terminating the movement of said platen toward the work support, and means acting responsive to said signal for thereafter effecting movement of the platen away from the work support and transversely of the work support.

2. Apparatus as in claim 1 wherein last said means is operative for effecting movement of the platen simultaneously away from the work support and transversely of the work support.

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