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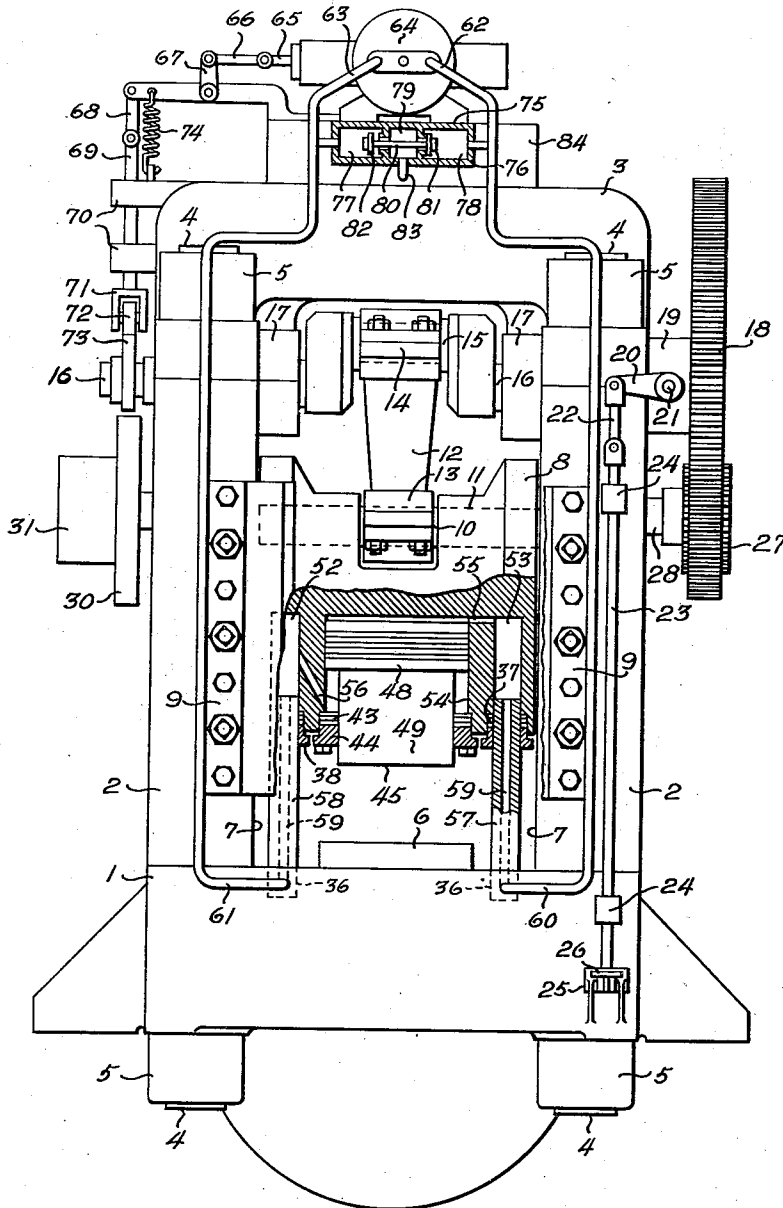
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2,201,443

AUXILIARY HYDRAULIC DEVICE FOR PRESSES

Original Filed Aug. 16, 1934 2 Sheets-Sheet 1

Fig. 1



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Fig. 2

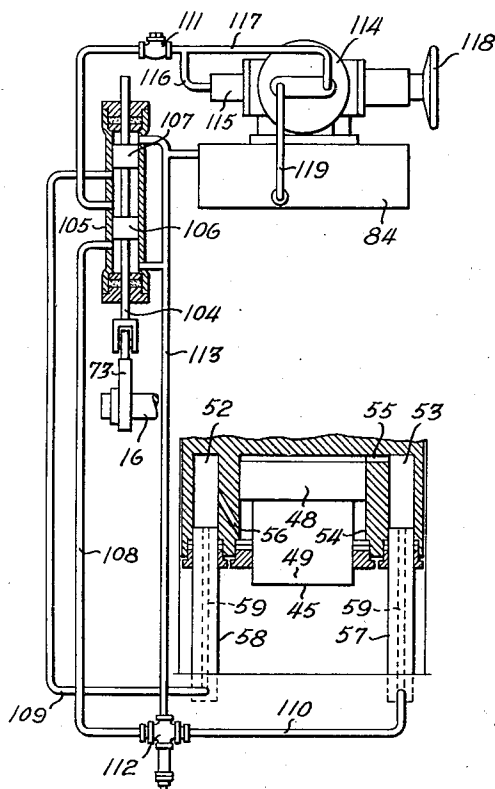
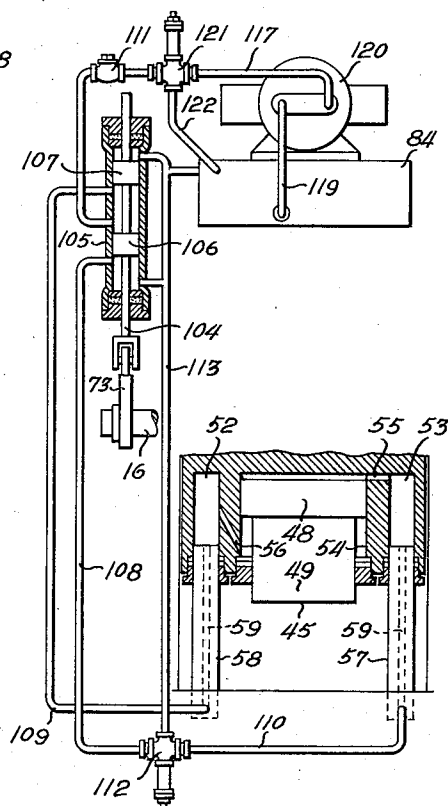


Fig. 3



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AUXILIARY HYDRAULIC DEVICE FOR PRESSES

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Original application August 16, 1934, Serial No. 740,148, now Patent No. 2,128,152, dated August 23, 1938. Divided and this application August 24, 1936, Serial No. 97,578

10 Claims. (Cl. 100—70)

This invention relates to presses, and especially to those having their platens moved by non-hydraulic means.

One object of my invention is to provide a press having a platen moved by any convenient means whether hydraulic or non-hydraulic, and devices for generating fluid pressure operated by the motion of the platen, the fluid pressure thus generated being available for operating various hydraulically-actuated devices and/or providing pressure control.

Another object is to provide a platen-operated hydraulic generating arrangement of the above mentioned type, the auxiliary hydraulic ram being of a double-acting nature, these generator rams being connected to an external hydraulic circuit so that the volume given the auxiliary hydraulic ram by the generator rams is amplified by the effect of this external circuit.

Another object is to provide a press having its platen moved by whatever means, with an auxiliary hydraulic pressing ram connected to an external hydraulic actuating circuit.

This application is a division of my copending application, Ser. No. 740,148, filed August 16, 1934, now matured into Patent No. 2,128,152, dated August 23, 1938.

In the drawings:

Figure 1 is a front elevation, partly in section, of a press having hydraulic generator rams and an auxiliary hydraulic ram with an external hydraulic circuit and connections whereby the action of the rams is amplified.

Figure 2 is a diagrammatic view of a circuit similar to Figure 1, but employing a cam-actuated reversing valve with a variable delivery hydraulic pump.

Figure 3 is a diagrammatic view similar to Figure 2, but employing a cam-actuated reversing valve with a constant delivery hydraulic pump.

Press with single-acting generator rams

Referring to the drawings in detail, Figure 1 shows a press having a base 1 joined by side members 2 to the top member 3 as by the strain rods 4, on which are threaded the nuts 5. Mounted on the base 1 is a work table or bed 6. The side members 2 of the press are equipped with guide portions 7 adapted to receive a press platen 8 for longitudinal reciprocation. The keeping of the platen 8 in engagement with the guide portion 7 is assisted by the retaining plates 9, bolted to the side members 2 of the press.

The press platen 8 may be moved in any convenient manner, such as mechanically or hydraulically.

For purposes of illustration, a gear-driven mechanical crank press is shown, but other types may be used without departing from the scope of my invention. In the form of press shown, the platen 8 is provided with a cross shaft 10, journaled in bearings 11 on the upper portion of the platen 8. Pivotaly engaging the cross shaft 10 of the platen 8 is a connecting rod 12 having a lower bearing 13, surrounding the cross shaft 10. At its upper end, the connecting rod 12 is provided with an upper bearing 14 which surrounds the crank portion 15 of the main drive shaft 16. The latter is journaled in bearings 17, mounted upon the side members 2 of the press.

The driving end of the main drive shaft 16 is provided with a gear 18 for this purpose. The gear 18 is connected by a clutch mechanism within the clutch housing 19 in such a manner that the gear 18 may be connected or disconnected from the main drive shaft 16, as desired. The clutch mechanism within the clutch housing 19 is actuated by the crank arm 20 mounted on the clutch shaft 21, and connected by the link 22 to the pedal rod 23. The latter is reciprocally supported in the bosses 24 attached to one of the side members 2, and is secured at its lower end by the pivotal connection 25 to the foot pedal 26. By depressing or releasing the foot pedal 26, the gear 18 may be made to operatively engage the main drive shaft 16 or rotate loosely upon it. In this manner the foot pedal 26 controls the press to provide for its executing working strokes or for its remaining idle, as may be desired.

The gear 18 is driven by a pinion 27, meshing therewith, and mounted upon the countershaft 28 journaled in bearings attached to the side members 2. The opposite end of the countershaft 28 from the pinion 27 bears a flywheel 30 and a pulley 31, whereby the press may be driven, as from an electric motor belted to this pulley. Accordingly, when the pulley 31 is thus rotated, the gear 18 also rotates loosely upon the main drive shaft 16. When the foot pedal 26 is depressed, the gear 18 drivingly engages the main shaft 16 and causes the crank portion 15 thereof to move in an orbital path. This movement causes the connecting rod 12 to move up and down, carrying with it the platen 8.

The platen 8 in its lower portion is provided with a pair of generator cylinder bores 52 and 53 and an auxiliary pressing cylinder bore 54. These cylinder bores are connected to the cylinder bore 54 by the passages 55 and 56. Reciprocally mounted within the cylinder bores 52 and 53 are hydraulic generator rams 58 and 57, having their

lower ends secured in sockets 36, in the base 1 (Figure 1). Leakage from the generator cylinders 52 and 53 is prevented by the provision of the packings 37 adapted to be compressed by glands 38. Mounted for reciprocation in the auxiliary pressing cylinder bore 54 is the double-acting auxiliary pressing ram 45, having an upper enlarged portion 48 and a lower reduced portion 49. Leakage from the cylinder bore 54 is prevented by the packing 43, engaged by the gland 44, which surrounds the reduced portion 49 of the auxiliary pressing ram 45.

It will be observed that the right-hand cylinder 53 is connected at its upper end by the passage 55 to the space above the enlarged head 48 of the auxiliary hydraulic ram 45, whereas the upper end of the cylinder 52 is connected by the oblique passage 56 to the space below the enlarged head 48. The pistons 57 and 58, however, are provided with hollow longitudinal bores 59, and thus act like telescoping connections, and to some extent like pistons. The bores 59 are connected at their lower ends to the pipes 60 and 61, respectively.

The pipes 60 and 61 lead to the opposite ports 62 and 63, respectively, of a hydraulic pump 64. This hydraulic pump is of the variable delivery type having a flow control rod 65, which when moved in or out, varies the quantity and direction of the pressure fluid passing through the pipes 60 and 61. The flow control rod 65 is connected by the link 66 to one arm of the bell-crank 67, the other arm thereof being connected by the link 68 to the cam push rod 69. The latter is reciprocally mounted in the bearings 70 attached to the upper frame member 3, and has a yoke 71 at its lower end. Mounted in the yoke 71 is a roller 72 which serves as a cam follower engaging the cam 73 mounted upon the main drive shaft 16 of the press. The coil spring 74 urges the cam follower 72 downward against the cam 73 (Figure 1).

Since the spaces on the opposite sides of the enlarged head 48 of the auxiliary pressing ram 45 are of unequal volume, a differential valve 75 is provided to supply or release fluid whenever this is necessary. This differential valve 75 is bridged across the pipes 60 and 61, and consists of a casing 76 having end chambers 77 and 78, together with a middle chamber 79. Reciprocable in channels through the partitions through the various chambers is a valve rod 80, having enlarged heads 81 and 82 at its opposite ends. Connected to the middle chamber 79 is a pipe 83 leading downward into the tank 84, which serves as a reservoir for the working fluid. When the pipes 60 and 61 become suction lines alternately, and require additional fluid, the valve member 80 shifts, allowing fluid to be drawn upward from the tank 84, through the pipe 83 and the middle chamber 79, into either of the end chambers 77 or 78, as may be under suction.

In the operation of the press shown in Figure 1, when the platen 8 moves downwardly (Figure 1), fluid under pressure passes from the hydraulic pump 64, through the pipe 60 and the longitudinal passage 59, into the cylinder 53, thence through the passage 55 into the space above the enlarged head 48 of the auxiliary pressing ram 45, where it exerts its pressure to actuate the auxiliary pressing ram 45. The flow control member 65 and the cam 73 have been adjusted so that the pump 64 will deliver such pressure fluid through the pipe 60 during the downward stroke of the platen 8. While

this is occurring, the fluid in the space below the auxiliary pressing ram head 48 is forced outwardly through the oblique passage 56 into the cylinder bore 52, and passes downwardly through the bore 59 in the plunger 58, returning to the pump 64 by way of the pipe line 61. At the same time, the fluid pressure is somewhat increased by the plunger-like effect of the fixed piston 57 in the moving cylinder 53.

When the platen 8 starts on its upward return stroke, the cam 73 causes the cam follower 72 and cam push rod 69 to descend, under the urge of the spring 74. This causes the flow control rod 65 to be drawn outwardly from the pump 64, reversing the flow of the pressure fluid delivered thereby. The pipe line 61 now becomes the pressure line, and the pressure fluid passing therethrough into the cylinder bore 52 proceeds through the oblique passage 56 into the space beneath the auxiliary pressing ram head 48 and returns to the pump 64 by way of the passage 55, the cylinder bore 53, the passage 59 and the pipe 60.

It will be understood that in place of the hydraulic pump 64, having a flow control rod 65, a non-reversible hydraulic pump may be used in connection with a reversing valve. In this arrangement (Figure 2), the valve rod 104 of the reversing valve 105 is shifted by the action of the cam 73. This moves the valve heads 106 and 107, and reverses, in an obvious manner, the flow of fluid in the lines 108, 109 and 110, leading from the reversing valve 105 to the press. The high pressure check valve 111 prevents a backward flow of fluid, whereas the high pressure regulating valve 112 discharges the fluid from the line 108 into the discharge line 113 leading back to the tank 84. The variable delivery pump 114 is here provided with a servo-cylinder 115 connected by the pilot line 116 to the main pump line 117. This serves to shift the flow control element of the pump 114 when the pressure in the lines 117 and 116 rises beyond the pressure setting of the servo-cylinder 115. The latter is adjusted by the hand wheel 118. The line 119 leads from the opposite side of the pump 114 to the tank 84. The line 110 leads to the forward side of the pressing plunger, the line 109 to the return side thereof.

The arrangement shown in Figure 3 is similar to that shown in Figure 2 and like numerals are used, except that a constant delivery pump 120 is employed in conjunction with a pressure relief valve 121, which discharges its flow into the tank 84 by way of the discharge line 122 when the pressure exceeds the pressure setting of the valve 121.

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 frame, a mechanically movable platen, means for moving said platen, a pressing cylinder and an auxiliary cylinder carried by said platen, a hydraulically-operated double-acting pressing ram reciprocable in said pressing cylinder, and movable relatively thereto a fixedly mounted auxiliary plunger with a fluid conduit therethrough extending between said frame and said auxiliary cylinder, said auxiliary cylinder being hydraulically connected to said pressing cylinder, and means for supplying

fluid under pressure to said conduit additional to the pressure fluid generated by the relative motion between said auxiliary cylinder and said auxiliary plunger whereby to provide an additional pressing effect to said platen.

2. In combination in a press, a mechanically movable platen, means for moving said platen, an auxiliary cylinder carried by said platen for generating fluid pressure in response to the motion of said platen, a hydraulically-actuated double-acting ram pressing plunger movable relatively to said platen and adapted to be operated by the fluid from said platen-operated auxiliary cylinder, and a stationarily mounted auxiliary plunger with a fluid conduit therethrough within said auxiliary cylinder, and a pump connected to supply additional fluid to said conduit to amplify the pressure of fluid generated in said platen-operated auxiliary cylinder in response to the motion of said platen whereby to provide an additional pressing effect to said ram.

3. In combination in a press, a mechanically movable platen, means for moving said platen, a pair of auxiliary pressure-generating cylinders carried by said platen and operated by the motion of said platen, a fixedly mounted tubular plunger in each auxiliary cylinder, a pressing cylinder and a double-acting piston associated with said platen and adapted to be operated in opposite directions by the pressure fluid from said pressure-generating cylinders, and a hydraulic pump connected to the tubular portions of said tubular auxiliary plungers to supply additional pressure fluid to amplify the pressure exerted upon said double-acting piston by the pressure fluid produced by said pressure-generating piston and cylinder assembly.

4. In combination in a press, a mechanically movable platen, means for moving said platen, a pair of auxiliary pressure-generating cylinders carried by said platen and operated by the motion of said platen, a fixedly mounted tubular plunger in each auxiliary cylinder, a pressing cylinder and a double-acting piston associated with said platen and adapted to be operated in opposite directions by the pressure fluid from said pressure-generating cylinders, and a hydraulic pump connected to the tubular portions of said tubular auxiliary plungers to supply additional pressure fluid to amplify the pressure exerted upon said double-acting piston by the pressure fluid produced by said pressure-generating piston and cylinder assembly, said press having means adapted to reverse said pump when said platen reaches the limit of its working stroke.

5. In combination in a press, a mechanically movable platen, means for moving said platen, a pair of auxiliary pressure-generating cylinders carried by said platen and operated by the motion of said platen, a fixedly mounted tubular plunger in each auxiliary cylinder, a pressing cylinder and a double-acting piston associated with said platen and adapted to be operated in opposite directions by the pressure fluid from said pressure-generating cylinders, and a hydraulic pump connected to the tubular portions of said tubular auxiliary plungers to supply additional pressure fluid to amplify the pressure exerted upon said double-acting piston by the pressure fluid produced by said pressure-generating piston and cylinder assembly, said press having timing means adapted to reverse the direction of flow from said pump when said platen reaches the lower limit of its working stroke.

6. In combination in a press, a mechanically movable platen, means for moving said platen, a pair of auxiliary pressure-generating cylinders carried by said platen and operated by the motion of said platen, a fixedly mounted tubular plunger in each auxiliary cylinder, a pressing cylinder and a double-acting piston associated with said platen and adapted to be operated in opposite directions by the pressure fluid from said pressure-generating cylinders, and a hydraulic pump connected to the tubular portions of said tubular auxiliary plungers to supply additional pressure fluid to amplify the pressure exerted upon said double-acting piston by the pressure fluid produced by said pressure-generating piston and cylinder assembly, said press having timing means adapted to reverse the direction of flow from said pump when said platen reaches the lower limit of its working stroke, said timing means being synchronized to be operated in accordance with the motion of said platen.

7. In combination in a press, a mechanically movable platen, a double-acting piston and cylinder assembly adapted to provide additional movement to the movement produced by said platen, a hydraulic pump connected to said piston and cylinder assembly to actuate the same, means responsive to the attainment of a predetermined pressure for reducing the flow from said pump to said assembly, and a pressure-generating piston and cylinder assembly operated by the motion of said platen and adapted to provide pressure fluid above said predetermined pressure.

8. In combination in a press, a mechanically reciprocable platen, a piston and cylinder assembly carried by said platen and moved in opposite directions only hydraulically, a reversible variable delivery hydraulic pump connected to said hydraulic assembly and having a flow-varying reversing member associated therewith, and mechanical means synchronized with the motion of said platen for shifting said flow-varying reversing member to reverse the flow of said pump to said hydraulic assembly when said platen reaches a predetermined position.

9. In combination in a press, a mechanically movable platen, a piston and cylinder assembly carried by said platen and moved in opposite directions only hydraulically, a reversible variable delivery hydraulic pump connected to said hydraulic assembly and having a flow-varying reversing member associated therewith, connecting mechanism attached to said flow-varying member, and means for shifting said connecting mechanism and said flow-varying reversing member to reverse the flow of said pump when said platen reaches a predetermined position.

10. In combination in a press, a mechanically movable platen, means for moving said platen, a double-acting hydraulic piston and cylinder assembly moved in opposite directions only hydraulically associated with said platen to provide additional movement to the mechanical movement of said platen, a constant delivery hydraulic pump connected to said hydraulic assembly, a reversing valve therebetween, means for shifting said reversing valve to reverse the flow of said pump to said hydraulic assembly when said platen reaches a predetermined position, and pressure-responsive valve means responsive to the attainment of a predetermined pressure to divert the flow of said pump from said assembly.

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