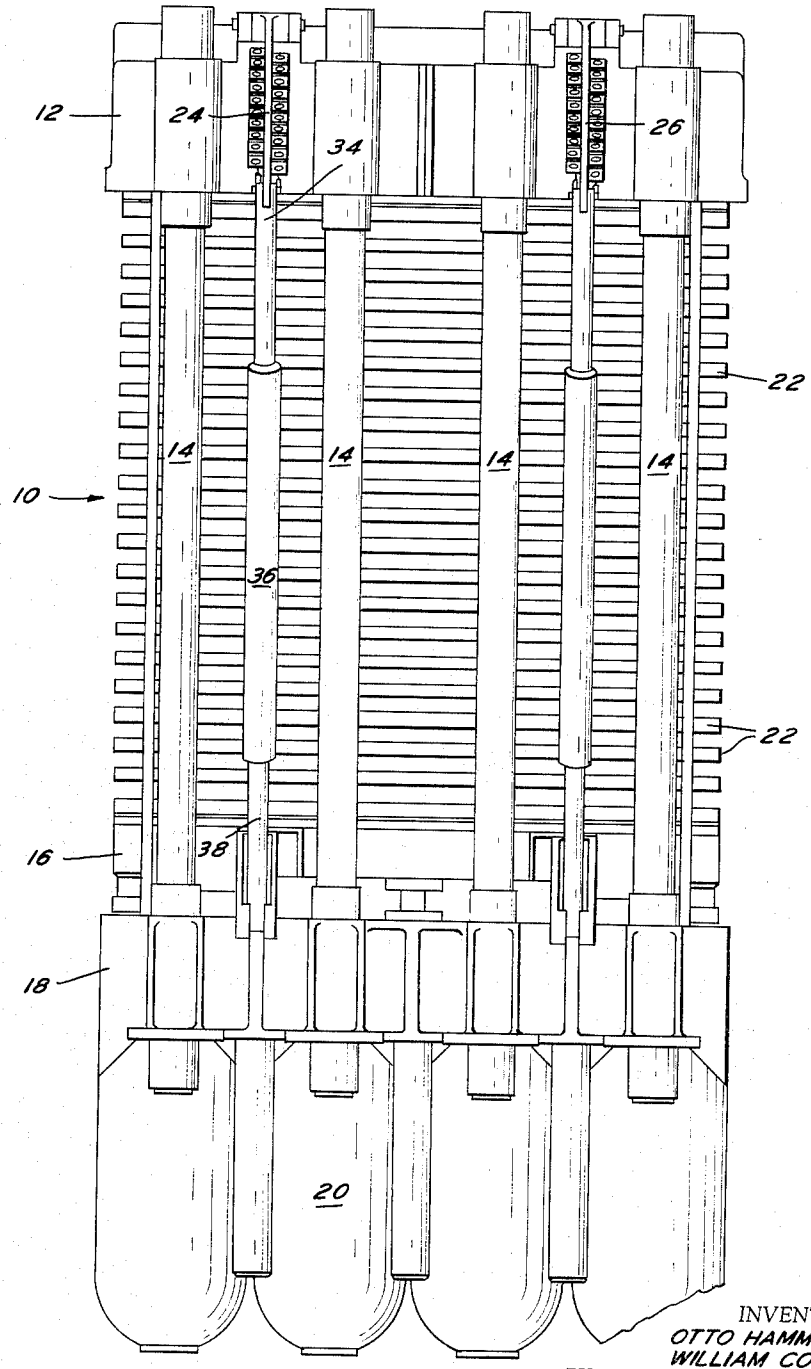
Aug. 24, 1965 O. HAMMON ETAL 3,202,088

MULTIPLATEN PRESS

Filed Nov. 30, 1962

5 Sheets-Sheet 1

FIG. 1



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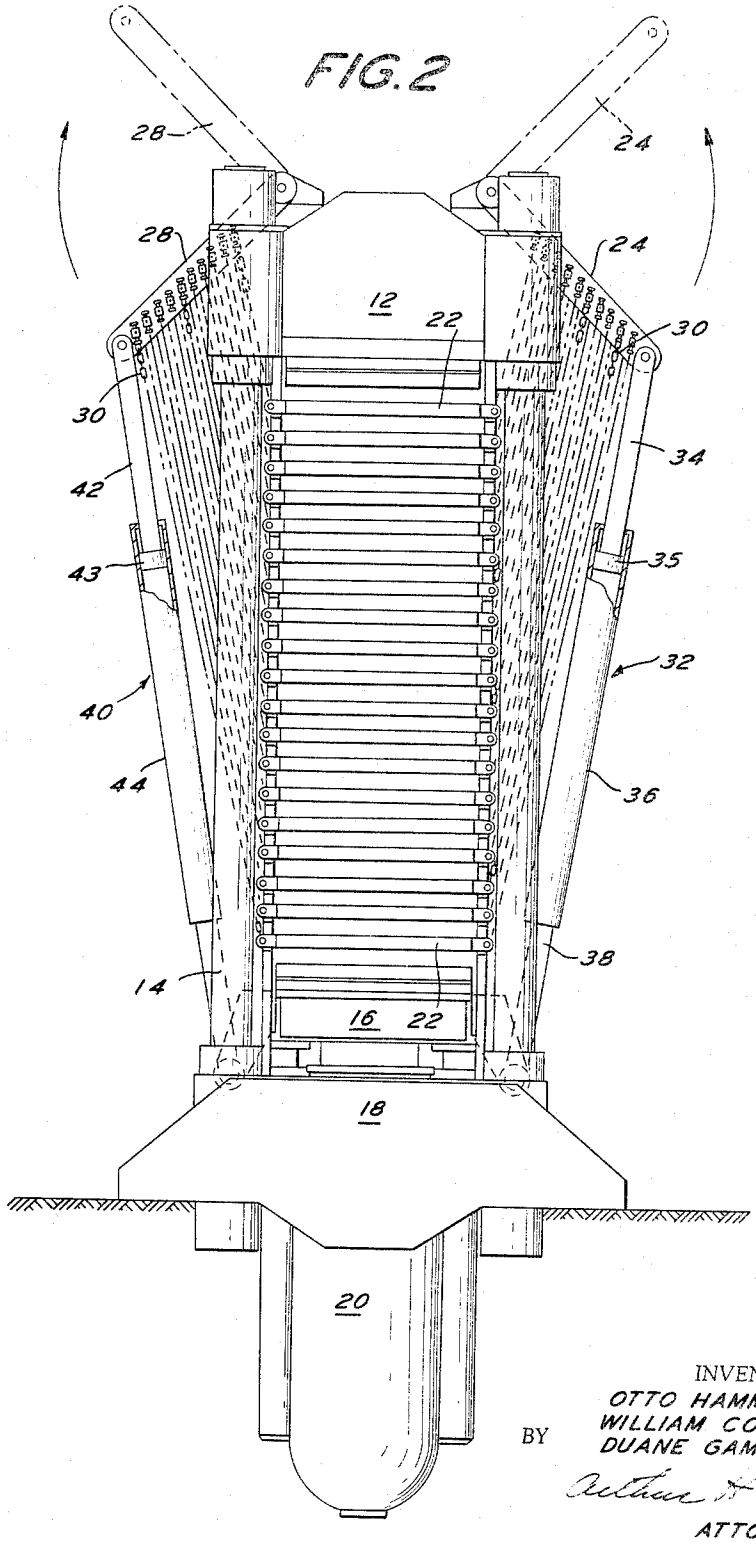
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FIG. 2



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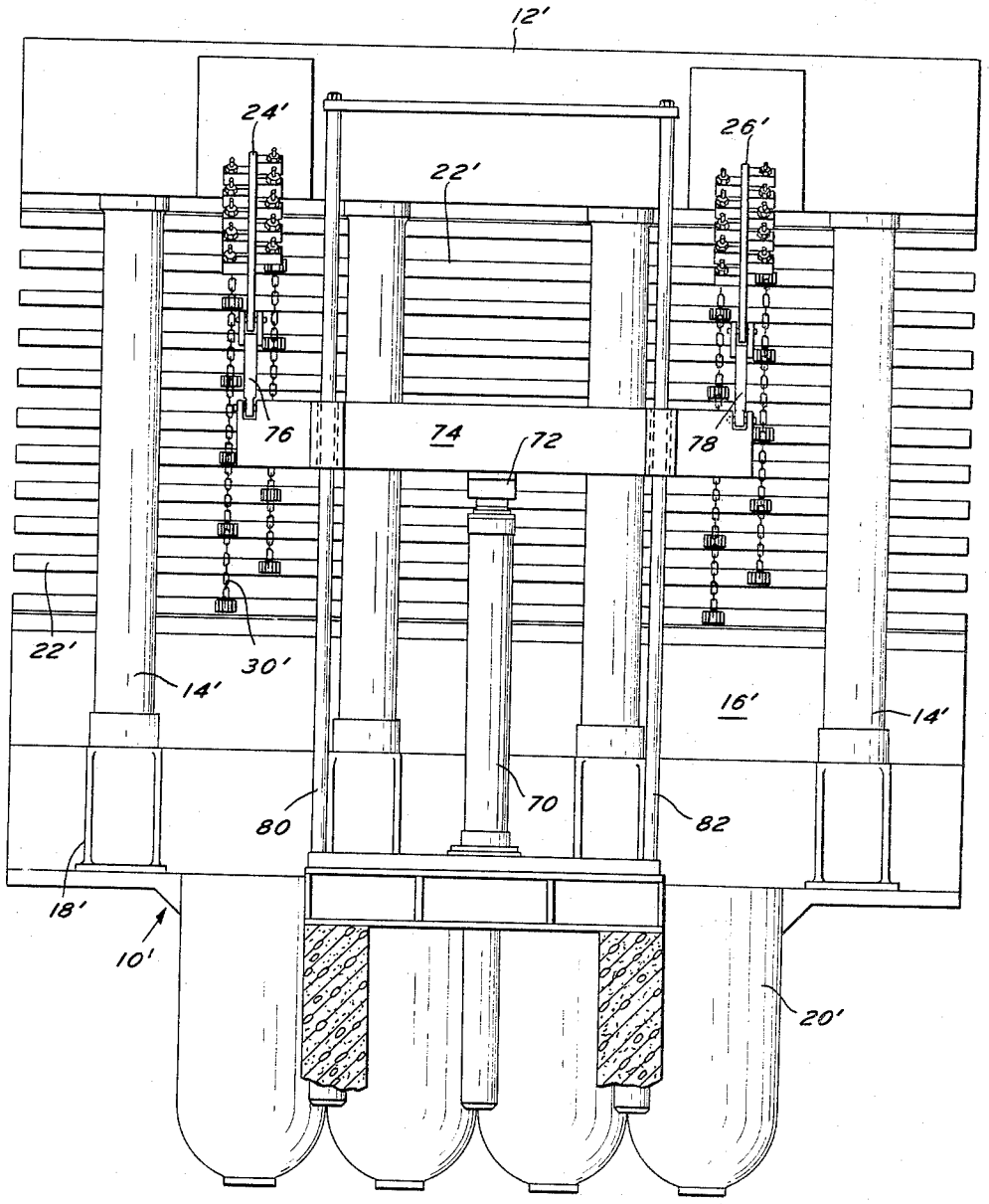


FIG. 3

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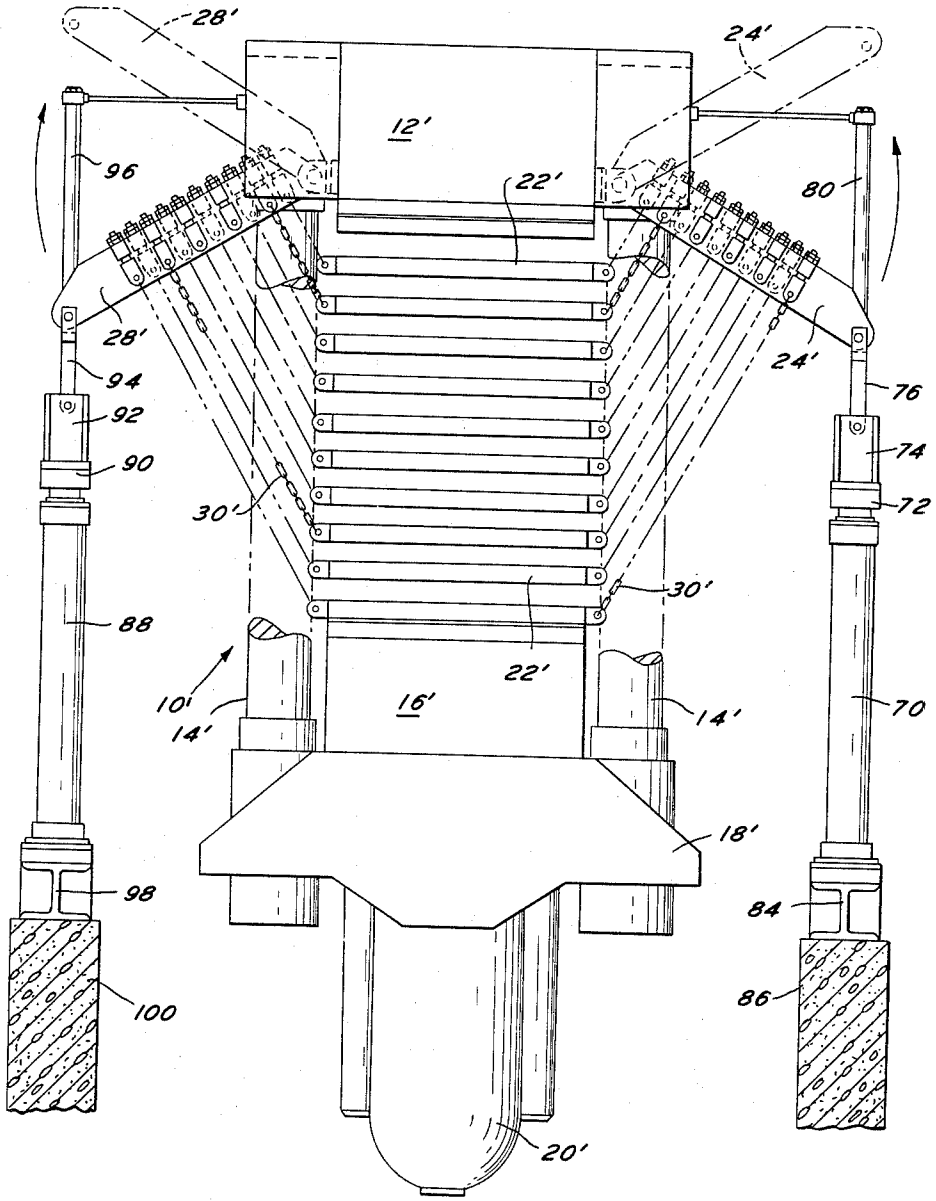


FIG. 4

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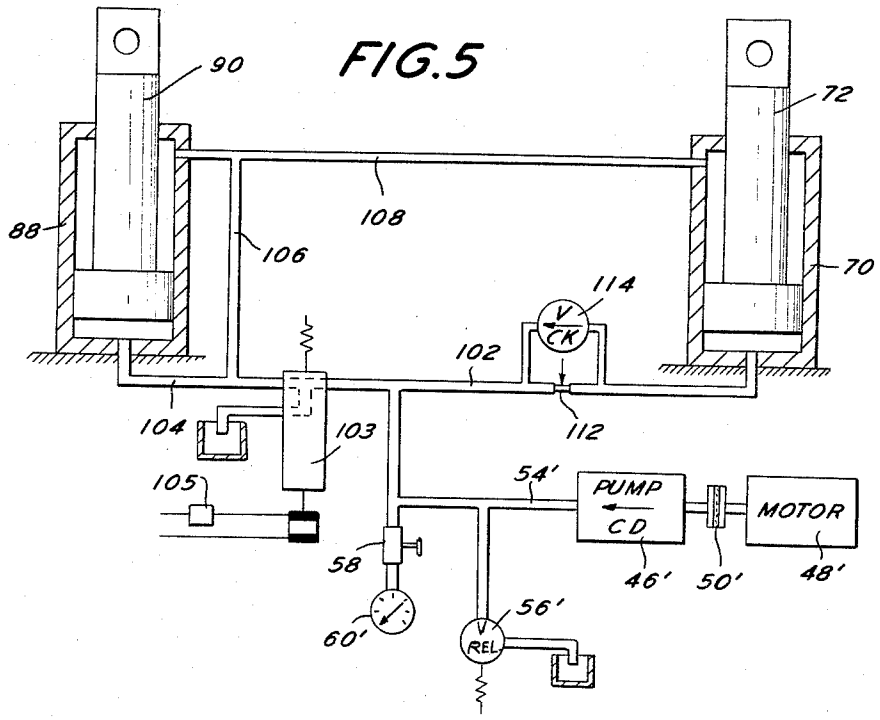
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FIG.5



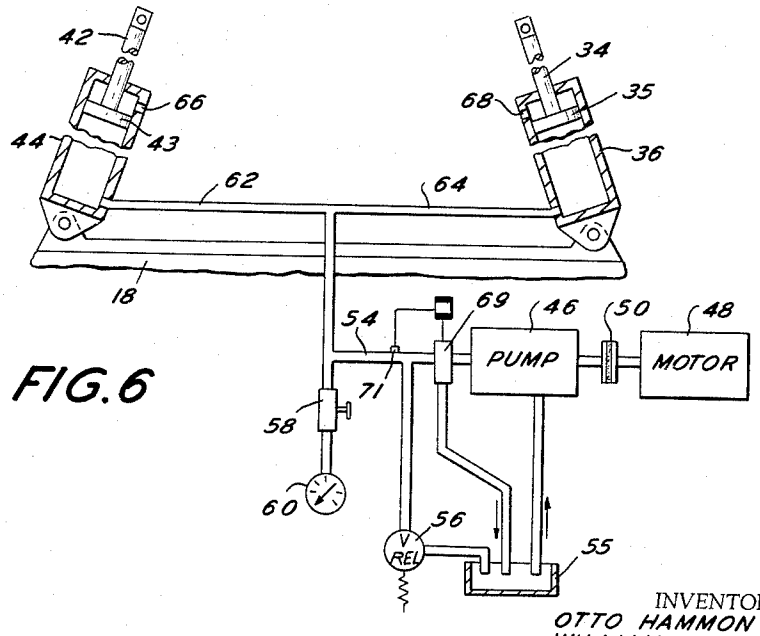


FIG.6

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United States Patent Office 3,202,088
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3,202,088

MULTIPLATEN PRESS

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Filed Nov. 30, 1962, Ser. No. 241,217
8 Claims. (Cl. 100—53)

This invention relates to a multiplaten press, and more particularly, to a multiplaten press wherein a plurality of superimposed platens are caused to move toward and away from each other uniformly.

Multiplaten hot presses of the general type of the present invention have been proposed heretofore. For example, see U.S. Patents 2,586,474; 2,884,032 and 2,913,027. In the prior art, there is insufficient stress control in the rods supporting the platens. In each of the two last mentioned patents, a control setting must be provided for each of the rods, whether it be a separate cylinder or a spring adjustment. Such settings and adjustments are time consuming and difficult to attain if the platens are to move uniformly at the same speed toward and away from each other.

The presses provided heretofore have overlooked the compressive stresses on the platen supporting rods when the product between two juxtaposed platens is thicker than the other products. In accordance with the present invention, lever arms are hydraulically actuated uniformly so that the distance between any two platens changes the same amount during the stroke of the press thereby preventing products between the lower platens from being subjected to extra pressure from the weight of the platens thereabove during the upward stroke of the crosshead.

A fixed hydraulic preload is provided to allow for the weight of the platens and the product plus a safety factor. Hence, even if some platens do not contain a product, the stress on these platen support members, such as the chains as provided by the present invention, cannot substantially rise above that allowed by the preload in the hydraulic system for actuating the lever arms. By using chains as the support member for the platens, the large number of individual hydraulic cylinders as disclosed in Patent 2,913,027 and buckling stresses in support rods are eliminated.

It is an object of the present invention to provide a novel multiplaten hot press.

It is another object of the present invention to provide a multiplaten press wherein lever arms for actuating movement of the platens are responsive to and actuated by a preloaded hydraulic circuit.

It is another object of the present invention to overcome the above mentioned disadvantages of the prior art occasioned by the absence of a product between two adjacent platens.

It is another object of the present invention to provide a versatile and simple hydraulic circuit for causing movement of platens in a multiplaten press.

It is another object of the present invention to provide a multiplaten press requiring a minimum amount of adjusting time while providing for maximum speed.

It is still another object of the present invention to provide a novel multiplaten hot press which is capable of being manufactured more economically than those proposed heretofore by overcoming disadvantages of the prior art.

Other objects will appear hereinafter.

For the purpose of illustrating the invention there is shown in the drawings forms which are presently preferred; it being understood, however, that this invention

is not limited to the precise arrangements and instrumentalities shown.

FIGURE 1 is a side elevation view of one embodiment of the present invention.

FIGURE 2 is an end elevation view of the press illustrated in FIGURE 1.

FIGURE 3 is a side elevation view of another embodiment of the present invention.

FIGURE 4 is an end elevation view of the press shown in FIGURE 3.

FIGURE 5 is a schematic illustration of the hydraulic circuitry for the press illustrated in FIGURES 3 and 4.

FIGURE 6 is a schematic illustration of the hydraulic circuitry for the press illustrated in FIGURES 1 and 2.

Referring to the drawing in detail, wherein like numerals indicate like elements, there is shown in FIGURES 1 and 2 a press designated generally as 10.

The multiplaten hot press 10 includes a stationary headplate 12 supported by a plurality of columns 14. The columns 14 are supported by a base 18. A movable bedplate 16 is guided by the columns 14 and actuated toward and away from the headplate 12 by a plurality of cylinders 20.

A plurality of superimposed platens 22 are supported between the headplate 12 and the bedplate 16. The sheets of material to be compressed will be disposed in the spaces between the platens 22. Each of the platens 22 is supported from above at four points by chains 30. The upper end of the chains 30 are secured to lever arms 24, 26, 28 and a fourth arm not shown. One end of each of the lever arms is pivotably secured to the headplate 12.

Hence, each lever arm will be connected to each platen by one of the chains 30. Each of the lever arms has coupled to its free end a preloaded hydraulic actuator. Hence, arm 24 is provided with a preloaded hydraulic actuator 32. Actuator 32 includes a piston rod 34 having a clevis at its upper end pivotably connected to the free end of lever arm 24.

Piston rod 34 extends into cylinder 36 and terminates at its lowermost end in a piston 35. The cylinder 36 is provided with an extension 38 pivotably connected to the bedplate 16. Each of the remaining lever arms is provided wtih a similar preloaded hydraulic actuator. For purposes of illustration, the actuator for lever arm 28 is designated as 40. The actuator 40 includes a piston rod 42 having a clevis at its upper end pivotably connected to the free end of lever arm 28. The piston rod 42 terminates at its lower end in a piston 43 which is disposed within a cylinder 44. The cylinder 44 is provided with an extension pivotably connected to the bedplate 16.

The hydraulic circuitry which is coupled to the preloaded hydraulic actuator is shown schematically in FIGURE 6. The circuitry includes a pump 46 driven by a motor 48 with a clutch 50 therebetween. The pump 46 has an inlet communicating with a source of motive fluid 55 and an outlet communicating with conduit 54. Conduit 54 is provided with a bypass relief valve 56 which limits the maximum pressure of motive fluid in conduit 54.

The specific pressure in conduit 54 may be ascertained by opening needle valve 58 and viewing gauge 60. Conduit 54 communicates with cylinders 36 and 44 below the pistons disposed therein by means of conduits 62 and 64. The space above the pistons is in communication with atmosphere by way of vents 66 and 68. A solenoid operated three-way pump by-pass valve 69 is provided in conduit 54 to relieve the load on the pump 46 when the pressure of the motive fluid in the cylinders 36 and 44 is within a prescribed range as detected by pressure switch 71.

The operation of the apparatus 10 is as follows:

The apparatus 10 will be in the position illustrated in FIGURES 1 and 2 with the platens 22 spaced from each other. The sheets or layers of material to be pressed are disposed between the platens. Motive fluid is introduced into the cylinders 20 to raise the bedplate 16 upwardly in FIGURES 1 and 2. Pump 46 has previously pressurized conduits 54, 62 and 64 so that the pressure in cylinders 36 and 44 is within a prescribed range as dictated by balancing the moment arm of lever arms 24 and 26 so that the effect of the pressure on pistons 35 and 43 is slightly greater than the moment arm effected by the weight of the platens and the products. The cylinders 36 and 44 and their piston rods move upwardly with the bedplate 16 and act as rigid members.

Let it be assumed that the product between the two lowermost platens is thinner than the others or is absent. As the bedplate 16 moves toward the stationary headplate 12, the pressure of the bedplate 16 cannot be transmitted directly through the hydraulic actuators and the lever arms to the chains of the loaded platens during this free portion of the stroke of the bedplate 16. Any such transmission of pressure through the hydraulic actuators immediately raises the pressure in cylinders 36 and 44 below pistons 35 and 43, respectively. When the pressure in cylinders 36 and 44 exceeds a predetermined amount, valve 56 opens to relieve this pressure and the cylinders move relative to their respective pistons.

Relief valve 56 is set to open at a particular preload on the hydraulic system. When the pressure in the hydraulic system reaches the fixed preload provided to allow for the weight of the platens and the product plus a safety factor, valve 56 opens and the pressure is relieved. Hence, it is not possible to overly stress the chains 30 or cause the piston rods 34 and 42 to buckle.

In the above-mentioned patents, the rotation of the lever arms is directly responsive to movement of the bedplate and, therefore, the platens therein will not accommodate to different thicknesses of products or the absence of a product without providing a complicated means for taking into consideration the buckling stresses on the various rods or lever arms.

In the apparatus 10 of the present invention, the stress on the chains 30 cannot substantially rise above the fixed preload of the hydraulic system if a product is not disposed between two adjacent platens 22. Relief valve 56 is preferably adjustable so as to provide a means for avoiding any excessive pre-squeezing of the products which may be undesirable for reasons of uniformity.

After the products have been subjected to pressure and heat while disposed between the platens, the above operation is reversed with the weight of the platens and products assisting in the opening movement. When the pressure in cylinders 36 and 44 reaches a predetermined range immediately below the setting of valve 56, the switch 71 actuates valve 69 so that the outlet side of pump 46 is in communication with the source of motive fluid. Hence, there will be no load on the pump 46 so long as the pressure in the cylinders does not fall below the predetermined range. Accordingly, the cylinders will remain pressurized at all times. The remaining details relating to the operation of the apparatus 10 are well known to those skilled in the art and need not be described in detail.

In FIGURES 3–5, there is disclosed another embodiment of the present invention designated generally as 10'. The apparatus 10' is identical with the apparatus 10 except as will be made clear hereinafter. Accordingly, like elements are provided with corresponding primed numerals.

As shown more clearly in FIGURES 3 and 4, lever arm 24' is provided with a preloaded hydraulic actuator which includes a stationary cylinder 70 on one side of the apparatus 10'. A piston rod 72 has one end extending into the cylinder 70 and terminates at a piston therein. The other end of piston rod 72 is connected to a transversely extending crossbar 74, as shown more clearly in FIGURE 3. One end of the crossbar 74 is pivotably connected to one end of link 76. The other end of link 76 is pivotably connected to the free end of lever arm 24'. The other end of crossbar 74 is similarly interconnected with lever arm 26' by means of link 78.

Vertical reciprocation of the crossbar 74 is guided by guide rods 80 and 82 which are supported at their lower ends by an I-beam 84 on the floor support 86. The upper end of the guide rods 80 and 82 is spaced from and interconnected with the headplate 12'.

A preloaded hydraulic actuator is provided for the lever arm 28' and the lever arm on the same side of the apparatus 10' as arm 28' but not shown. Such actuator includes a cylinder 88 having a piston rod 90 extending thereinto and terminating at a piston therein. Piston rod 90 is connected to a crossbar 92 corresponding to crossbar 74. Crossbar 92 is interconnected with the free end of lever arm 28' by a link 94 which corresponds to the link 76.

Vertical reciprocation of the crossbar 92 is guided by guide rods 96 which correspond to the rods 80 and 82. The lower end of cylinder 88 is supported by an I-beam 98. Beam 98 is supported by floor support 100. Hence, it will be seen that the apparatus 10' is provided with lever arms which are actuated by a preloaded hydraulic actuator which is separate and apart from the bedplate 16'.

The hydraulic circuitry for the apparatus 10' is shown schematically in FIGURE 5. The circuitry in FIGURE 5 is substantially identical with the circuitry in FIGURE 6 described above. Conduit 54' communicates with the cylinder 70 below the piston therein by way of conduit 102. Conduit 104 communicates cylinder 88 below the piston therein with the cylinders 70 and 88 above the pistons therein by means of conduits 106 and 108.

Pump 46' pumps fluid into cylinder 70 by way of conduits 54' and 102. Conduit 102 has a variable restriction 112 therein to control the rate of flow to cylinder 70. As the piston in cylinder 70 rises, it causes the fluid above the piston to flow into cylinder 88 by way of conduits 106, 108 and 104 to raise the piston in cylinder 88. Valve 103 is closed. The piston rods 72 and 90 rise at the same speed or slightly faster than the speed of bedplate 16'. Motor 48' and the motor for the pumps (not shown) of the cylinders for bedplate 16' may be operated by a single switch.

When the press is closed, pressure switch 105 causes valve 103 to open thereby relieving the pressure in cylinders 70 and 88. The fluid in cylinder 70 may by-pass restriction 112 by flowing through check valve 114. At the same time, a pressure switch (not shown) or switch 105 will cause motor 48' to stop. The platens and the product will be supported by the bedplate 16' when the press is closed.

When the press has closed but sufficient pressure in the cylinders for bedplate 16' has not yet been reached so that switch 105 is actuated, the valve 56' will relieve the pressure load on the pump 48'. Valve 56' will also relieve the pressure in cylinder 70 if it becomes greater than the predetermined amount as determined by the weight of the products, the weight of the platens and the safety factor as described above with respect to apparatus 10. The operation and advantages of apparatus 10' is otherwise the same as that of apparatus 10.

In apparatus 10, the lever arms move in hydraulic synchronization with the bedplate 16. In apparatus 10' the lever arms move in response to hydraulic actuation which is independent of the bedplate 16'. In each embodiment of the present invention, a fixed hydraulic preload is obtained by a relief valve arrangement. The hydraulic preload takes into consideration the weight of the platens, the product, and a safety factor. Hence, even

if some of the platens do not contain a product, the stress on the chains 30 or 30' cannot substantially rise above that allowed by the hydraulic preload in the hydraulic system. As used hereinafter, the terminology "preloaded hydraulic actuator" refers to a hydraulic actuator which is pressurized to an initial preload to overcome the weight of the lever arms, chains, platens, and the product on the platens, plus a safety factor.

The present invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof and, accordingly, reference should be made to the appended claims, rather than to the foregoing specification as indicating the scope of the invention.

We claim:

1. In a press comprising a stationary head plate, a plurality of lever arms each having one end pivotably connected to the head plate, a plurality of spaced platens juxtaposed to one another, said platens being disposed below said head plate and adapted to be moved upwardly toward said head plate, a separate flexible member extending between and directly interconnecting each platen with each arm, at least two preloaded hydraulic actuators each having one end pivotably coupled to a free end portion of one of said arms for rotating said arms in unison to move said platens in unision towards and away from said head plate, each actuator including means to limit the stress to which said members may be subjected as the platens are moved toward and away from said head plate by rotation of said arms, a bed plate below the lowermost of said platens, and a separate hydraulic means for moving said bed plate toward and away from said head plate.

2. A press in accordance with claim 1 wherein said flexible members are chains.

3. A press in accordance with claim 1 wherein said hydraulic actuators each include a hydraulic cylinder, and means pivotably connecting the lower end portion of said cylinder to said bed plate.

4. In a press in accordance with claim 1 wherein said means to limit the stress to which said members may be subjected includes a relief valve for relieving the pressure of each hydraulic actuator.

5. In a press in accordance with claim 1 wherein said preloaded hydraulic actuators include first and second cylinders on opposite sides of said platens, each cylinder having a piston rod associated therewith, each piston rod having one end pivotably coupled to said lever arms and each cylinder having one end portion pivotably coupled to a support.

6. In a press in accordance with claim 1 wherein each actuator includes a cylinder, each cylinder being stationary and having a movable piston, each piston being coupled to one of said lever arms through a cross bar.

7. In a press in accordance with claim 1 wherein each actuator includes a stationary cylinder, a pump coupled to one of said cylinders, a means separate from said pump for controlling the rate of flow of fluid from said pump to said one cylinder.

8. In a press in accordance with claim 7 including conduits coupling the upper end of said one cylinder to the lower end of the other cylinder, and a pressure relief valve coupled to the lower end of each cylinder.

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