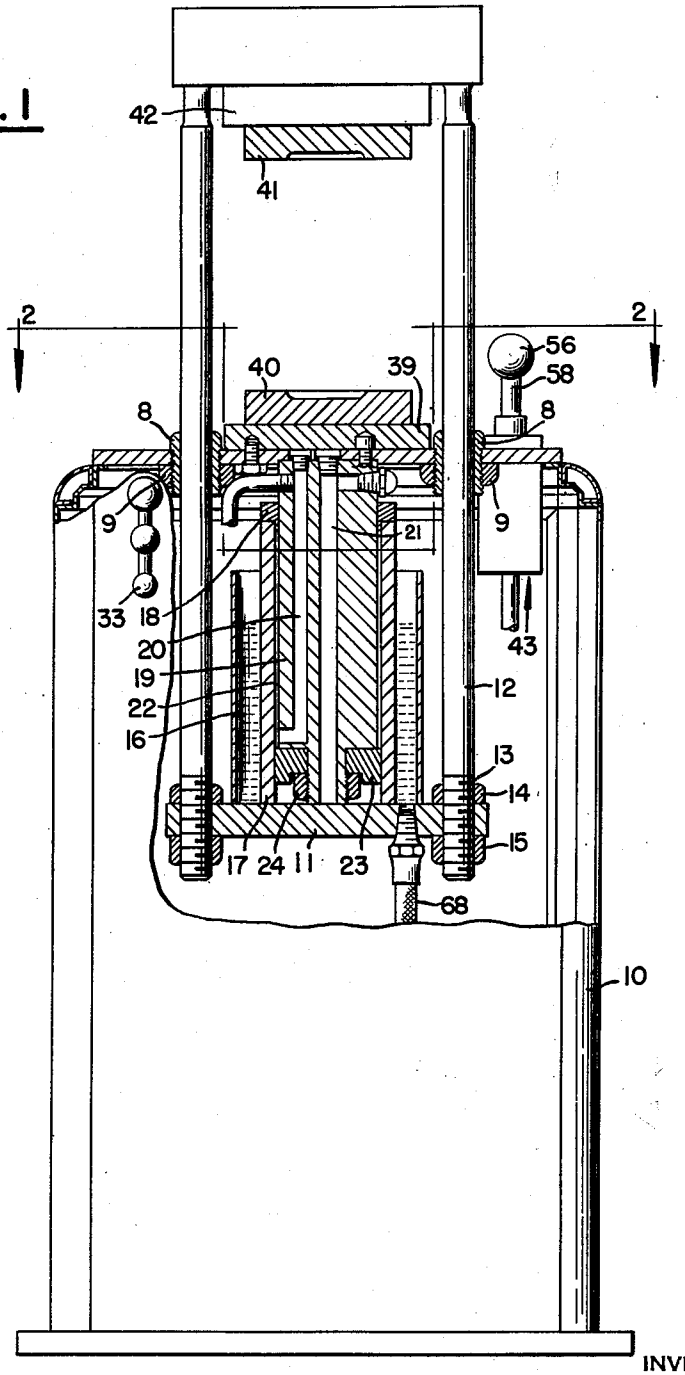
Oct. 21, 1952 H. M. PURCELL 2,614,488

HYDRAULIC PRESS

Filed April 7, 1947 3 Sheets-Sheet 1

FIG. 1



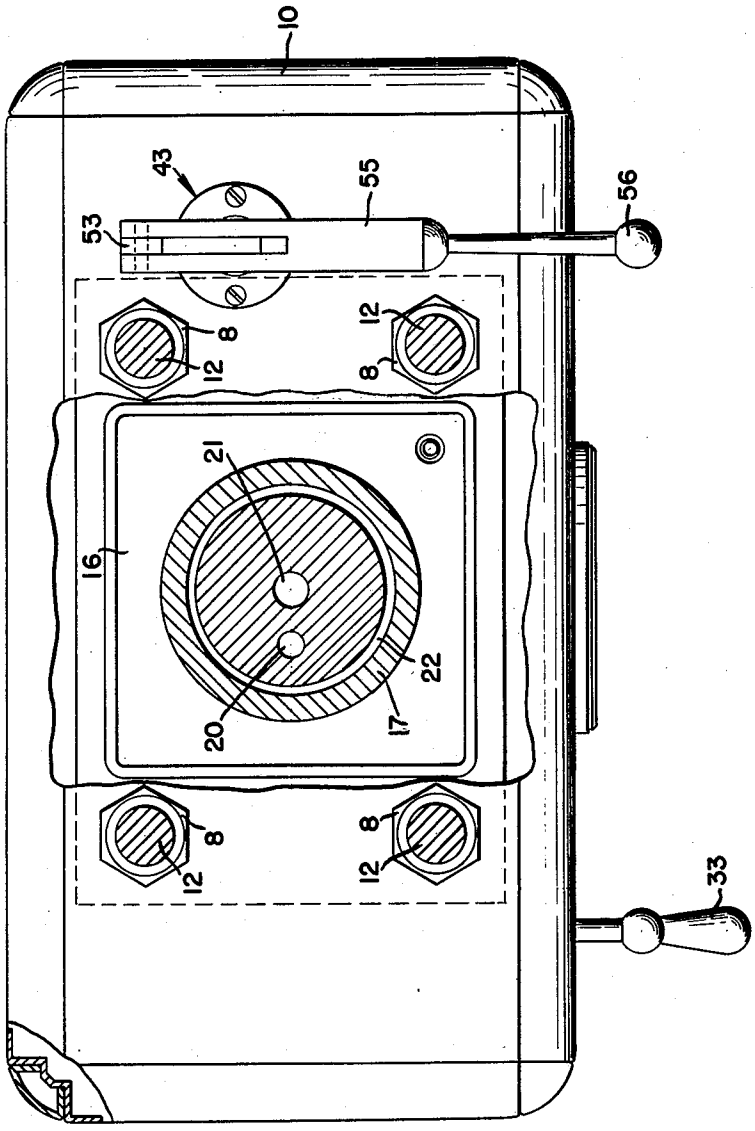
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FIG. 2



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Oct. 21, 1952 H. M. PURCELL 2,614,488

HYDRAULIC PRESS

Filed April 7, 1947. 3 Sheets-Sheet 3

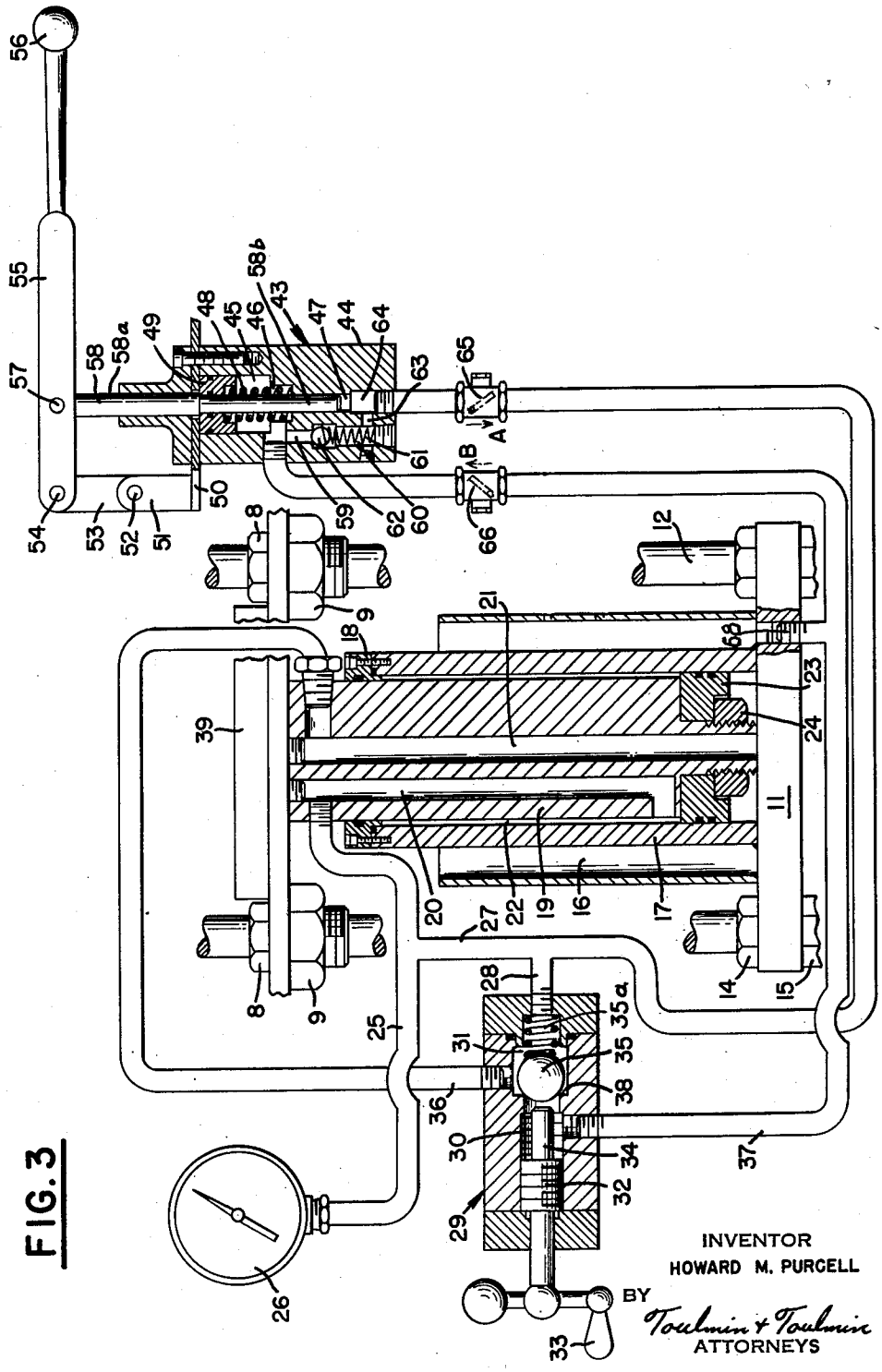


FIG. 3

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HYDRAULIC PRESS

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3 Claims. (Cl. 100—269)

1

The present invention relates to hydraulic presses and, especially, to hydraulic presses for use in small shops, laboratories and the like.

It is an object of this invention to provide a hydraulic press which will be simple in construction, easy to operate and highly economical in operation.

It is a further object to provide a hydraulic press which, while operable manually, will perform a fast working cycle.

A still further object of the invention consists in the provision of a hydraulic press of the above mentioned type which may selectively be operated by a manually operable pump or by a motor driven pump.

It is also an object of this invention to provide a laboratory type press in which the closing speed may be varied and which closes by gravity.

Still another object of this invention is to provide a press construction for laboratory presses and the like in which the reservoirs and hydraulically actuated ram are entirely concealed within the press bed.

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

Figure 1 is a partial transverse section taken through the press of the present invention;

Figure 2 is a section taken along the line 2—2 of Figure 1;

Figure 3 represents a diagrammatic showing of the press according to the invention and of a hydraulic circuit therefor.

General outline

A press constructed according to the present invention consists primarily of a bed having a stationary platen on the top thereof and a movable platen positioned over the stationary platen. Strain rods are connected with the movable platen and extend downwardly into the bed within which they are connected with a platform. The aforementioned platform has mounted thereon a cylinder which opens upwardly to receive a double acting ram secured to the stationary platen and extending downward therefrom. A suitable sealing means is provided around the upward open end of the cylinder so that it forms with the aforementioned ram advancing and retracting means.

A reservoir is also carried by said platform and surrounds the cylinder and opens upwardly so that any leakage of fluid from the cylinder flows by gravity directly into the reservoir.

2

Preferably a manually operated pump is employed for supplying fluid to the cylinder but it will be understood that a motor driven pump could be utilized if desired.

The combined weight of the movable platen, the strain rods, the platform connecting the strain rods at their lower ends, and the cylinder and reservoir combination is such that the press will close by gravity when fluid is released from the upper end of the cylinder. For this purpose a manually operated valve is employed and the said valve is adapted for varying the rate of fluid flow from the upper end of the cylinder thereby to control the closing speed of the press.

Structural arrangement

Referring now to the drawings in detail, the structure described therein comprises a frame generally designated 10 which has movably mounted therein a platfrom 11 which in its turn carries four strain rods. These strain rods 12 may be fastened to the platform 11 in any desired manner. In the particular structure shown in the drawings the strain rods 12 pass through the platform 11 and are provided with a thread 13 engaged by locking nuts 14 and 15. The strain rods 12 are slidably mounted in and guided by bushings 8 threaded into the press frame and secured thereto by lock nuts 9.

Connected in any convenient manner to the platform 11 is a fluid reservoir or tank 16. Spaced from the inner wall of the tank 16 but inside said tank and connected to the platform 11 is a cylinder 17, the bottom of which is formed by the platform 11 while the upper end of the cylinder 17 is formed by a ring 18. Extending through the ring 18 and rigidly connected to the press frame in any convenient manner is a plunger 19 provided with two bores 20 and 21.

The bore 20 communicates with the cylindrical space 22 provided between the cylinder 17 and the outer wall of the plunger 19. The bore 21 extends all the way through the plunger 19 and through a piston 23 which is connected to the plunger 19 and which, either itself prevents connection of the cylindrical space 22 with the bottom of the cylinder 17, or which may be provided with piston rings or the like to prevent such communication. In the construction shown, the piston 23 is firmly held against the plunger 19 by means of a nut 24. The upper end of the bore 20 communicates with a conduit 25 leading to a pressure gauge 26. Also communicating with the conduit 25 is a conduit 27 having a branch line 28 leading to a manually op-

erable three-way valve generally designated 29. The valve 29 comprises a cylindrical portion 30 communicating with a cylindrical portion 31 of a slightly larger diameter than the cylindrical portion 30. The cylindrical portion 30 is provided with a thread engaged by a corresponding thread of an abutment screw 32 which is adapted to be advanced or retracted by means of the handle or crank 33.

The screw 32 has a non-threaded extension 34 adapted to engage a ball 35, which in its turn will close off communication of the branch line 28 with a conduit 36 when the ball is in its right hand end position with regard to Figure 3. In this instance fluid communication is established between the conduit 36 and the conduit 37. On the other hand, when the ball 35 engages the seat 38, fluid communication between the conduits 36 and 37 is prevented while fluid communication is established between the conduit 28 and the conduit 36. The conduit 36 communicates with the upper portion of the bore 21. A spring 35*a* is effective to urge the ball 35 toward the seat 38 for a purpose to become hereinafter more apparent.

Arranged on top of the plunger 19 and connected to the press frame in any convenient manner is a platen 39 adapted to carry a die 40 for cooperation with the die 41, which latter is connected to the movable bed 42 carried by the upper ends of the strain rods 12.

The press according to the present invention is furthermore provided with a hand pump generally designated 43. This pump comprises primarily a casing 44 with a central bore having a larger section 45, a medium section 46 and a smaller section 47. A spring 48 has its lower end resting in the medium section 46, whereas the upper end of the spring 48 engages a piston 49 and continuously urges the latter upwardly against a panel 50. The panel 50 carries a support 51 to which is linked by means of the pivot 52 a link 53. The link 53 is connected by means of a pivot 54 to a lever arm 55 having connected thereto a handle 56 and being linked by pivot 57 to a plunger 58. The plunger 58 has a section 58*a* of a diameter somewhat larger than that of the lower section 58*b*. In this way, downward movement of the plunger 58 will cause the section 58*a* to abut the plunger 49 which latter will then move downwardly against the thrust of the spring 48. The larger section 45 of the central bore in the casing 44 constitutes a cylinder in which the piston 49 acts as a pumping plunger. This cylinder communicates through the conduit 37 with the cylindrical portion 30 of the valve 29. The cylinder 45 also communicates through a channel or duct 59 with a duct 60 housing a spring 61 which continuously urges the valve ball 62 upwardly so as to prevent communication between the duct 59 and the duct 60. The duct 60 communicates through a duct 63 with a port 64 in the pump casing 44, the port 64 communicating in its turn with the conduit 27. Arranged in the conduit 27 is a check valve 65 which opens only in the direction of the arrow A. Similarly, a check valve 66 is provided in the conduit 37 and opens only in the direction of the arrow B. A flexible conduit 68 is connected with the tank at the bottom thereof and leads to the conduit 37 thereby supplying make-up fluid to the lower end of cylinder 17 during the closing of the press, and conveying exhaust fluid to the tank during the opening of the press.

Operation

It may be assumed that the press is open as shown in Figure 1 and that the ball 35 of the valve 29 is in its right hand position to close off communication between the conduits 28 and 37. It will be apparent that at this time the fluid in the upper end of the cylinder 17 is trapped by the ball 35 and the check valve 65 so that the upper platen is stationarily supported.

To bring about a closing movement of the press, the operator actuates the handle 33 to retract the extension 34 from the ball 35. At this time the spring 35*a* and the pressure standing in the upper end of the cylinder 17 act to move the ball 35 leftwardly. The conduit 28 is thereby opened and the weight of the press parts causes the movable platen 42, the strain rods 12, the platform 11 and the cylinder 17 to move downwardly. It will be apparent that the rate of this downward movement can be controlled by the operator by manipulating the handle 33 to position the ball closer or farther from the end of the conduit 28.

During the closing movement of the press by gravity, fluid is supplied to the lower end of the cylinder 17 from the reservoir 16 through the flexible conduit 68, the conduit 37, the valve 29 and the conduit 36 and bore 21.

When the press is completely closed and the movement thereof is halted by engagement of the work piece by the die or mold mounted on the movable platen, the working stroke of the press is instituted by actuation of the pump 43. At this time the handle 33 of the valve 29 is actuated to permit the ball 35 to seat against the seat 38. It will be noted that the spring 35*a* accomplishes this seating.

During the first part of the working stroke of the press at which time the resistance encountered may not be very great, the handle 55 of the pump 43 is oscillated below its Figure 3 position. Downward movements of the handle move the piston 49 and the plunger 58*b* downwardly to expel fluid through the check valve 65 into the conduit 27 whence it is conducted to both ends of the cylinder 17. Inasmuch as the working area in the lower end of the cylinder is greater than that in the upper end, the said cylinder, platform, strain rods and other platen move downwardly.

After the work resistance being encountered by the press increases to the point where it becomes difficult to move the lever 55 a further working movement of the press may be had by oscillating the said lever above its Figure 3 position. This will allow the piston 49 to remain idle and the entire pumping action will be by the plunger 58*b*. The plunger 58*b* being substantially smaller than the combination of plunger 58*b* and piston 49, the pressure which can be developed by the pump is substantially greater. The arrangement thus provides for a variable speed closing stroke, a high speed initial working stroke, and a final high pressure working stroke.

After the work in the press has been completed, the handle 33 is rotated so that the extension 34 moves the ball 35 to the right and again closes off the end of conduit 28. The lower end of the cylinder 17 is now connected directly with the reservoir 16 while the upper end is connected in closed circuit with the pump 43.

Actuation of the pump therefor will cause upward movement of the cylinder 17, platform 11, strain rods 12 and the upper platen 42. When the cylinder 17 has been returned to its Figure 3 position, actuation of the pump 43 is halted and

the press will remain open and ready for a new cycle of operation.

It will be noted that any leakage from the upper end of the cylinder 17 flows directly back to the reservoir 16 and that the reservoir 16 and the ram 19 are completely enclosed within the press bed. This results in a very neat arrangement and one in which the hydraulic fluid and the highly polished hydraulic ram are at all times protected from dirt and other foreign particles.

It will be understood of course that the present invention is by no means limited to the particular construction shown in the drawings and the particular field of employment referred to in the specification, but that this invention also comprises any modifications and applications within the scope of the appended claims.

I claim:

1. A hydraulic press comprising in combination, a stationary plunger, fluid operable cylinder means surrounding said plunger and having opposed unequal pressure areas, first conduit means extending through said plunger and communicating with one of the pressure areas of said cylinder means, second conduit means extending through said plunger and communicating with the opposite pressure area of said cylinder means, pump means, and valve means having connections respectively with said pump means and each of said conduit means and operable selectively to hydraulically connect the opposite pressure areas of said cylinder means simultaneously with said pump means or for connecting only one of the pressure areas of said cylinder means with said pump means.

2. In a hydraulic press, a stationary horizontal platen, a double acting ram connected with and extending downwardly from said stationary platen, a cylinder receiving said ram and forming therewith an upper pressure chamber and a lower pressure chamber having a pressure-responsive face larger than that of said upper pressure chamber, a platform carried at the lower end of said cylinder, a movable platen positioned above said stationary platen, strain rod means connecting said movable platen and said platform, a reservoir surrounding said cylinder and mounted on said platform and opening upwardly to receive fluid leakage from said cylinder, and valve means connected with said upper pressure chamber and movable selectively to entrap fluid therein for stationarily supporting said movable platen above said stationary platen or to exhaust fluid therefrom for permitting the descent by gravity of said movable platen, said valve means being adjustable to control the rate of descent of said movable platen.

3. In a hydraulic press, a horizontal stationary platen, a double acting ram extending downwardly from said stationary platen, a cylinder receiving said ram and defining therewith upper and lower pressure chambers, the lower pressure chamber having a pressure-responsive area greater than that of said upper pressure chamber, a platform carried by said cylinder, strain rod means connected with said platform and extending upwardly through said stationary platen, a movable platen carried by said strain rod means above said stationary platen, a reservoir surrounding said cylinder and mounted on said platform and opening upwardly, pumping means connected to supply fluid under pressure to both of said pressure chambers, and valve means connected between said pressure chambers, said reservoir, and said pumping means, and movable selectively into a first position to connect said upper pressure chamber with said pumping means while connecting said lower pressure chamber with said reservoir, a second position to interconnect said pressure chambers and said reservoir, and a third position to connect both of said pressure chambers with said pumping means.

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