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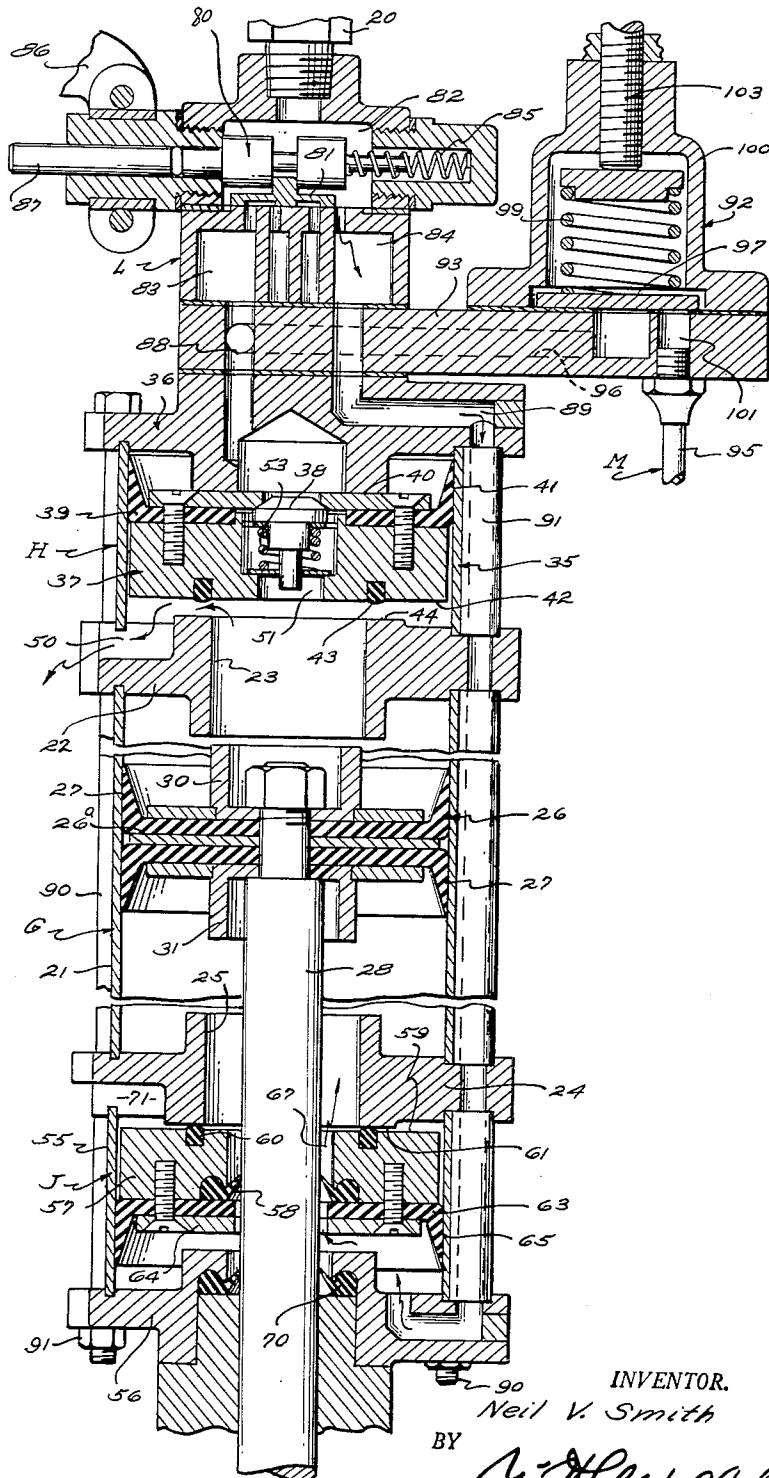
N. V. SMITH
FLUID PRESSURE ACTUATED OPERATOR
FOR AN IMPACT PRESS OR THE LIKE

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2 Sheets-Sheet 2

Fig. 3.



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FLUID PRESSURE ACTUATED OPERATOR FOR AN IMPACT PRESS OR THE LIKE

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This invention is concerned with a fluid pressure actuated operator for an impact press, or the like, and it is a general object of the invention to provide a simplified improved mechanism that is dependable and quick in operation.

The mechanism provided by this invention is applicable to a machine such as an impact press, or the like, and as a preferred embodiment it is shown in such a mechanism and that mechanism is shown as including, generally, a base to carry work, a standard projecting upwardly, a carrier supported by the standard, feed means operating the carrier relative to the standard, a head carried by the carrier to reciprocate relative to the base, and for carrying a tool cooperating with a tool on the base, and a releasable means controlling action of the head. The releasable means preferably involves a latch operated by fluid pressure.

The actuator for the head involves a cylinder carrying a piston, an upper valve mechanism at the upper end of the cylinder admitting fluid under pressure to the upper end of the cylinder and operating as a quick exhaust means, a valve mechanism at the lower end of the cylinder operating to admit fluid thereto, and to rapidly exhaust fluid therefrom, and a selective fluid control receiving operating fluid from a supply line and admitting it either to the upper valve or to the lower valve. A fluid connection extends from the control to the operating cylinder controlling a latch and an adjustable pressure operated valve is provided in the said connection. The upper and lower valves in the ends of the cylinders are similar and each includes a cylindrical case which is, in effect, a continuation of the cylinder, a disc shiftable in the case and in the nature of a slide valve which, when in one position, seats against the head of the cylinder and closes the exhaust and which has an inlet opening thereto controlled by a check valve.

An object of this invention is to provide a mechanism of the general character referred to in which a quick acting valve mechanism is provided at either one or both ends of the cylinder and piston mechanism that serves to actuate the head of the press. The quick acting valve mechanism involves check means admitting fluid under pressure to the cylinder and it involves a disc or piston type member shiftable in a case and serving to open so that fluid exhausts freely and rapidly from the cylinder.

It is another object of this invention to provide a mechanism of the general character referred to involving few simple working parts making the mechanism simple of manufacture and dependable in action.

The various objects and features of my invention will be fully understood from the following detailed description of a typical preferred form and application of the invention, throughout which description reference is made to the accompanying drawings, in which:

Fig. 1 is a side elevation of an impact press having actuating means embodying the present invention, parts of the press and parts of the actuating means being shown in section, and the working parts being shown in an up

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position. Fig. 2 is an enlarged plan section taken substantially as indicated by line 2—2 on Fig. 1, and Fig. 3 is an enlarged vertical sectional view of the actuating mechanism as shown in Fig. 1, showing the parts in a partially operated position such as the parts assume as the mechanism is being returned or operated upwardly.

The actuating mechanism provided by this invention can be used to advantage in connection with various devices or machines. However, since it is particularly practical as applied to an impact press and when applied thereto has a peculiar cooperative relationship therewith, I have shown it in that connection.

The particular mechanism or impact press illustrated in the drawings involves, generally, a base A with a horizontal work carrying top 10. A standard B projects upwardly from the base and a carrier C is carried by the standard to shift vertically thereon. Feed means preferably a screw mechanism D is provided for adjusting the carrier vertically relative to the base. The carrier is provided with vertical ways or guides 11 supporting a head E which slides or operates vertically relative to the base 10. The head is designed to carry work or tools and in the case illustrated die parts are shown carried by the base and head, a die plate 13 being mounted on the base and a punch 14 being carried by the head to cooperate with the plate.

A releasable retaining means F is provided to releasably hold the head E in an elevated position as shown in Fig. 1 and in the particular case illustrated the means F involves a pivoted latch in the form of a bell crank 15 which, when engaged, has a lug 16 holding the head E up by engagement with a shoulder 17. A cylinder and piston mechanism 19 is provided for operating the latch through a connecting rod 18. The particular parts shown are related so that when fluid under pressure is admitted to the lower end of the mechanism 19 the rod 18 is pushed up and the latch released, freeing the head E for downward movement.

The actuating mechanism provided for operating the head preferably includes a cylinder and piston mechanism G vertically disposed and arranged above the head as clearly shown in Fig. 1 of the drawings. An upper valve mechanism H is provided at the upper end of the mechanism G while a lower valve mechanism J is provided at the lower end of the mechanism G. A fluid control L is supplied with actuating fluid from a supply line 20 and selectively controls the admission of operating fluid to the valves H and J. A fluid connection M connects the control L with the cylinder and piston mechanism 19.

The cylinder and piston mechanism G is shown as including a vertically disposed cylinder 21 closed at its upper end by a head 22 having a central passage or opening 23 therethrough and closed at its lower end by a head 24 having a central passage or opening 25 therethrough. A piston 26 operates in the cylinder 21 and is shown as involving an assembly of plates 26^a and oppositely faced cup-shaped packing elements 27. A piston rod 28 is attached to or carries the piston 26 and depends therefrom through the opening 25 in head 24 and extends downwardly a substantial distance to connect to the head E. An upwardly extending projection 30 on the piston 26 fits into the opening 23 in head 22 with clearance so that these parts cooperate to have a retarding or checking action on upward movement of the piston as it reaches the upper end of its stroke, in the event that the piston is moved to a position where it is adjacent the head 22. A downwardly extending projection 31 is provided on the lower side of the piston 26 and fits loosely into opening 25 in head 24 to have a checking or retarding effect upon downward movement of the piston as it approaches the head 24.

The upper valve mechanism H occurs at the upper end

of the mechanism G, preferably immediately above the head 22 and in its preferred form it involves a cylindrical case 35 concentric with cylinder 21, a cap 36 closing the upper end of the case and a sliding element 37 in the nature of a valve disc operating in the case and carrying an inlet check valve 38. The case 35 in the situation illustrated corresponds in size with the cylinder 21 and is, in effect, an upward extension or continuation thereof, these parts being related with the cylinder head 22 between them. The lower end of the case 35 is closed by the cylinder head and as will be later described the case, the cap 36, and the cylinder head 22 are maintained in a rigid assembly. The disc 37 carries a packing element 39 which is held on the upper side of the disc by a plate 40 and which has an upwardly facing cup-shaped portion or lip 41 which seals with the interior of the case 35. The lower side or face 42 of the disc 37 carries an annular seal 43 which engages or cooperates with a valve face 44 on the upper end or side of the head 22 surrounding the opening 23. When the disc 37 is in a down position the seal 43 rests on or cooperates with seat 44 so that opening 23 through the head 22 is closed. An exhaust opening or port 50 is provided so that when the disc 37 is lifted from the head 22 fluid is free to exhaust through the opening 23 and from the lower end portion of the case 35. In the particular structure illustrated the exhaust port 50 is formed in the head 22 and opens radially of the structure, as clearly shown in Fig. 3 of the drawings. Through this arrangement and construction, when the valve disc 35 is up or open, as shown in Fig. 3, there is a large or adequate exhaust passage allowing fluid to freely pass out of the upper end of cylinder 21 in the manner or in the direction indicated by the arrows.

An opening 51 is provided through the disc, preferably centrally thereof, and the inlet valve 38 is provided to control flow through the opening 51. In the case illustrated the valve 38 is of the poppet type and is normally held up or closed, by means of a spring 53, so that the valve is in seated engagement with a seat provided on the plate 40 which is, in effect, a part of the disc retaining the packing element 38 in place. The valve 38 operates so that when pressure is applied above it it opens and admits such pressure through the opening 51 into the upper end of the cylinder 21. However, it will be apparent that when pressure is applied above the disc 37 the disc is initially moved downwardly in the case 35 and when the disc seats on the seat 44 of head 21 then the valve 38 opens, passing the fluid or pressure into the cylinder 21 above piston 26.

The lower valve mechanism J preferably corresponds generally in construction with the valve H above described. In the particular case illustrated the valve mechanism J involves, generally, a case 55, a cap 56, a valve disc 57 operating in the case, and an inlet check valve 58 carried by the disc. The piston rod 28 extends through the valve mechanism J and in the preferred arrangement the case 55, which is cylindrical, corresponds in size with and is also concentric with the cylinder 21 so that it is, in effect, an extension or continuation thereof. The upper end of case 55 is closed by the head 24 at the lower end of cylinder 21 while the lower end of the case 55 is closed by the head 56.

The disc 57 is a valve-like element that reciprocates in the case and is provided with an upper face 59 carrying an annular sealing member 60 which cooperates with and seals against a downwardly facing valve seat 61 provided on the lower side of head 24 surrounding the opening 25 through the head. A packing or sealing member 63 is carried by the disc 57 and is held thereon by a plate 64. The member 63 has a downwardly facing lip or cup part 65 sealing with the interior of the case 55. The disc 57 and the parts related thereto as a part thereof, are provided with a central opening 67 fitting or passing the rod 28 with substantial clearance. The check valve 58 is a leaf type valve annular in form, and is carried by the

disc 57 to control passage therethrough so that fluid can flow only upwardly through the passage.

The cap 56 slidably passes the rod 28 and is preferably provided with a suitable seal 70 preventing downward passage of fluid around the rod. With the mechanism just described the disc 57 is normally in a down position in the case 55 so that pressure or fluid in the cylinder 21 below the piston 26 is free to exhaust through the opening 25 and the exhaust port 71 provided in the head 24. When fluid pressure is admitted beneath the disc 57 the disc moves up and seals with the seat 61 whereupon the valve 58 opens and fluid under pressure is admitted into the lower end of cylinder 21 causing piston 26 to move upwardly in the cylinder.

The fluid control L is operable to selectively admit fluid under pressure from a fluid supply line 20 to the valve mechanisms H and J. In the particular case illustrated the control L includes a valve 80 and suitable fluid conducting ports or ducts that connect the valve with the mechanisms H and J. The valve 80 as shown in Fig. 3 of the drawings is a slide valve including a reciprocating valve element 81 controlling passage of fluid under pressure from a chest 82 to distributing ports 83 and 84. When the valve 81 is in one position fluid is supplied to port 84 as shown in Fig. 3. When it is in the other position port 84 is cut off and fluid is admitted to port 83. The valve is normally held in the position shown by a spring 85 and is manually operated by a lever 86 that actuates a valve stem 87. The port 83 is in communication with the upper end of case 35 through suitable ports 88 while the port 84 is in communication with the lower end of case 55 through suitable ports 89 and ducts 90. In the case illustrated there are three ducts 90 assembled with the cylinder 21, cylinder heads 22 and 24, cases 35 and 55 and caps 36 and 56. Suitable tie rods 90 operated by nuts 91 tie these various elements together in a unit or rigid assembly.

The fluid connection M as shown in the drawings involves an adjustable pressure actuated valve 92 supplied with fluid under pressure from port 83 through a ported plate or insert 93, and passing fluid under pressure to a duct 95 which extends to the lower end of the cylinder and piston mechanism 19. The insert 93 is shown coupled between the member provided with the ports 83 and 84 and the cap 36 of valve mechanism H and a port 96 provided in the insert extends from port 88 to the valve 92 where it admits pressure under a valve plate 97. The valve plate is normally held down or closed by a spring 99 carried in a valve case 100. When the pressure under the plate 97 is sufficient to lift the plate fluid under pressure is admitted to a port 101 to which the duct 95 is connected. A suitable adjusting screw 103 is provided to vary the pressure exerted by a spring 99 so that the mechanism can be set so that the valve disc 97 lifts or opens when a predetermined pressure develops beneath it.

In the preferred arrangement and proportioning of parts the piston 26 is well below the upper cylinder head 21 when in its upper position as shown in Fig. 1. When the valve 80 is operated to admit fluid under pressure to the upper end of valve mechanism H the disc 37 is moved downwardly closing the exhaust from the mechanism H and the valve 38 opens, admitting fluid under pressure into the upper end of cylinder 21. A substantial amount of fluid will fill into or build up in the cylinder 21 above the piston 26 and when pressure finally develops sufficient to cause the valve 97 to lift the mechanism 19 operates, releasing the latch 15. When the latch 15 is released fluid under pressure in the cylinder 21 above the piston 26 operates or drives the piston 26 downwardly with great force or rapidly, causing the head E to operate the tools or dies in the desired manner. Under ordinary conditions the mechanism as above described will be operated by gas or air. However, it will be apparent that the mechanism can be operated by

liquid, but expansive action causing rapid operation or driving of the parts cannot be gained with liquid as it can with gas or air. In the form of the invention above described quick exhausting mechanisms H and J are shown at both ends of the cylinder mechanism G, whereas it will be apparent that such mechanisms will be employed at only one end or at either end, as circumstances require.

Having described only a typical preferred form and application of my invention, I do not wish to be limited or restricted to the specific details herein set forth, but wish to reserve to myself any variations or modifications that may appear to those skilled in the art and fall within the scope of the following claims.

Having described my invention, I claim:

1. An actuating mechanism of the character described including, a cylinder, heads at the ends of the cylinder one with an opening therethrough, a piston operating in the cylinder, a rod attached to the piston and projecting through the opening in said head, and a valve mechanism including, a cylindrical case abutting and projecting from said head, an element reciprocating in the case into and out of engagement with said head and closing the opening in said head when engaged with said head, said element having an opening therethrough passing the rod, and a check valve closing the opening in said element against flow in one direction therethrough.

2. An actuating mechanism of the character described including, a cylinder, heads at the ends of the cylinder, one having an opening therethrough and an annular seat around the opening, a piston operating in the cylinder, a rod extending from the piston, and a valve mechanism including, a cylindrical case projecting from said head and cooperating with said head defining a chamber adjoining said head and open to the exterior of the mechanism, an element reciprocating in said case and engageable with the seat to close the opening in said head, the element having an opening therethrough passing the rod, and a check valve operating to pass fluid through the opening in said element and into the cylinder through the opening in said head.

3. An actuating mechanism of the character described including, a cylinder, heads at the ends of the cylinder each with an opening therethrough, a piston operating in the cylinder, a rod extending from the piston through the opening in one of the heads, and a valve mechanism at each head and including, a cylindrical case projecting from the head, a cap closing the case, an element operating in the case and cooperating with the head to close the opening therethrough, the element having an opening therethrough, and a check valve controlling flow through said opening in said element.

4. An actuating mechanism of the character described including, a cylinder, heads at the ends of the cylinder each with an opening therethrough, a piston operating in the cylinder, a rod extending from the piston through the opening in one of the heads, a valve mechanism at each head and including, a cylindrical case supported by and projecting from the head, a cap closing the case, an element operating in the case and cooperating with the head supporting the case to close the opening therethrough, the element having an opening therethrough, a check valve controlling flow through the opening in said element, and a fluid control receiving fluid under pressure and supplying it to one or the other of the valve mechanisms to

operate the element therein to closed position and then flow past the check valve of such mechanism to the cylinder.

5. An actuating mechanism of the character described including, a cylinder, heads at the ends of the cylinder each with an opening therethrough, a piston operating in the cylinder, a rod extending from the piston through the opening in one of the heads, a valve mechanism at each head and including, a cylindrical case projecting from the head, a cap closing the case, an element operating in the case and cooperating with the head from which the case projects to close the opening therethrough, the element having an opening therethrough, a check valve controlling flow through the opening in said element, and a fluid control receiving fluid under pressure and supplying it to one or the other of the valve mechanisms to operate the element therein to closed position and then flow past the check valve to the cylinder, the control including a manually operable two way distributing valve.

6. An actuating mechanism of the character described including, a cylinder, heads at the ends of the cylinder each with an opening therethrough, a piston operating in the cylinder, a rod extending from the piston through the opening in one of the heads, a valve mechanism at each head and including, a cylindrical case projecting from the head, a cap closing the case, an element operating in the case and cooperating with the head from which the case projects to close the opening therethrough, the element having an opening therethrough, and a check valve controlling flow through the opening in said element, and a single means holding the caps, cases, heads and cylinder rigidly together.

7. An actuating mechanism of the character described including, an elongate cylinder, heads at the ends of the cylinder one with an opening therethrough, a piston operating in the cylinder, a rod attached to the piston and projecting through the other head, and a valve mechanism in communication with said opening and including, a cylindrical case abutting and projecting outwardly from the first mentioned head in alignment with the cylinder, a disc shaped element freely slidable in the case to move into and out of engagement with said head and closing the opening in said head when engaged with said head, said element being operated into engagement with the head by fluid pressure entering the outer end of the case through a control valve and having an opening therethrough, and a spring biased check valve closing the opening in said element against flow outwardly therethrough.

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