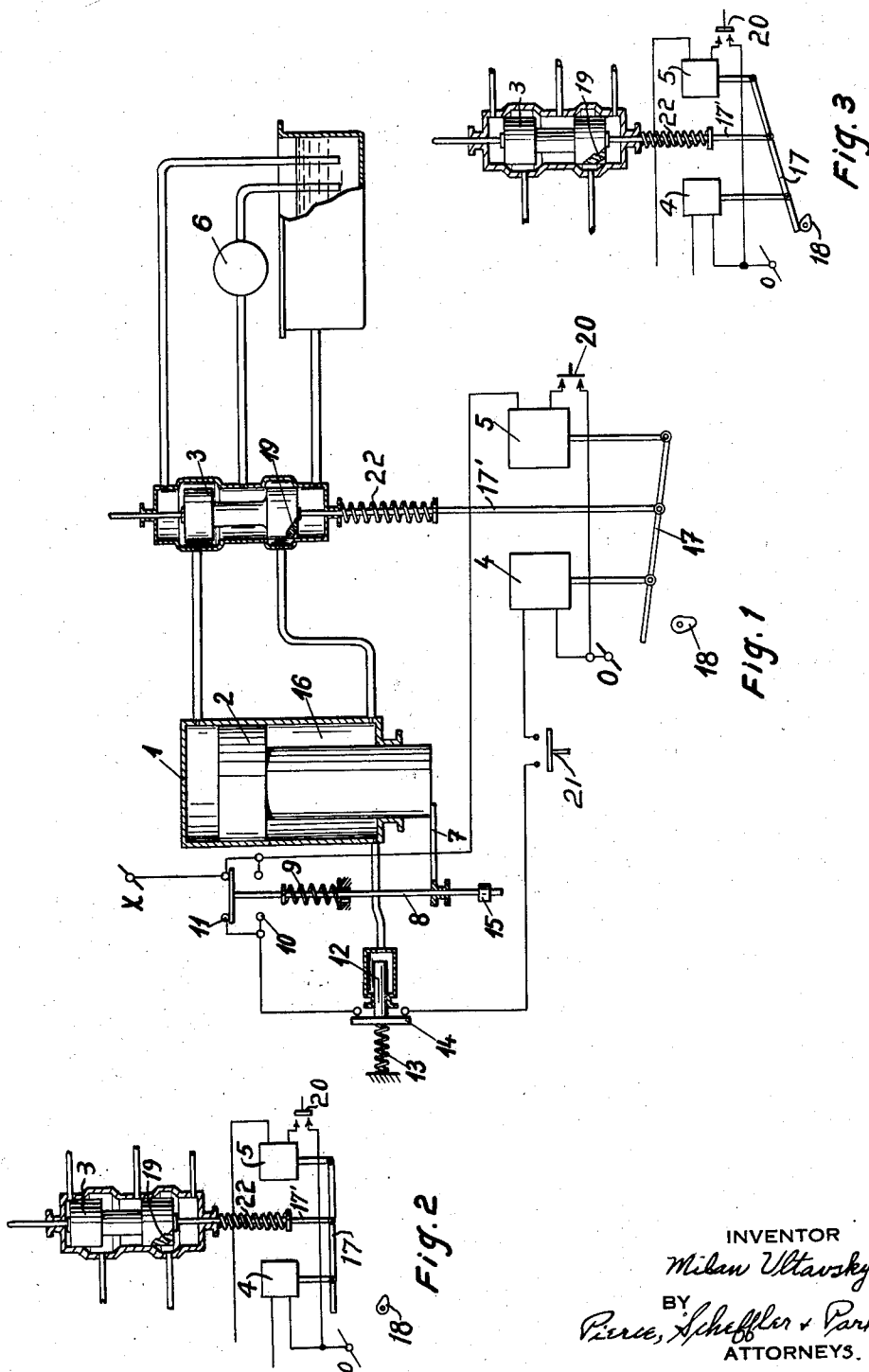


Aug. 12, 1958

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 DEVICE FOR SLOWING DOWN THE MOVEMENT OF THE
 PRESS PISTON IN HYDRAULIC PRESSES
 Filed Feb. 28, 1955

2,846,980



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DEVICE FOR SLOWING DOWN THE MOVEMENT OF THE PRESS PISTON IN HYDRAULIC PRESSES

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Application February 28, 1955, Serial No. 491,138

Claims priority, application Czechoslovakia
March 1, 1954

4 Claims. (Cl. 121—38)

In hydraulic presses or other hydraulic apparatus, such as hydraulic welding machines, it is frequently necessary to provide for the movable element of the molding tool or the movable electrode of the welding machines, moving during the idle run at high speed, to be slowed down just before meeting the piece to be molded or welded. Such slowing down has hitherto been achieved in different ways, mostly by throttling down the feed of the pressure fluid into the pressing cylinder or by throttling the discharge of the pressure fluid from the backward space of the pressing piston. However, for the pressing operation proper it is necessary to stop throttling in time so as not to impede the molding of welding process. In those cases where such throttling action derives mechanically from the piston movement, its stoppage is brought about with a certain lead over the beginning of the pressing operation. This, however, results in a renewed speeding up of the pressing piston, if only for a short period, having a prejudicious effect, more particularly in the case of welding presses for welding articles with fine projections; the moving parts of the pressing piston present a great mass and their renewed speeding up after the stoppage of the slowing down action resulted frequently in damaging the fine projections of the welding edge, leading to a defective joint.

The present invention relates to a new device for removing the aforesaid drawback, causing the piston to be slowed down just for the period lasting up to the beginning of the pressing operation, i. e. slowing down stops automatically only when the pressing force begins to rise. An embodiment of the device according to the present invention is illustrated in the accompanying drawing.

Fig. 1 is a fragmentary sectional schematic view of a device constructed in accordance with my invention and shows the electrical and hydraulic connections of the distributing gear and a cylinder which it controls; and

Figs. 2 and 3 are detailed views of the distributing valve, lever, and electromagnet positions for full flow and exhaust throttled operation.

Referring now to the drawing, 1 indicates the hydraulic cylinder including the pressing piston 2 controlled by a well known device, e. g. slide distributing gear 3 under the action of a first electromagnet 4 and a second electromagnet 5. A pump 6 supplies the pressure fluid to the distributor.

The piston 2 actuates through an arm 7 a pull rod 8 which in its rest condition is urged by a spring 9 into the upper position. The pull rod 8 shifts a double contact 10 and 11 in such a way that in the rest position and on the piston moving down at high speed the contact 10 is broken whilst the contact 11 is closed.

The device being the object of the present invention is attached to the bottom space 16 of the pressing piston. It consists of a hydraulic plunger 12 urged inwards into the cylinder by a spring 13. Said plunger controls the contact 14 which is interrupted as soon as a pressure is

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exerted on the plunger 12. The electrical circuit from the X-phase conductor "X" to the neutral conductor "O" includes two parallel branches, one branch including the left hand contacts of parallel-connected switches 11 and 10, switch 14, switch 21 and electromagnet 4, and the other branch including the right hand contacts of switches 11 and 10, electromagnet 5, and push button 20.

In its position illustrated in the drawing the electromagnet 4 is energized whilst the electromagnet 5 is currentless. The pressing piston is in its top position at rest, as the discharge of the pressure fluid from the space 16 is closed by the slide valve 3. The plunger 12 is acted upon merely by a pressure corresponding to the weight of the piston 2 and accessories which, however, is not adequate to overcome the force of the spring 13 so that the contact 14 remains closed. Spring 22 similarly urges the slide valve 3 to its lower position. As soon as a current passes also through the electromagnet 5, this being caused by the handling push button 20, the slide valve 3 is shifted into its top position Fig. 2 and the piston 2 begins to move down with full speed in accordance with the output of the pump. As soon as the pull rod 8 is shifted by the arm 7 abutting against the stop 15, the contact 11 is broken, whereupon the electromagnet 4 becomes currentless and the end of the lever 17 pivotally connected intermediate its ends to control rod 17' fits against the control stop 18. By the drop of the lever the slide valve 3 is lowered and stopped in such a position that the discharge of the fluid from the space 16 is being throttled by the groove 19 thus bringing about a slowing down of the movement of the piston 2 and consequently a rise of the pressure inside the space 16 resulting in the plunger 12 being pushed out and the contact 14 broken. Even if during the further movement of the piston 2 the contact 10 is closed, the electromagnet 4 remains currentless, since the contact 14 is still interrupted thus enabling the slowed down piston stroke to go on. The preliminary pressing operation sets in at reduced speed and can be eventually carried on with a reduced pressure. As soon as the movement of the piston 2 is stopped by fitting on the object to be pressed, the pressure inside the space 16 diminishes and the spring 13 pushes the plunger 12 inwards thus closing the contact 14. Current passes again through the electromagnet 4 displacing the slide valve 3 into its upper position. In this way, the slowing down action is stopped and the pressing operation with full pressure sets in. After completion of the pressing process by the release of the push button 20, the current in the electromagnet 5 is interrupted and, at the same time, by a contactor 21, and the current in the electromagnet 4 is likewise interrupted. The current in the electromagnets being interrupted the slide valve 3 is placed by the action of a spring into its lower position and the piston 2 rises into its starting position and is stopped therein as soon as by closing of the contacts 11 a current passes through the electromagnet 4.

As is obvious from the foregoing description, the stoppage of the slowing down sets in without any further movement of the press piston so that it passes smoothly and without shock from its slow course to full pressure movement.

Having now fully described my invention, I claim:

1. In a hydraulic system having a cylinder, a pressing piston reversibly slidably movable in said cylinder, a source of pressure fluid connected to said cylinder, and a distributing slide valve in said source, said distributing valve having a first position to cause movement of said piston at a given rate of speed in one direction toward the work to be pressed thereby, a second throttling position to cause movement of said piston toward the work at a reduced rate of speed, and a third position to cause movement of said piston in the opposite direction away

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from the work; means for controlling the position of said distributing valve comprising a control rod axially aligned with and secured at one end to said distributing slide valve, a lever pivotally connected intermediate its ends to the other end of said control rod, a first electromagnet having a movable core secured to one end of said lever, a second electromagnet having a movable core secured to the other end of said lever, electric circuit means for simultaneously energizing both of said electromagnets to cause both ends of said lever to be attracted to a position to set said distributing valve to its first position, and means for breaking the energization of said first electromagnet to cause the end of the lever associated therewith to be moved in a position to set said distributing valve in its second throttling position.

2. Hydraulic apparatus as defined in claim 1 wherein said means for breaking the energization of said first electromagnet includes a normally closed switch in said electric circuit means, and switch actuating means responsive to the position of said pressing piston with respect to its cylinder for opening said switch when said piston reaches a first point adjacent the work.

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3. Hydraulic apparatus as defined in claim 2 wherein said switch includes additional contacts which are closed by said switch actuating means upon further travel of said piston in the pressing direction toward the work.

4. Hydraulic apparatus as defined in claim 3 wherein said means for breaking the energization of said first electromagnet further includes an auxiliary normally-closed pressure responsive switch, and conduit means connecting said pressure responsive switch to said cylinder to cause said pressure responsive switch to open when the pressure within the cylinder exceeds a predetermined value.

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