TWO-HANDED PRESS CONTROL DEVICE

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This invention relates to improvements in means for safely starting the operation of a press or similar machine without endangering the hands of the operator.

Starting devices for presses have heretofore been constructed for the purpose of requiring both of the operator's hands to start the operation of the press. Such means, however, have generally been so constructed that the operator was able to place a weight on one of the starting members or otherwise hold one of the starting members continuously in starting position, so that the press could be started with one hand, thus leaving the other hand free, with the resulting possibility of injury thereto.

One of the objects of this invention is to provide a press starting device of this kind which can only be operated by having the operator actuate both starting members with both of his hands, and then release both starting members before the press can again be started. Another object is to provide starting means of this type in which both of the hand-operated starting members must be moved into two different positions for each start of the press.

A further object is to provide a starting means including a storage device for storing power during one position of the hand-operated members and for discharging the stored power to the press starting mechanism when the hand-operated members are in another position.

A further object is to provide a pair of hand-operated electrical switches which, in one of their positions, close a circuit to a condenser for charging the same, and which when moved by the hands into another position close another circuit for discharging the condenser to effect actuation of the starting mechanism.

Another object is to provide a device which is constructed to effect the actuation of the starting mechanism of a press or similar machine from the electrical discharge of a condenser.

Other objects and advantages of this invention will appear from the following description and claims.

In the accompanying drawings:

Fig. 1 is a fragmentary, front elevation of a punch press provided with starting means embodying this invention.

Fig. 2 is a diagrammatic view of the electrical connections for actuating the starting mechanism of the press.

Fig. 3 is a fragmentary, sectional elevation of a starting mechanism operated by compressed air and which may be actuated by means of the improved switch embodying this invention.

Fig. 4 is a fragmentary, sectional elevation thereof, on line 4—4, Fig. 3.

Fig. 5 is a sectional plan view thereof, on line 5—5, Fig. 3.

Fig. 6 is a fragmentary, sectional elevation of an electrically-operated mechanism for starting the press.

Fig. 7 is an elevation of an air-operated starting mechanism of modified construction which may be actuated by the press starting means embodying this invention.

Fig. 8 is a fragmentary, sectional elevation thereof, on an enlarged scale.

My improvements may be applied to the actuation of any intermittently operating press or other machine, and in Fig. 1, I have illustrated by way of example, a punch press to which my improvements may be applied. The word “press” as hereinafter used is intended to apply to any type of press or similar mechanism. The press shown in the drawings has a bed or base 10 and a die 11 mounted thereon. 12 represents the ram of the press on which a punch or complementary die 14 is mounted to cooperate with the die 11. The ram may be actuated in any suitable manner, for example, by means of an eccentric or crank activating a pitman 15, 16 represents the flywheel of the press which may be driven by any suitable motor or other power means (not shown) through the medium of a clutch 17 interposed between the flywheel 15 and the crank or eccentric which actuates the pitman and this clutch is actuated by means of a clutch rod 18 which is movable upwardly to engage the clutch and downwardly to disengage the same. The actuating means for the clutch rod may be confined within a housing 19 mounted on a press.

All the parts thus far described have heretofore been used in connection with presses, and of themselves, do not constitute a part of this invention.

My invention deals particularly with means for controlling the mechanism for starting the operation of the press, which in the particular construction shown in Fig. 1 is arranged within the housing 19, and this controlling mechanism is so constructed that the operation of the press can only be effected if the operator uses both hands to actuate two different members, so that it will be impossible to operate the press while the operator has his hands in positions in which they might be injured. For this purpose, a pair of hand-operated control members 20 and 21 are provided on the press and spaced apart far enough so that the operator must use both hands to actuate these control members. In the particular embodiment of the invention illustrated by way of example, these two members are in the form of switches as shown more particularly in Fig. 2, each switch having a conducting mem-
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3. The hand-operated members are preferably normally held in their upper positions by any suitable means such as springs (not shown), which urge the control members into their upper positions in Figs. 1 and 2.

I also provide a storage device which is capable of storing only enough energy to provide for one actuation of the press, the storage device being charged only when both of the control members are in their normal positions which they occupy when released by the operator. For example, an electrical condenser 25 may be employed for this purpose and the control members 20 and 21 are so connected with the condenser that when the control members are in their upper positions in the construction shown, a circuit will be completed by means of which the condenser will be charged, and when these members are in their lower positions, another circuit will be completed by means of which the electrical charge on the condenser will be discharged to effect the starting of the press. For this purpose, electric power from any suitable source may be received from a pair of conductors 26 and 27. If alternating current is supplied to these lines, suitable rectifying means are provided for charging the condenser, these shown by way of example being arranged within the usual tube 28. The conductors 26 and 27 are connected to the opposite terminals of a filament 29 in the tube 28 and a branch conductor 30 connects conductor 21 to one of the terminals of the condenser 28. The other conductor 26 is connected to a pair of cathodes 32 within the tube 28. The anode plates 33 are connected to a conductor 34 which leads to the two switch or control members 20 and 21, the circuit including conductor 34 being broken at each switch member and completed only when both switch members are in the upper positions as shown in Fig. 2, in which case, direct current passes through the conductor 34 and the two switch members 20 and 21 to a conductor 35 leading to the other terminal of the condenser, thus completing a circuit for charging the condenser. It will be noted that the circuit to the condenser for charging the same is only closed if both of the switch members 20 and 21 are in their upper or normal positions at the same time.

The other or discharge circuit includes another conductor 37 which has two gaps or breaks therein, which occur when the switches or control members 20 and 21 are moved to lower positions by the hands of the operator. This conductor leads to one terminal of the coil of a relay 38, the other terminal being connected by means of conductor 39 to the negative terminals of the storage device. It will, consequently, be apparent that the circuit including the conductor 37 can only be closed if both of the switch members 20 and 21 are moved into their lower position.

The relay 38 closes a switch 40 in a circuit including a pair of conductors 42 and 43 receiving power from any suitable source and leading to the opposite terminals of the solenoid 44, this relay circuit being necessary because of the small power developed from the discharge of the condenser. The core of the solenoid 44 may either actuate the clutch rod 18 directly or through the medium of some other power operated means. For example in Fig. 6, the solenoid 44 has its core 45 connected by means of a link 46 to a lever 48 pivoted at 49 on a housing 50. The clutch rod 18 extends into the housing and has a shouldered portion formed by a projection or enlargement 52 provided on the lower end thereof with which the outer end of the lever may engage. This lever 48 has a control member 53 mounted on the end thereof in position to engage the enlargement 52 of the clutch rod when the lever 48 is swung downwardly by the core of the solenoid 44. The latch 53 is pivoted at 54 on the lever 48 and the latch engages a stop when in the position shown in Fig. 6 to prevent further upward movement of the outer end thereof and a spring 55yielding-ly holds the latch in this position. As the core 45 approaches the end of its downward movement, the end of the latch 53 will swing out of engagement with the enlargement 52 of the clutch rod, and thus permit this rod to be moved upwardly by the usual clutch rod spring (not shown). Consequently, even if the solenoid 44 should remain energized for a period longer than that required for an operation of the press, the clutch rod 18 will be released promptly upon the completion of the downward movement of the core 45 so that only a single operation of the press will be assured. When the solenoid is deenergized, the core 45 is returned upwardly by any suitable means, such as a spring 56, so that the lever 43 will swing upwardly to place the latch 53 into a position to engage the upper surface of the enlargement 52 of the clutch actuating rod, so that the mechanism is then ready for another operation. During this movement of the lever, the latch will swing on its pivot to clear the enlargement 52 and will be restored to the position shown in Fig. 6 by the spring 55.

My improved controlling mechanism may also start a press through the medium of a fluid under pressure, such as compressed air or other gas. In the particular construction shown in Figs. 3 to 5, the solenoid 44 is mounted in the housing 57. The lower end of the core 45 of the solenoid engages an end of a valve actuating lever or arm 53. The connection between the solenoid core and the lever or arm may be made by means of a U-shaped link or clevis 63 mounted on the end of the core and extending about the end of the arm. The arm 53 presents a stop to limit the extent to which the solenoid and the clevis 63 may move downwardly.

The arm 62 has a post 65 rigidly secured thereto, the upper end of which is provided with a substantially hemispherical part 66, which seats in a partly spherical bearing in the lower end of a thimble or sleeve 67 secured to a valve housing 70. A hollow tubular stem 68 is slidably arranged in a partition wall 69 arranged in the housing 70 and suitable packing is provided about the stem 68 to prevent leakage about the stem. The lower end of the tubular stem has a flange or head 71 secured thereto, one of which a spring 72 bears to urge the tubular valve stem and head 71 into engagement with the enlargement 66 of the post 65. The valve housing 70 is also provided with a valve 74 which controls the passage connecting two chambers 15 and 76. The chamber 76 is connected by means of a duct 77, leading from a source of compressed air or other gas and the chamber 76 is connected with a conduit 78 leading to a cylinder 89 which is hereinafter more fully described.

It will now be noted that the swinging of the arm 62 causes the enlargement or head 66 of the post 65 to swing or pivot on its bearing in the sleeve 67. When in the position shown in Fig. 4, the upper face of the enlargement 66 is parallel to
the head or enlargement 71 of the tubular stem 68, and consequently, the spring 72 holds this tubular stem in its lowest position. When the arm 82 swings, an edge portion of the enlarged head 66 of the post 65 will tilt upwardly, thus moving the head or flange 71 and the hollow stem 68 upwardly so that the upper open end of the stem engages a packing disk 79 secured to the lower end of the tubular stem and also moving the valve 74 upwardly from its seat, thus permitting air from the duct 77 to pass to the duct 78 to the cylinder 80. When the solenoid is de-energized so that its core moves downwardly into the position shown in Fig. 3, the post 65 again assumes the position shown in Figs. 3 and 4 and permits the tubular stem 66 to move downwardly, thus restoring the valve 74 to its seat. Upon further downward movement by the action of the springs 72, the upper end of the tubular stem 66 will disengage the packing disk 79 and thus permit air to flow into the interior of the tubular stem, from where it is discharged through holes 82 in the stem and thence through holes 83 in the sleeve or thimble 67, so that the exhaust is discharged to the atmosphere. Any other suitable valve for controlling the flow of fluid under pressure to and from the cylinder 90 may be employed, if desired.

The cylinder 80 has a piston or plunger 84 therein, as seen in Fig. 3, which is urged into its upper position in the cylinder by means of a spring 85. The piston is connected to a piston rod 90 and has an inverted U-shaped lower fitting, the legs 81 of which straddle and are suitably connected to a lever 88 which may be in sliding connection in the lever 48 described in connection with Fig. 6. The lever 88 is pivoted at one end thereof at 89 to the housing 16, and has a latch 90 at the other end thereof which is yieldedly held, for example, by a spring 92 in the position shown in Fig. 3. The end of the lever may engage an enlargement 93 of a clutch actuating rod 18. This rod is normally held in its upper or clutch disengaging position by means of a spring 95. The balls 121 are loosely arranged in the displacement of the balls into and out of the grooves is controlled by a cap member 123 which is slidably mounted on the hollow piston rod 108, and which has a downwardly and outwardly flaring inner surface or bore. Consequently, when the cap member is in its lower position, as shown in full lines in Fig. 8, this flaring surface moves the balls into the groove 120 so that the balls form a rigid connection between the tubular piston rod 108 and the clutch actuating rod 110. As the piston moves downwardly, the lower end of the cap member 123 will engage the flange 114 of the bushing 114 while the tubular piston rod 109 moves down toward the flange 112, and this relative movement allows the balls 121 to move outwardly out of the groove 120 into the wider portion of the frusto-conical bore in the cap member 123, thus uncoupling the hollow piston rod 108 from the clutch actuating rod 110, as shown in broken lines in Fig. 8. This latter rod is engaged by suitable yielding means, such as a spring 118 to urge the same rapidly upwardly, when disengaged from the tubular piston rod 108, thus returning the clutch actuating rod to its upper and clutch disengaging position in ample time to prevent a second operation of the press.

The solenoid 100 and the housing 106 may be suitably mounted on a press in any desired man-
ner, for example, by means of a bracket 122, Fig. 7, which may be suitably secured to the press. The bracket preferably is provided with a stop 124 against which the lower end of the spring 118 may bear.

In the drawings, I have illustrated only a pair of control members 28 and 21 for use on a press requiring only a single operator; it will be obvious that on larger presses requiring a number of operators, a plurality of pairs of control members or switches may be provided, one pair for each operator, and these switch members should be arranged in the conductors 34 and 31, so that circuits through these conductors would be completed only when all of the switch or control members are moved into positions for charging the storage device, or for discharging the same.

I claim as my invention:

1. In means for controlling mechanism for starting the operation of a power-actuated plunger of a press having a clutch and a rod for actuating said clutch and which is yieldingly urged into clutch disengaging position, that improvement which includes an electrical condenser, a plurality of hand-operated switches having movable members yieldingly urged into normal positions, a circuit leading from a source of power to said condenser for charging the same and which circuit is completed only when the movable members of all of said switches are in their normal positions, another circuit through which discharge current from said condenser flows only when the movable members of all of said switches are moved from their normal positions into another position, a relay in said other circuit for closing a switch, a third circuit including said switch and a solenoid having a core connected with said clutch rod for moving said clutch rod into clutch-engaging position, and means for disconnecting said solenoid core from said clutch rod after said clutch rod has been moved into clutch-engaging position and for again connecting said solenoid core with said clutch rod and for a solenoid-actuated circuit for starting the operation of said plunger, a pair of switch members each including terminals arranged in series with said charging circuit and other terminals arranged in series with said discharge circuit, each switch including a movable switch member capable of engaging either set of terminals means for biasing said movable switch member into position to engage said terminals of said charging circuit, said switches being spaced apart sufficiently so that both hands of the operator are required to actuate both switches of said pair, said movable switch members when urged against said biasing means being movable into engagement with said terminals of said discharge circuit, whereby both of said movable members must be released by the operator to effect charging of said condenser and must be moved by the operator against said biasing means to simultaneously engage said terminals of said discharge circuit.

2. In means for controlling mechanism for starting the operation of a power-actuated plunger of a press having a clutch and a rod for actuating said clutch and which is yieldingly urged into clutch disengaging position, that improvement which includes an electrical condenser, a plurality of hand-operated switches having movable members yieldingly urged into normal positions, a circuit leading from a source of power to said condenser for charging the same and which circuit is completed only when the movable members of all of said switches are in their normal positions, another circuit through which discharge current from said condenser flows only when the movable members of all of said switches are moved from their normal positions into another position, a relay in said other circuit for closing a switch, a third circuit including said switch and a solenoid having a core, a cylinder containing a piston connected with said clutch rod for moving the same into its clutch-engaging position, a valve for controlling the flow of fluid under pressure to said cylinder, and means connecting said solenoid core to said valve for actuating the same.

3. Means for controlling mechanism for starting the operation of a power actuated plunger of a press, said means including a condenser, a charging circuit for supplying electric power to said condenser for charging the same, a discharge circuit including said condenser, relay means actuated by current discharged from said condenser through said discharge circuit for starting the operation of said plunger, and a series of switches each including terminals arranged in series in said charging circuit and other terminals arranged in series in said discharge circuit, each switch including a movable switch member, means for yieldingly urging said movable member into a position to contact said terminals of said charging circuit to complete the same, said movable members of said switch means being biased against said yieldings means to connect said terminals of said discharge circuit to complete the same, a pair of said switches being provided for each operator of the press, whereby said charging circuit is closed only when all of said switches are released by the operator or operators of said press and said discharge circuit is closed only when all of said movable members are moved by the operator or operators against the action of said yielding means.

4. Electrical means for controlling mechanism for starting the operation of a power-actuated plunger of a press, said means including a condenser, a charging circuit connecting said condenser with a source of power for charging said condenser, a discharge circuit including said condenser, a solenoid also included in said discharge circuit, a solenoid-actuated circuit for starting the operation of said plunger, a pair of switch members each including terminals arranged in series with said charging circuit and other terminals arranged in series with said discharge circuit, each switch including a movable switch member capable of engaging either set of terminals means for biasing said movable switch member into position to engage said terminals of said charging circuit, said switches being spaced apart sufficiently so that both hands of the operator are required to actuate both switches of said pair, said movable switch members when urged against said biasing means being movable into engagement with said terminals of said discharge circuit, whereby both of said movable members must be released by the operator to effect charging of said condenser and must be moved by the operator against said biasing means to simultaneously engage said terminals of said discharge circuit.

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