

Nov. 10, 1942.

B. J. YANCHENKO

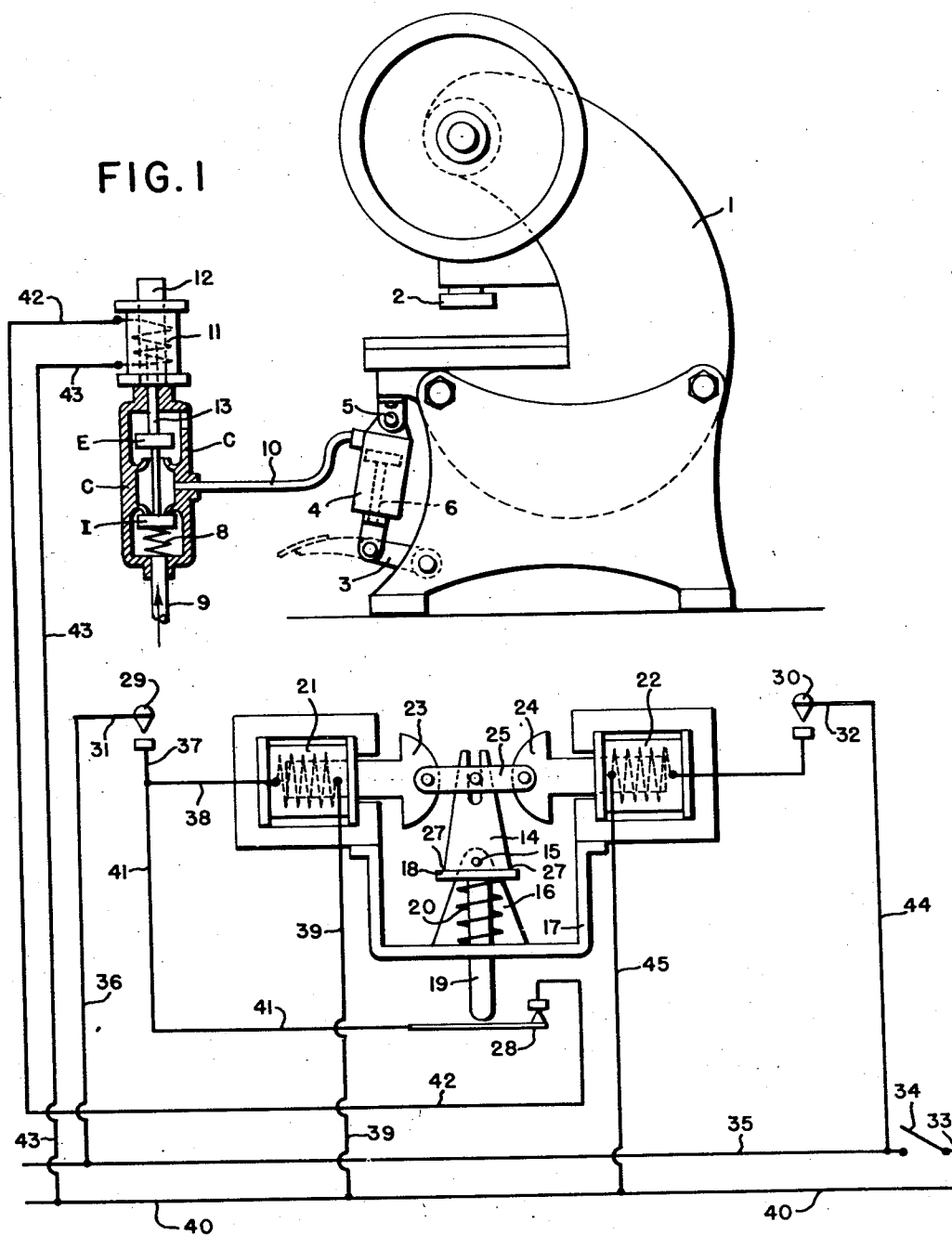
2,301,491

TWO-HAND CONTROL

Filed July 30, 1941

3 Sheets-Sheet 1

FIG. 1



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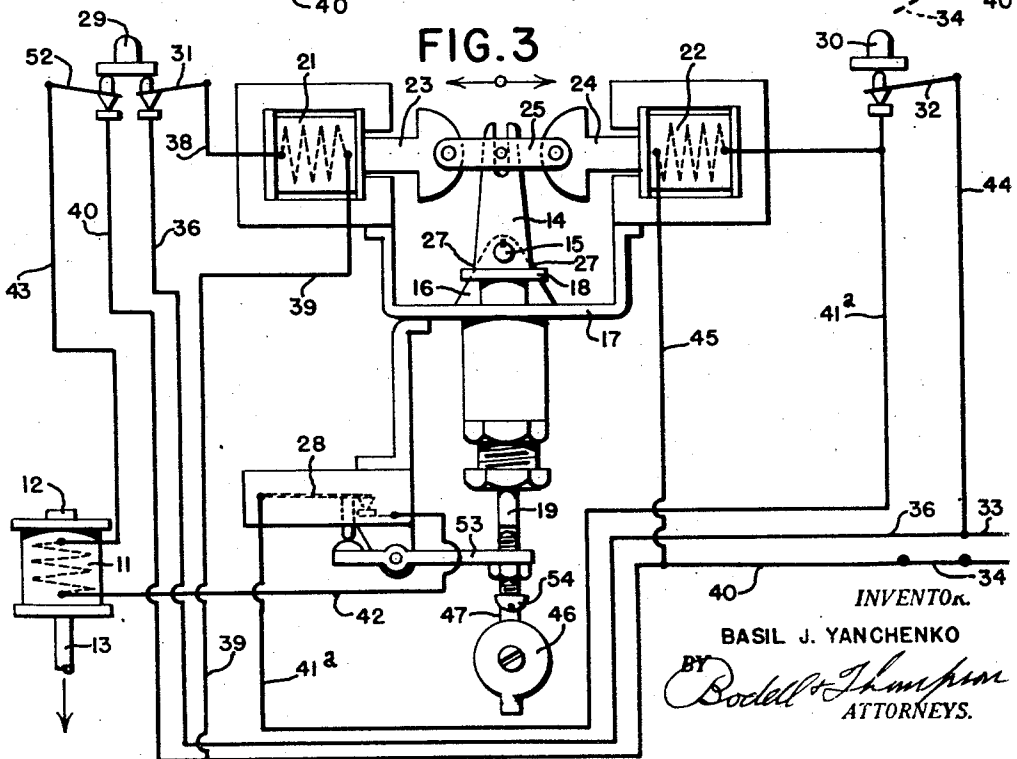
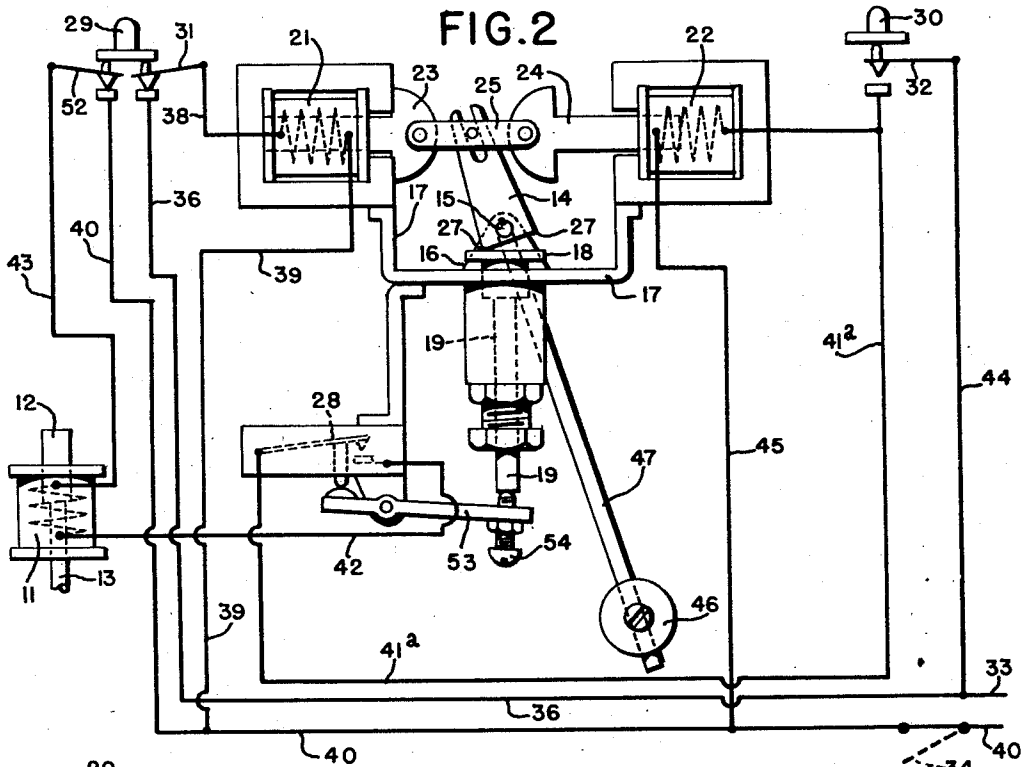
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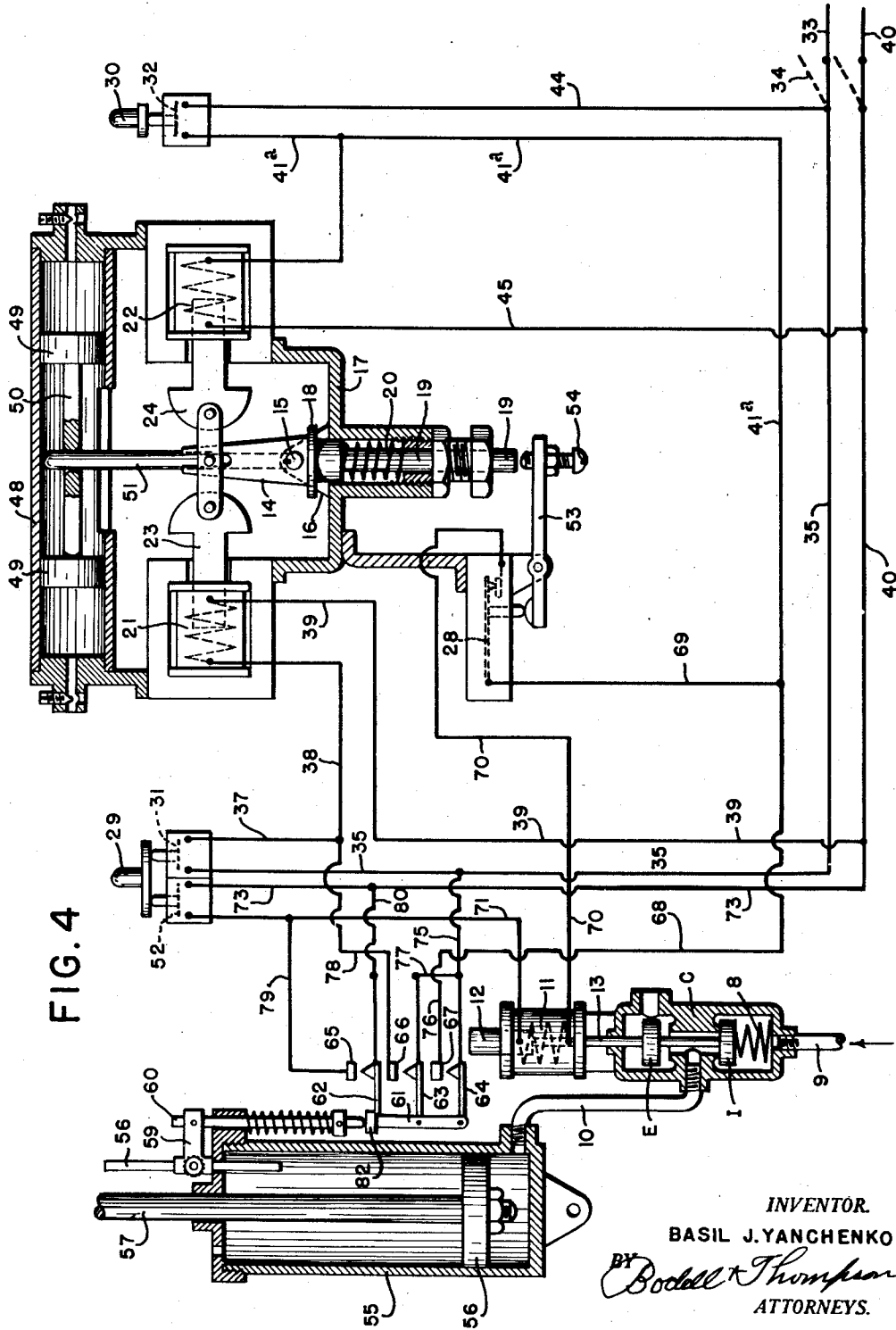
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## UNITED STATES PATENT OFFICE

2,301,491

## TWO-HAND CONTROL

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13 Claims. (Cl. 192—131)

This invention relates to two hand safety controls for machines having an operating movement dangerous to the operator, as punch presses, and other pressing machines, such as garment and laundry presses, and has for its object a two hand control which requires the simultaneous operation of both manuals to effect each operation, and which is ineffective to effect the operation of the machine when only one manual is operated, or when one manual is operated more than a split second in advance of the other.

It further has for its object means by which the operation of both manuals is required, but the operation need not be exactly simultaneous, but one manual may be operated a split second in advance of the other, or means for momentarily delaying the operation of disabling means when one manual is operated a split second in advance of the other.

The invention further relates to an electrical two hand control in which the manuals are manually operated switches, and also in which the control for the control member of the machine motor, which member is usually a valve operated by an electric motor or magnet, and has for a further object a switch operated by the operating movement of the machine, or the motor which actuates the machine to hold the control member or valve in its operated or open position, after the manually operated switches have been released.

Other objects appear throughout the specification.

The invention consists in the novel features and in the combinations and constructions hereinafter set forth and claimed.

In describing this invention, reference is had to the accompanying drawings in which like characters designate corresponding parts in all the views.

Figure 1 is a diagrammatic view illustrating this two hand control in its simplest form, as controlling the operation of a control member for a machine, as a punch press, through an electrically operated motor or magnet which operates the control member of the press.

Figure 2 and 3 are diagrammatic views showing means for momentarily retarding the disabling means for a split second when the manual controls are not operated exactly simultaneously, Figure 2 showing the operation when only one manual is operated or depressed, and Figure 3 showing the operation when both manuals are

depressed substantially simultaneously or within a split second of each other.

Figure 4 is a diagrammatic view showing the locking means operated by the operating movement of the machine for holding the control member for the machine in its operated position, that is, the valve in its position after both manuals have been released.

The machine, the operation of which is to be controlled, is shown in Figure 1, as a punch press 1, in which the head 2 moves down and up during each operation. The punch press shown is of the type which is usually pedal controlled, the pedal controlling the engaging of a clutch and the clutch being a one-revolution or periodic clutch automatically thrown out upon each operation or each revolution. As the operation of this type of clutch in punch presses is well known, further description is unnecessary.

3 designates the pedal for controlling the clutch. 4 designates a motor, as a cylinder and piston, for operating the pedal 3. The cylinder is here shown as pivoted at 5 to the press and the piston rod at 6 to the pedal 3 or a lever substituted for the pedal 3.

The two hand control of this invention for the motor 4 comprises an element shiftable oppositely from central position, a pair of power operated motors connected to said element to act equally in opposite directions on the same when both are energized or hold said element in central position, but to shift said element in one direction or the other out of central position when only one or the other of the motors is energized, a pair of manuals operable to effect the energization of the motors of the pair respectively, a second or disabling control for the control member of the machine, the disabling control being normally in operative position but shiftable out of operative position by the shifting of said element in either direction out of central position.

The invention is here illustrated as applied to an electric control system, or where the motors used therein are electro-responsive motors, as magnets or solenoids, although the invention, in its broader aspect, may also be applied to air operated motors performing the function of the magnets or solenoids.

C designates the control member for the motor 4 of the machine, this being a two-way or combined intake and exhaust valve having a movable valve member having a normally open exhaust valve head E, and a normally closed intake valve head I, the valve member being held in its normal position by a spring 3. The

valve is connected to a suitable source of power, as compressed air, through a pipe 9. When the intake valve head I is open and the exhaust valve head E closed, obviously air will pass from the pipe 9 through the valve casing C, and through a pipe 10 into the motor 4 to actuate the piston therein to depress the pedal 3 or the lever substituted therefor. When the valve member is in normal position with the intake head I closed and the exhaust head E open, air can exhaust back through the valve from the motor 4.

11 designates an electro-responsive motor, this being here shown as a magnet or solenoid having its core 12 arranged to thrust, when energized, against the stem 13 of the combined intake and exhaust valve member to close the exhaust valve head E and open the intake valve head I.

14 designates the element of the two hand control shiftable laterally in opposite directions from a central position, this being shown as pivoted at 15 near one end at a fixed point, as a bracket 16, of a suitable support 17, the end of the element 14 resting on a head or shoulder 18 of a plunger 19 slidable in the support 17 against the action of a spring 20, this plunger operating a disabling means or switch, as will be hereinafter described.

21 and 22 designate the pair of power operated motors, these being shown as electro-magnets or solenoids acting equally in opposite directions on the element 14 to move the same in one direction or the other about its pivot 15. The cores 23 and 24 of these electro-magnets are connected together and to the element 14 by a link 25 having a pin working in a lengthwise slot in the element 14. When only one electro-magnet 21 or 22 is energized, the element 14 is moved on its pivot, for instance, as seen in Figure 2, in one direction or the other, and the points 27 at the pivot end of the element 14 and on opposite sides of the pivot act cam fashion on the head 18 to depress the plunger 19 when the element 14 is moved on its pivot in one direction or the other, and thus open the disabling switch 28.

28 designates the disabling switch, this being normally closed and opened when one only of the electro-magnets 21, 22 is energized by the depression of one or the other only of the manuals. 29 and 30 designate the manuals respectively, these operating to close switches 31, 32, and one of these switches, as 31, in Figure 1, is in the circuit leading to the magnet 11 which operates the control valve C. The disabling switch 28 is in series with the manually operated switch 31 in multiple with the magnet 21. Upon operation of both manuals 29, 30 substantially simultaneously, the current flows from main line 33 through a master switch 34 therein through wires 35, 36, closed manually operated switch 31, wire 37, wire 38 through the coils of the electro-magnet 21, and thence through wire 39 to the other wire 40 of the feed circuit; and also from wire 37 through wire 41 through disabling switch 28, which is normally closed, wire 42, the windings of the electro-magnet 11, thence through wire 43 to the other main wire 40. At the same time, the current passes from the wire 35 through wire 44, manually closed switch 32, the windings of the magnet 22 through wire 45 to the feed wire 40.

Thus both motors or electro-magnets 21, 22 are energized and oppose each other, so that no pivotal movement of the element 14 takes place, and hence the disabling switch 28 remains closed, and the motor or solenoid 11 which operates

the control valve C is energized to open the intake head I and close the exhaust valve head E, permitting air to pass to the cylinder of the motor 4, actuate the piston therein to operate the lever 3 substituted for the usual foot pedal of the press. If, however, one manual only is operated, as the manually operated switch 31, then only the magnet 21 is energized, so that the element 14 is moved on its pivot, for instance, as shown in Figure 2, depressing the plunger 19 causes it to open the disabling switch 28. Hence, upon the operation of the other manually operated switch 32, nothing happens, as the two magnets 21, 22 are equal in strength, and the subsequent energization of the magnet 22 can not shift the element 14 back to central position to permit the disabling switch 28 to close. If the manually operated switch 32 only is operated, the element 14 will be shifted to the right (Figure 1) and depress the plunger 19 to open the disabling switch, so that subsequent operation or closing of the manually operated switch 31 will be of no avail. Thus, the press can not be operated by fastening down one of the manuals or operated by operating the manuals 29, 30 alternately or not simultaneously.

However, means is provided by which it is not necessary that the hands of the operator engage the manuals exactly simultaneously. This means may be an inert member 46 (see Figures 2 and 3) acting momentarily in opposition to the swinging movement of the element 14. The inert member is here shown as a weight acting as a pendulum and mounted on a rod 47 swinging from the pivot 15 of the element 14 and rigid with the element 14. In other words, the element 14 is keyed to the pivot 15 and the rod 47 is also fixed to the pivot 15. When one manual 29 or 30 is operated, a fraction of a second ahead of the other manual, the time taken to overcome the static inertia of the weight 46 is sufficient to delay the shifting of the element 14 by one magnet 21 or 22 only when energized, until the other magnet is energized. The delay is merely for a split second, so that exact simultaneous operation of both manuals is not required.

As seen in Figure 4, this delaying means may be an oppositely acting air dash pot 48, this consisting of a cylinder having a double piston 49 in opposite ends thereof, and connected by a rod 50 to an arm 51 rigid with the element 14.

In Figures 2 and 3, slightly different wiring diagram is shown. In Figures 2 and 3, the disabling switch 28 is connected in series with the manually operable switch 32 instead of the manually operable switch 31, and in multiple with the magnet 22 and the circuit for the electro-magnet or solenoid 11, which operates the control valve C has another switch 52 therein, which is normally open and closed by the other manual 29, that is, the manual which also operates to close the switch 31. Upon the operation of both manuals 29, 30, the switches 31, 32 and 52 will be closed, and hence the current will pass to both of the opposed magnets 21, 22 and the disabling switch 28 will remain closed, so that the magnet or solenoid 11 operating the control valve C will be energized to open the control valve C to the flow of air or power therethrough. However, if only one manual, as the manual 30, is operated to close the switch 32, the current will pass from the main line wire 33 through wire 44, closed switch 32 through the windings of solenoid 22 and wire 45 to the other line wire 40, as before, but at the same time will pass

through wire 41<sup>a</sup> through the disabling switch 28 through the windings of the solenoid 11 which operates the control valve C, but the circuit will not be completed, as the switch 52 is open, as the other manual 29 has not been depressed, the solenoid 22 being thus energized, the element 14 moves to the right and the disabling switch 28 opens.

In Figures 2 and 3, upon the operation of the manual 29 only, the switches 31, 52 will be closed, energizing the magnet 21 which opposes the magnet 22, causing the element 14 to be swung into the position shown in Figure 2, and thus open the disabling switch 28. In Figures 2 and 3, the motion of the plunger 19 is transferred to the disabling switch 28 through an intermediate lever 52 having a set screw 54 thrusting against the end of the plunger 19. This screw 54 may be normally adjusted to provide a space or lost motion between it and the end of the plunger 19, and this lost motion may be sufficient to delay the opening of the disabling switch 28 when one of the manuals is operated a split second in advance of the other. Thus, if the manual 29 is operated or tied down, the disabling switch 28 will be open and subsequent operation of the other manual 30 will be of no avail.

It is, under some circumstances, depending upon the character of the work, necessary for the protection of the operator to operate the machine with the two hand control. At other times with work of different nature, it is desirable to operate the machine with a one hand control. In some instances, with the left hand control and in another instance, with the right hand control. For instance, in some work, the operator takes the work from the stock pile with his right hand and places it in the machine with his left hand, then operates the left hand manual with his left hand. In other instances, the operator's position is such that he takes the work from a stock pile with his left hand, passes it to his right hand and with his right hand places it in the machine and operates the machine by depressing the right hand control. In either instance, the hand taking the work from the stock pile is out of range of the machine. In order to accomplish the operation of this two hand control with one hand only, means may be provided for blocking the pivotal movement of the element 14, when only the right hand or left hand manual is operated, as the case may be, that is, in accordance with whether or not the machine is to be operated with the right hand or left hand manual, or selectively operable switches may be provided for cutting out the right or the left hand manual and connecting the windings of the magnets 21, 22 in series with one or the other of the manually operated switches 31, or 32. The blocking means or the switches are located in a locked compartment accessible only to the foreman or some one in authority to change the operation of the machines to suit the conditions, as to the work being operated upon.

In some presses, as garment and laundry presses, the opening movement does not immediately follow the closing movement, as in punch presses, and the like, but on the other hand, the press remains closed until release mechanism is operated by the operator or automatically by a timer to permit the press to open.

In Figure 4 is shown a construction by which the press will remain closed without requiring

the operator to hold the manuals 29, 30 operated while the press is closed.

In Figure 4, the wiring diagram, in so far as the operation of the manuals is concerned, is generally the same as in Figures 2 and 3. 55 designates the cylinder of the motor of the press having a piston 56 therein, the rod 57 of which is connected to the motion transmitting mechanism of the press. The cylinder and piston corresponds to the cylinder and piston motor 4 (Figure 1). Motive fluid, as air, is supplied to the cylinder 55 through the pipe 10 leading from the control valve C, and when the control valve C is open, the piston is actuated on its power stroke or upwardly in Figure 4, thus closing the press. When the press is closed to a safety position, usually when the head is close to or in light contact with the coating pressing element, a moving part, here shown as the piston, of the machine actuates a mechanism for cutting out the manuals or taking the control away from the manuals and holding the control valve open, in order to hold the press closed, until the control valve is released either by the operator or by automatic release means.

In this embodiment of the invention, the control valve is held in its operated position when the press closes, by establishing a stick circuit for the solenoid 11 which operates the control valve, and movement of the piston on its power stroke closes the switch to establish the stick circuit. The stick circuit here shown is established through the windings of the electromagnets 21, 22. When the piston 56 travels a predetermined distance on its power stroke, it is here illustrated as contacting a sliding rod 58 which carries an arm 59 connected to a spring-pressed plunger 60 which operates a three-pole switch 61 having arms 62, 63, 64, coacting respectively with contacts 65, 66, 67. When the piston has been actuated a predetermined amount, it closes the circuit between the arm 64, contact 67; arm 63, contact 66; arm 62 and contact 65. The manually operated control switches in Figure 4 are the same as shown in Figures 2 and 3, and when both manually operated switches are closed, the current flows as follows: From wire 35, wire 44 through the switch 32, wire 41<sup>a</sup>, wire 69, through the closed disabling switch 28, wire 70 through the windings of the magnet 11, wire 71, switch 52, wire 73 to the return wire 40; and at the same time through wire 41<sup>a</sup>, windings of the magnet 22, wire 45 to the other line wire 40, and also from wire 35, switch 31, wires 37, 38 to the windings of the solenoid 21, and return wire 39 to the other wire 40 of the feed circuit.

Upon the closing of the three-pole switch by the operation of the piston 56, the solenoid 11 which operates the control valve C is held in its operated position when the manuals are released by a circuit established as follows: wires 35, 75, switch arm 64 and contact 67, wires 76, 68, 41<sup>a</sup>, windings of the magnet 22 and wire 45 to the other line wire 40, thus maintaining the magnet 22 energized, and also from wire 75 through wire 77, switch arm 63 and contact 66, wires 78, 38 to the windings of solenoid 21, thence through wire 39 to the line wire 40, thus maintaining the solenoid 21 energized. The maintaining of these two solenoids energized keeps the disabling switch 28 closed, so that the current passes from the wire 35 through the disabling switch 28, wire 70 to the windings of the sole-

noid 11, which actuates the control valve C, wire 71 to wire 79, contact 65, switch arm 62, wire 80, wire 73 to the line wire 40. Thus, by reason of the stick circuit established directly for the solenoids 21, 22, a stick circuit is established indirectly for the solenoid 11 which operates the control valve C, and holds the solenoid 11 energized to hold open the control valve C, when the piston 56 has traveled far enough to close the three-pole switch 61, and the operator releases the manuals 29, 30. The press may be opened by manually operating the three-pole switch 61 by depressing the same at 82.

What I claim is:

1. The combination with a member for controlling the operation of a machine, and a motor for operating the control member; of a two hand control for the motor comprising an element shiftable oppositely from central position, a pair of power operated motors connected to said element to act equally in opposite directions on said element when both are energized and hold said element in central position and to shift said element in one direction or the other out of central position when only one or the other of said motors is energized, a pair of manuals operable to effect the energization of the motors respectively of said pair, and a second disabling control for the control member of the machine, normally in operative position and shiftable out of operative position by the shifting of said element in either direction out of central position.

2. The combination with a control member for controlling the operation of a machine and a motor for operating the control member; of a two hand control for the motor comprising an element shiftable oppositely from central position, a pair of manuals, means controlled thereby for shifting said element in one direction or the other when one or the other of the manuals only is operated and to act equally on said element when both manuals are operated substantially simultaneously, and means operated by the shifting of said element by one or the other of the manuals for rendering the motor for operating the machine control member inoperative.

3. The combination with a control member for controlling the operation of a machine and an electro-responsive motor for operating the control member; of a two hand control for the motor comprising an element shiftable oppositely from central position, a pair of electro-responsive motors connected to said element to act equally and in opposite directions on the same when both are energized and hold said element in central position, and to shift said element in one direction or the other from central position, when one or the other only of said motors is energized, electric circuits for the motors, a pair of manuals, and switches operated thereby in the circuits for the motors of the pair respectively, the switches being normally open, the circuits for one of the manually operated switches being also connected in a branch circuit to the motor for the machine control member, the branch circuit also having a normally closed switch therein, and means operable by the shifting of said element out of central position for opening the last named switch.

4. The combination with a control member for controlling the operation of a machine and an electro-responsive motor for operating the control member; of a two hand control for the motor comprising a pivoted element shiftable laterally in opposite directions about its pivot from central position, a pair of oppositely acting elec-

tro-magnets, the movable members of which are connected to said element, electric circuits for the motor and the electro-magnets, and a pair of manually operable switches in the electro-magnet circuits respectively, the circuit for the motor including a line in circuit with one of the manually operated switches and having a normally closed disabling switch therein operable to open position by the pivotal movement of said element in one direction or the other out of central position.

5. The combination with a control member for controlling the operation of a machine and an electro-responsive motor for operating the control member; of a two hand control for the motor comprising a pivoted element shiftable laterally in opposite directions about its pivot from central position, a pair of oppositely acting electro-magnets, the movable members of which are connected to said element, electric circuits for the motor and the electro-magnets, and a pair of manually operable switches in the electro-magnet circuits respectively, the circuit for the motor including a line in circuit with one of the manually operated switches and having a normally closed disabling switch therein, a spring-pressed plunger coacting with said switch and with said element and operable by the pivotal movement of said element laterally in one direction or the other to open the disabling switch.

6. The combination with a member for controlling the operation of a machine, and a motor for operating the control member; of a two hand control for the motor comprising an element shiftable oppositely from central position, a pair of power operated motors connected to said element to act equally in opposite directions on said element when both are energized and hold said element in central position and to shift said element in one direction or the other out of central position when only one or the other of said motors is energized, a pair of manuals operable to effect the energization of the motors respectively of said pair, and a second disabling control for the control member of the machine, normally in operative position and shiftable out of operative position by the shifting of said element in either direction out of central position, and means to momentarily delay the shifting of said element laterally upon the operation of either one of the pair of motors.

7. The combination with a member for controlling the operation of a machine, and a motor for operating the control member; of a two hand control for the motor comprising an element shiftable oppositely from central position, a pair of power operated motors connected to said element to act equally in opposite directions on said element when both are energized and hold said element in central position and to shift said element in one direction or the other out of central position when only one or the other of said motors is energized, a pair of manuals operable to effect the energization of the motors respectively of said pair, and a second disabling control for the control member of the machine, normally in operative position and shiftable out of operative position by the shifting of said element in either direction out of central position, and means to momentarily delay the shifting of said element laterally upon the operation of either one of the pair of motors, said means including an inert weight movable by the pivotal movement of said element.

8. The combination with a member for con-

trolling the operation of a machine, and a motor for operating the control member; of a two hand control for the motor comprising an element shiftable oppositely from central position, a pair of power operated motors connected to said element to act equally in opposite directions on said element when both are energized and hold said element in central position and to shift said element in one direction or the other out of central position when only one or the other of said motors is energized, a pair of manuals operable to effect the energization of the motors respectively of said pair, and a second disabling control for the control member of the machine, normally in operative position and shiftable out of operative position by the shifting of said element in either direction out of central position, and means to momentarily delay the shifting of said element laterally upon the operation of either one of the pair of motors, said means comprising dash pots operable by the pivotal movement of said element in either direction from central position.

9. The combination with a control member for controlling the operation of a machine and an electro-responsive motor for operating the control member; of a two hand control for the motor comprising an element shiftable laterally in opposite directions from central position, a pair of oppositely acting electro-magnets, the movable members of which are connected to said element, electric circuits for the motor and the electro-magnets, and a pair of manually operable switches in the electro-magnet circuits respectively, the circuit for the motor including a line in circuit with one of the manually operated switches and having a normally closed disabling switch therein operable to open position by the pivotal movement of said element in one direction or the other out of central position, and means operable to retard momentarily the lateral shifting movement of said element upon the energization of only one electro-magnet.

10. The combination with a control member for controlling the operation of a machine and an electro-responsive motor for operating the control member; of a two hand control for the motor comprising an element shiftable laterally in opposite directions from central position, a pair of oppositely acting electro-magnets, the movable members of which are connected to said element, electric circuits for the motor and the electro-magnets, a pair of manually operable switches in the electro-magnet circuits respectively, the circuit for the motor including a line in circuit with one of the manually operated switches and having a normally closed disabling switch therein operable to open position by the lateral shifting movement of said element in one direction or the other out of central position, and a normally open switch in the circuit for the motor in series with the disabling switch and operable to closed position by the operation of the other manually operated switch.

11. The combination with a control member for controlling the operation of a machine and an electro-responsive motor for operating the control member; of a two hand control for the

motor comprising an element shiftable laterally in opposite directions from central position, a pair of oppositely acting electro-magnets, the movable members of which are connected to said element, electric circuits for the motor and the electro-magnets, a pair of manually operable switches in the electro-magnet circuits respectively, the circuit for the motor including a line in circuit with one of the manually operated switches and having a normally closed disabling switch therein operable to open position by the lateral shifting movement of said element in one direction or the other out of central position, and a normally open releasable switch means operated to closed position by the machine for holding the circuits through the magnets closed after the manually operable switches have been released.

12. The combination with a control member for controlling the operation of a machine and an electro-responsive motor for operating the control member; of a two hand control for the motor comprising an element shiftable laterally in opposite directions from central position, a pair of oppositely acting electro-magnets, the movable members of which are connected to said element, electric circuits for the motor and the electro-magnets, a pair of manually operable switches in the electro-magnet circuits respectively, the circuit for the motor including a line in circuit with one of the manually operated switches and having a normally closed disabling switch therein operable to open position by the lateral shifting movement of said element in one direction or the other out of central position, a normally open switch in the circuit for the motor operable to closed position by the operation of the other manually operated switch, and normally open, manually releasable switch means in the circuits of the electro-magnets operable to closed position by the machine during its operating movement, to hold the electro-magnets energized when the manually operable switches are released.

13. The combination with a control member for controlling the operation of a machine and an electro-responsive motor for operating the control member; of a two hand control for the motor comprising an element shiftable laterally in opposite directions from central position, a pair of oppositely acting electro-magnets, the movable members of which are connected to said element, electric circuits for the motor and the electro-magnets, a pair of manually operable switches in the electro-magnet circuits respectively, the circuit for the motor including a line in circuit with one of the manually operated switches and having a normally closed disabling switch therein operable to open position by the lateral shifting movement of said element in one direction or the other out of central position, and a stick circuit for the motor having normally open switch means therein operable to closed position by the operation of the machine, to hold the control member in its operated position after the pair of manually operable switches are released.

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