May 13, 1941. C. P. FELDHAUSEN 2,241,589

CONTROLLER FOR MOTOR DRIVEN PRINTING PRESSES AND THE LIKE

Filed Nov. 21, 1938

Fig. 1

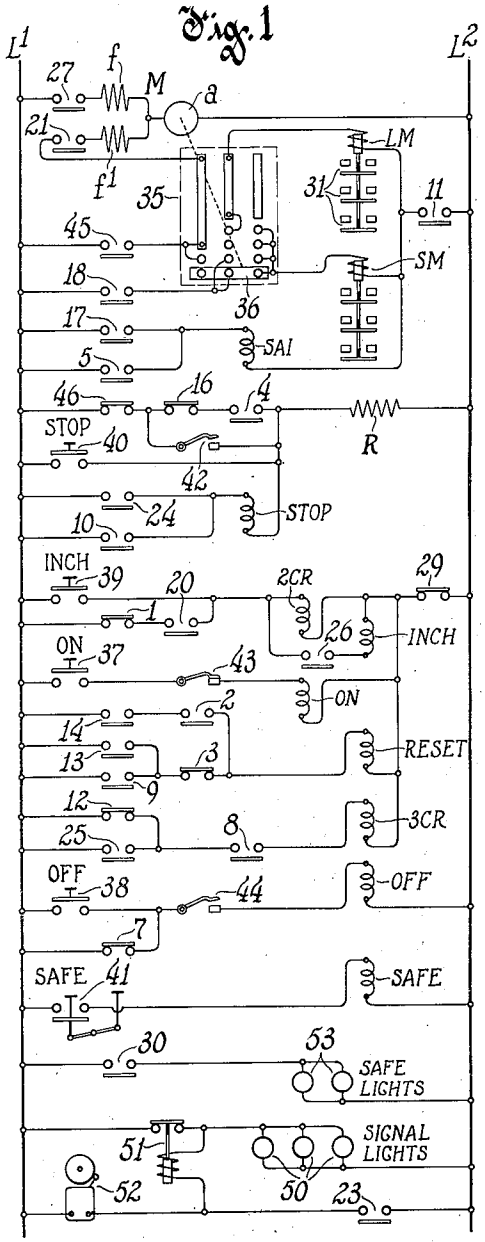


Fig. 2

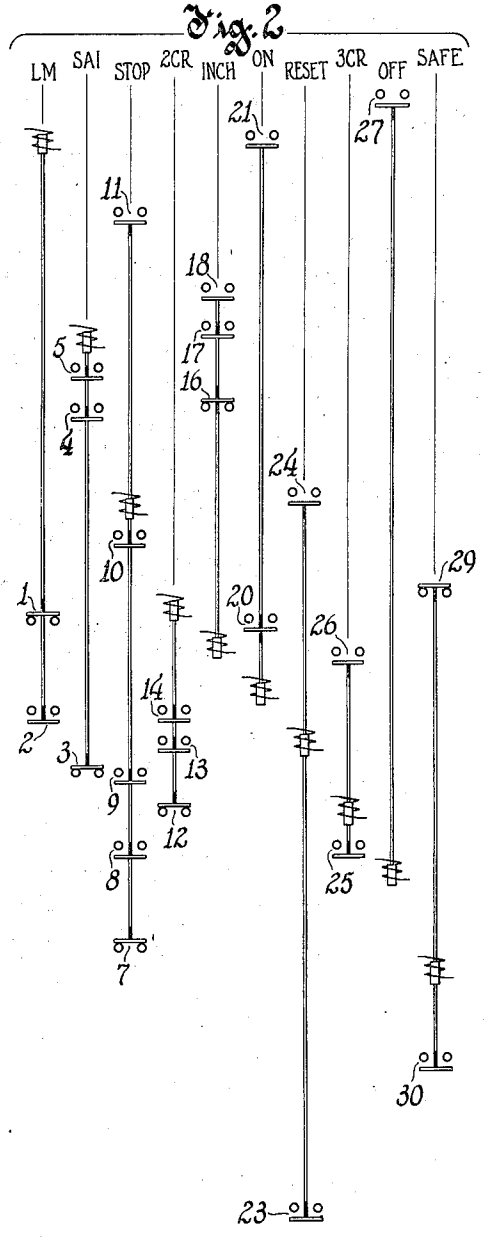
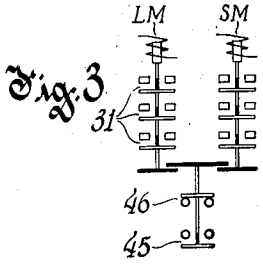


Fig. 3



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CONTROLLER FOR MOTOR DRIVEN PRINTING PRESSES AND THE LIKE

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14 Claims. (Cl. 177—311)

This invention relates to controllers for motor driven printing presses and other machines, and more particularly to controllers embodying signaling means.

Controllers for large printing presses are commonly required to afford signaling sufficiently in advance of starting, whether for inching or running, to enable the workmen who may be working on the press to protect themselves. Only a short signaling period is necessary and it is often important to avoid needless delay in starting. Also it is highly desirable that the press be set in operation immediately following a given manipulation of the controller so that the operator may inch with greater facility and accuracy than where the starting manipulation of the controller only becomes effective after the lapse of a predetermined time interval provided for safety.

The present invention has among its objects to provide a controller affording the protection aforementioned and at the same time affording the aforementioned and other desirable operating characteristics.

Another object is to provide a controller not only having improved operating characteristics but having also relative simplicity of construction and of wiring.

Another object is to provide a controller affording the aforementioned safe feature and improved operating characteristics as functions of manipulation in a convenient and natural way of certain of the push button switches now commonly employed in printing press controllers.

Other objects and advantages of the invention will hereinafter appear.

In accordance with the present invention as applied to a printing press drive having a relatively small motor for inching and slow speed running and a relatively large motor for high speed running, it is proposed to equip the controller with the usual control instrumentalities including separate push button switches for inching and running. In accordance with a preferred form of the invention it is proposed to provide means whereby when the press is stopped after inching or running the inching and running push button switches are rendered ineffective for starting when first depressed, but when first depressed are effective independently of one another to cause operation of signaling means preferably both visual and audible. It is further proposed to have such signaling means remain effective independently of the depressed push button and then to enable immediate starting by releasing and again depressing the same push button for inching or running, according to the selection of push buttons. It is proposed to have the signaling terminate with starting of the press, subject, however, to service at will during running by depressing the inch button during such period as signaling may be desired. With such provision it will be apparent that control for inching and running may be effected through the instrumentalities heretofore commonly employed therefor and in the same manner except that the inch button or the on button, as the case may be, must be depressed twice, starting of the press immediately following the second depression of the button. Of course recitation of these specific proposals is not to be regarded as limiting the present invention thereto or as setting forth in full the desirable operating characteristics contemplated.

One embodiment of the invention is illustrated in the accompanying drawing, the controller therein shown being designed for a printing press having a double motor drive such as that aforementioned, and this controller will now be described, it being understood that it is susceptible of various modifications without departing from the scope of the appended claims.

In the drawing,

Figure 1 is an across-the-line diagram of the controller,

Fig. 2 is a chart showing relays and contacts of Fig. 1, the corresponding coils and contacts of these two figures being in horizontal alignment, and Fig. 2 showing vertically aligned each coil and its respective contacts, and

Fig. 3 shows schematically certain switches of Fig. 1 and associated contacts also shown in Fig. 1 but not in Fig. 2.

First referring to Fig. 2, it will be observed that the controller involves among other switches a large motor switch LM and a number of relays, having contacts as follows:

LM having normally closed contacts 1 and normally open contacts 2.
SAI having normally closed contacts 3 and normally open contacts 4 and 5.
"Stop" having normally closed contacts 7 and normally open contacts 8, 9, 10 and 11.
2CR having normally closed contacts 12 and normally open contacts 13 and 14.
"Inch" having normally closed contacts 16 and normally open contacts 17 and 18.
"On" having normally open contacts 20 and 21.
"Reset" having normally open contacts 23 and 24.
3CR having normally open contacts 25 and 26.
"Off" having normally open contacts 27.
"Safe" having normally closed contacts 29 and normally open contacts 30.

The aforementioned contacts of the switch LM are merely auxiliary contacts, said switch being shown in Fig. 1 as having main contacts 31 to control the circuit of the large motor of the press drive, and Fig. 1 shows a switch SM of like type to control the circuit of the small motor of the

press drive. As will be understood, the press drive may comprise either D. C. or A. C. motors, whereas it is assumed that the motors are A. C. and of the three phase type, wherefore both switches are shown as of the triple pole type.

The system illustrated comprises in addition to the aforementioned switches and relays a crosshead type controller **35** to be operated by a pilot motor M having an armature *a* and series field windings *f* and f^1 to be excited selectively to effect reverse operations of the motor and hence reverse operations of the crosshead **36** of controller **35**. Use of such a crosshead type of controller for a double motor drive for printing presses whether A. C. or D. C. has been common practice for such a long period that both the motor connections and resistances have been omitted, the crosshead controller being shown only as provided with those connections required for the LM and SM switches and the pilot motor. As will be understood, the crosshead has a position—shown as its extreme down position—in which it enables the SM switch to be energized for inching, whereas said crosshead is movable from such position through the medium of the pilot motor M to other positions first to establish running connections for the small motor and then to start the large motor and to regulate the speed of the latter.

The pilot motor M is controllable for shifting of the crosshead **36** to selected positions through the medium of the aforementioned "on" and "off" relays which in turn are controllable by "on" and "off" push button switches **37** and **38** shown and so labeled in Fig. 1.

Further referring to Fig. 1, the same also shows an "inch" push button switch **39**, a "stop" push button switch **40** and a "safe" push button switch **41**, which respectively control the correspondingly marked relay coils of Figs. 1 and 2. Fig. 1 further shows the usual limit switches **42, 43, 44** for the crosshead controller and contacts **45** and **46**.

The contacts **45** and **46** are operatively associated with the switches SM and LM as depicted in Fig. 3. The contacts **45** are normally open while contacts **46** are normally closed and are jointly operable by either switch SM or switch LM. The arrangement is such that response of either switch closes contacts **45** and opens contacts **46**.

The signaling means shown in Fig. 1 comprises lamps **50** controlled by a flasher relay **51**, and also a bell **52**. The flasher and the bell are controlled by contacts of the "reset" relay.

Lamps **53** provide a safe indication, these lamps being controlled by the "safe" relay.

To inch the press when the crosshead **36** is in the position shown and when all of the switches and relays are deenergized, the "inch" button **39** is depressed, released, again depressed and again released. The operation is very simple and expeditious, but so many circuits are involved that the cycle will be described in four steps:

(*a*) When the "inch" push button switch **39** is depressed it connects the coil of relay **2CR** across lines L^1 and L^2, through the normally closed contacts **29** of the "safe" relay. The relay **2CR** is thus rendered responsive and through its contacts **13** connects the coil of the "reset" relay across lines L^1—L^2, through the normally closed contacts **3** of relay SAI and the normally closed contacts **29** of the "safe" relay. The "reset" relay is thus rendered responsive and through its contacts **23** completes the circuit of the bell **52** and of the relay **51** for signaling. Continued signaling independent of the "inch" push button is provided for by reason of the fact that the "reset" relay upon responding energizes the "stop" relay which maintains itself and also maintains the circuit of the "reset" relay. More specifically the coil of the "stop" relay is connected across lines L^1—L^2 through resistance R by the contacts **24** of the now energized "reset" relay and the "stop" relay in responding completes a maintaining circuit for itself through its contacts **10** and a maintaining circuit through its contacts **9** for the "reset" relay. Thus the "inch" button may be released while the signaling continues.

(*b*) Release of the "inch" button interrupts the circuit of the coil of relay **2CR** and said relay through its contacts **12** connects the coil of relay **3CR** across lines L^1—L^2 through the contacts **8** of the now closed "stop" relay and through the contacts **29** of the "safe" relay. The relay **3CR** is thus rendered responsive and through its contacts **26** connects the coil of the "inch" relay to the "inch" push button switch **39**.

(*c*) The second depression of the "inch" push button switch thus connects the coil of the "inch" relay across lines L^1—L^2 through the contacts **26** of relay **3CR** and contacts **29** of the "safe" relay. This renders the "inch" relay responsive and its contacts **18** connect the coil of switch SM across lines L^1—L^2 through the contacts **11** of the now closed "stop" relay. Switch SM upon responding starts the small motor for inching subject to stopping by release of the inch push button switch. In the meantime the "inch" relay through its contacts **17** has connected the coil of relay SAI across lines L^1—L^2 and said relay SAI through its contacts **5** has established for itself a maintaining circuit. Also the relay SAI in responding has through its contacts **3** dropped out the "reset" relay, stopping signaling.

(*d*) When the "inch" button is released following an inching operation it deenergizes the "inch" relay which in turn deenergizes the SM switch, thus effecting disconnection of the small motor. Also the "inch" relay in dropping out effects through reclosure of its contacts **16** short-circuiting of the coil of the "stop" relay, this short-circuit extending through the now closed contacts **4** of relay SAI, contacts **16** of said "inch" relay and contacts **46** which are reclosed upon opening of the SM switch. Hence the "stop" relay is caused to drop out, and this relay through its contacts **11** disconnects the coil of relay SAI and through its contacts **8** disconnects the coil of relay **3CR**. Thus to effect further inching of the press the aforedescribed cycle must be repeated.

To run the press the "on" push button switch **37** is depressed, released, again depressed and again released when the desired speed setting has been obtained and this cycle also will be described in steps, it being assumed that the several switches and relays occupy the respective positions illustrated in Fig. 1:

(*a*) Depression of the "on" push button switch **37** connects the coil of the "on" relay across lines L^1—L^2 through limit switch **43** and the normally closed contacts **29** of the "safe" relay. The "on" relay is thus rendered responsive and through its contacts **20** connects the relay **2CR** across lines L^1—L^2 through the normally closed contacts **1** of the switch LM and the contacts **29** of the "safe" relay. The relay **2CR** then functions as hereinbefore described to connect in circuit the coil of the "reset" relay, said "reset"

relay upon responding completing the circuit of the signal bell 52 and the flasher relay 51. Also as in the first step of the inching cycle the "reset" relay energizes the "stop" relay which maintains itself and the "reset" relay for continued signaling independent of the "on" push button switch.

(b) Release of the "on" push button switch disconnects the coil of the "on" relay, and said relay in dropping out disengages its contacts 20 to disconnect the coil of relay 2CR. Relay 2CR in dropping out functions through its contacts 12 to connect the coil of relay 3CR across lines L^1—L^2 through the now closed contacts 8 of the "stop" relay and the contacts 29 of the "safe" relay. Relay 3CR upon responding establishes a maintaining circuit for itself through its contacts 25.

(c) Depression for a second time of the "on" push button switch energizes the "on" relay as previously described, and said relay through its contacts 20 completes the circuit of the coil of the "inch" relay through the now closed contacts 26 of relay 3CR. This closes the switch SM to start the press and the pilot motor M is started by completion of a circuit jointly by the contacts 21 of the "on" relay and the contacts 45 closed upon response of the switch SM. The pilot motor is thus caused to drive the crosshead 36 upwardly while the "on" push button switch is held depressed. The "inch" relay again energizes the relay SAI as aforedescribed, which results in discontinuing signaling. As the crosshead moves upwardly the switch SM drops out and the switch LM is energized to start the large motor and to maintain the contacts 45 closed. Further upward movement of the crosshead increases the speed of the large motor, the "on" push button switch being released when the desired speed has been obtained. To slow down the press the "off" push button switch is depressed to energize the "off" relay which upon responding functions through its contacts 27 to complete the circuit of the pilot motor M for reverse operation. The reverse operation of the pilot motor to slow down the press may be terminated by releasing the "off" push button switch 38.

To stop the press when running the "stop" push button switch 40 is depressed, short-circuiting the coil of the "stop" relay and causing it to drop out. The "stop" relay in dropping out interrupts the common connection for the coils of the switches SM and LM and the coil of relay SAI, with the result that the various switches and relays again assume the position shown in Fig. 1.

Signaling during operation of the press by the large motor may be effected at any time by depressing the "inch" button. This energizes the coil of the "reset" relay through contacts 14 of the relay 2CR and the contacts 2 of the switch LM, the "reset" contacts 23 being thus closed to complete the signal circuit which remains closed until the "inch" button is released to deenergize the relay 2CR, which in turn deenergizes the "reset" relay.

When at rest the press may be made safe by closing the push button switch 41. This connects the coil of the "safe" relay directly across lines L^1—L^2 and response of said relay opens at its contacts 29 the common connection for the "inch" relay and the "on" relay. Accordingly the press cannot be restarted until the switch 41 is re-opened. When the "safe" relay responds it completes through its contacts 30 the circuit of the safe lights 53.

Pushing of the "safe" button with the press in operation prevents further acceleration in press speed for the energizing circuit of the "on" relay is then opened at the contacts 29 of the safe relay.

When the "stop" relay drops out while the crosshead 36 occupies a position other than that depicted in Fig. 1 said relay through its contacts 7 connects in circuit the coil of the "off" relay through limit switch 44. This effects return of the crosshead to the position shown, whereupon limit switch 44 opens to deenergize the "off" relay.

If after the "inch" button or the "on" button is depressed for signaling it is decided not to inch or run, as the case may be, signaling may be stopped by depressing the "stop" button or the "safe" button. Depression of either of the latter buttons restores the relays to the positions shown whereby the press cannot thereafter be started without double operation of the "inch" button or the "on" button.

What I claim as new and desire to secure by Letters Patent is:

1. In a motor controller, the combination with starting and stopping means including a manually operable switch and means functioning on stopping after inching or running to require said switch to be twice operated to effect starting thereby, of signaling means responsive to the first operation of said manual switch.

2. In a motor controller, the combination with starting and stopping means including a manually operable push button switch and means functioning on stopping after inching or running to require said switch to be depressed, released and again depressed to effect starting thereby, of signaling means responsive to said switch when first depressed.

3. In a motor controller, the combination with starting and stopping means including a manually operable switch and means functioning on stopping after inching or running to require said switch to be twice operated to effect starting thereby, of signaling means controlled by the former means for response to the first operation of said switch and for continued action pending the second operation of said switch.

4. In a motor controller, the combination with starting and stopping means including a push button operated switch and means requiring said switch to be depressed, released and again depressed to effect starting thereby, of signaling means controlled by the first mentioned means and affording signaling when said switch is first depressed and until said switch is released and again depressed, said first mentioned means affording automatic arrest of the action of said signaling means.

5. In a motor controller, the combination with starting and stopping means including a manually operable inching switch and means requiring said switch to be twice operated to effect starting for each step of inching, of signaling means controlled by said first mentioned means to afford signaling when said switch is first operated and until said switch is again operated.

6. In a motor controller, the combination with starting and stopping means including a push button switch for inching and means requiring said switch to be depressed, released and again depressed to effect starting for each step of inching, of signaling means controlled by said first

mentioned means to afford signaling when said switch is first depressed and until said switch is released and again depressed, said first mentioned means providing for automatic arrest of the action of said signaling means upon completion of the starting cycle.

7. In a motor controller, the combination with starting and stopping means including a manually operable switch for inching, a separate manually operable switch for running and means whereby starting may be effected by either of said switches but only when twice operated, of signaling means controlled by said first mentioned means for response upon first actuation of either of said switches to afford signaling pending completion of the starting cycle.

8. In a motor controller, the combination with starting and stopping means including a push button switch for inching, a separate push button switch for running and means to render either of said switches effective for starting but only after it has been depressed, released and again depressed, of signaling means controlled by said first mentioned means for response upon first depression of either of said switches and for arrest of its action upon completion of the starting cycle.

9. In a motor controller, the combination with starting and stopping means including a manual switch to direct starting and means functioning on stopping to render said switch ineffective for starting until it is twice actuated but rendering it effective at once on its second actuation, of means affording signaling when said switch is first actuated.

10. In a motor controller, the combination with starting and stopping means including a manual switch to effect inching, a separate manual switch to effect running, and means functioning on stopping to render each of said switches ineffective for starting until it is twice actuated, but rendering it effective at once on its second actuation, of means affording signaling when either of said switches is first actuated.

11. In a motor controller, in combination, a manual switch and starting and stopping means responsive to said switch to start and stop for inching, and including means functioning on stopping to render said switch ineffective for starting until it is twice actuated, but rendering it effective at once on its second actuation.

12. In a motor controller, in combination, separate manual switches and starting and stopping means responsive to one of said switches to start and stop for inching and responsive to another of said switches to effect running, said starting and stopping means including means functioning on stopping to render each of said switches ineffective for starting until it is twice actuated, but rendering each effective at once on its second operation.

13. In a motor controller, in combination separate push button switches and starting and stopping means responsive to one of said switches to start and stop for inching and responsive to another of said switches to effect running, said starting and stopping means including means functioning on stopping to render each of said push button switches ineffective for starting until it is depressed, released and again depressed, but rendering each effective at once on its second depression, and means affording signaling when either of said switches is first depressed.

14. In a controller for a double motor drive, in combination manual control means, starting and stopping means responsive to said manual means to effect inching or running selectively, and including means functioning on stopping to render said manual means ineffective for starting until twice actuated, but rendering said manual means effective at once on the second actuation thereof, and means affording signaling upon first actuation of said manual means whether for inching or running.

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