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T. H. RODMAN

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MOTOR CONTROLLER

Filed April 27, 1922

3 Sheets-Sheet 1

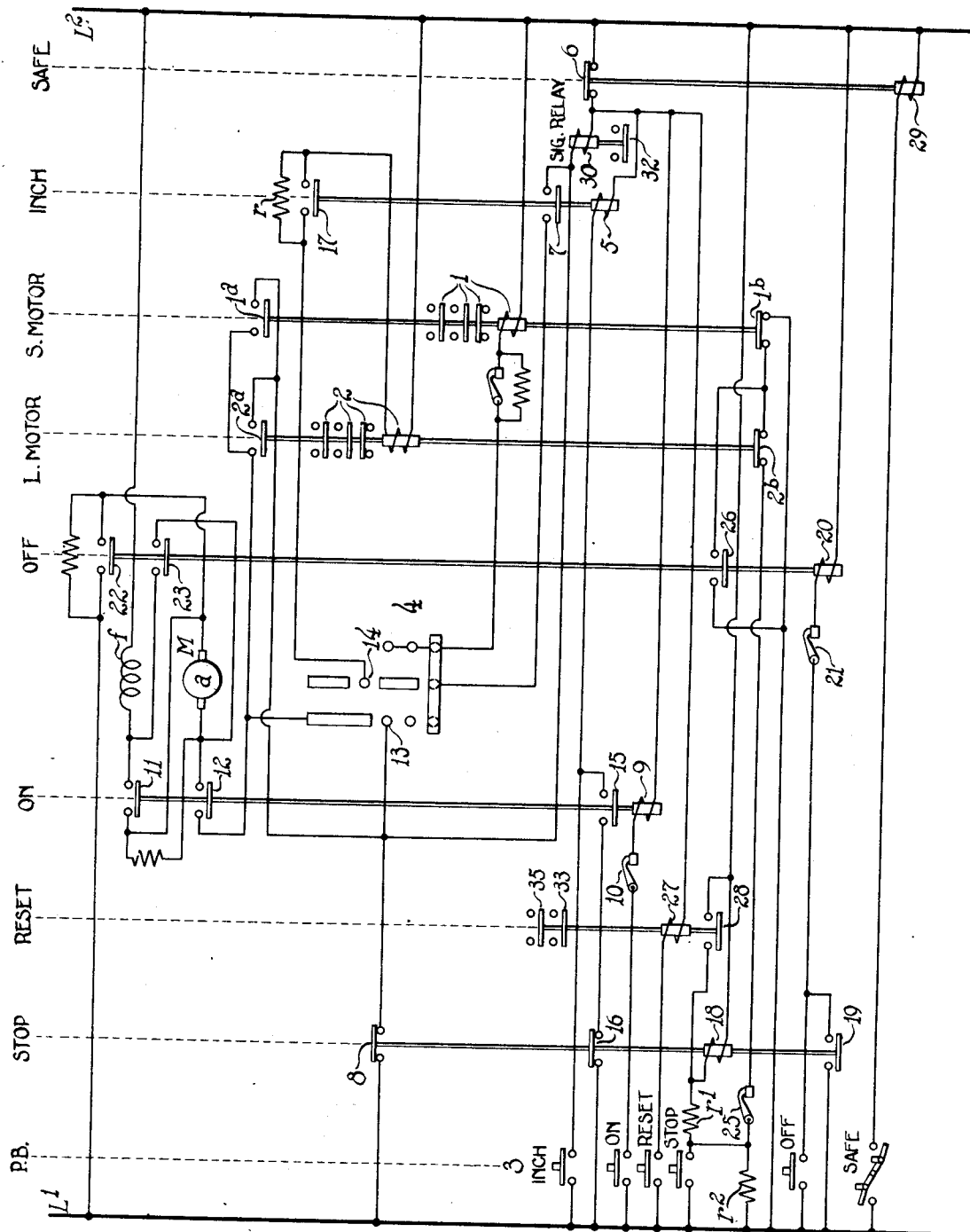


Fig. 1

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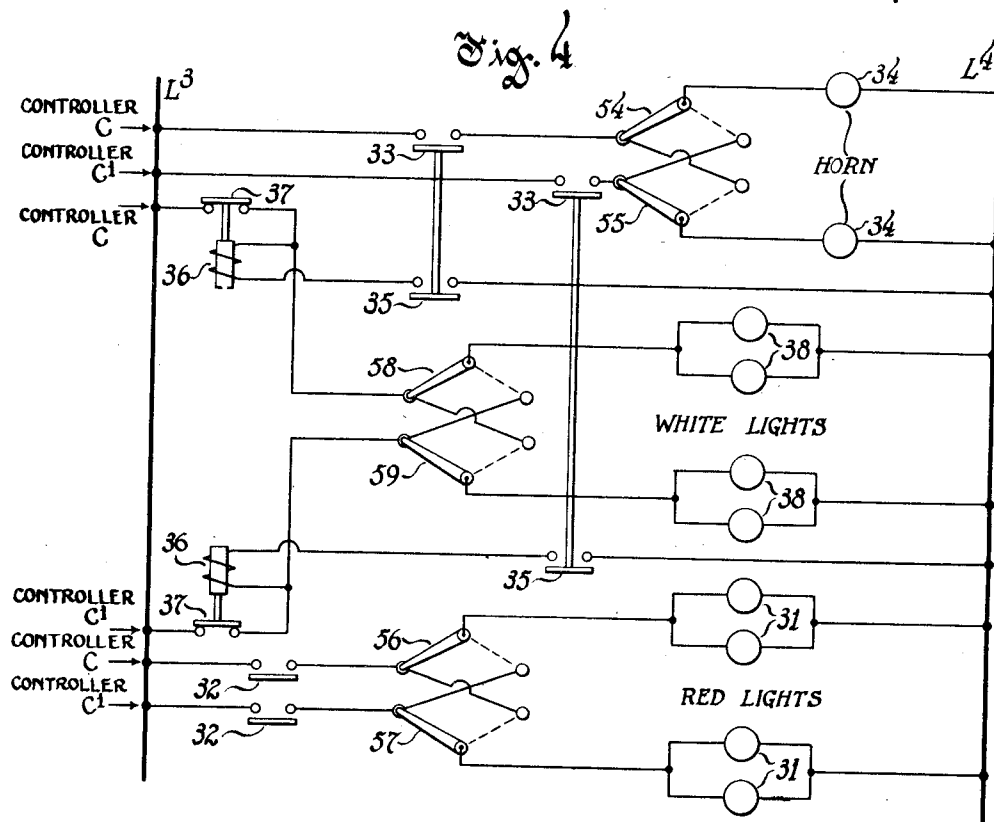
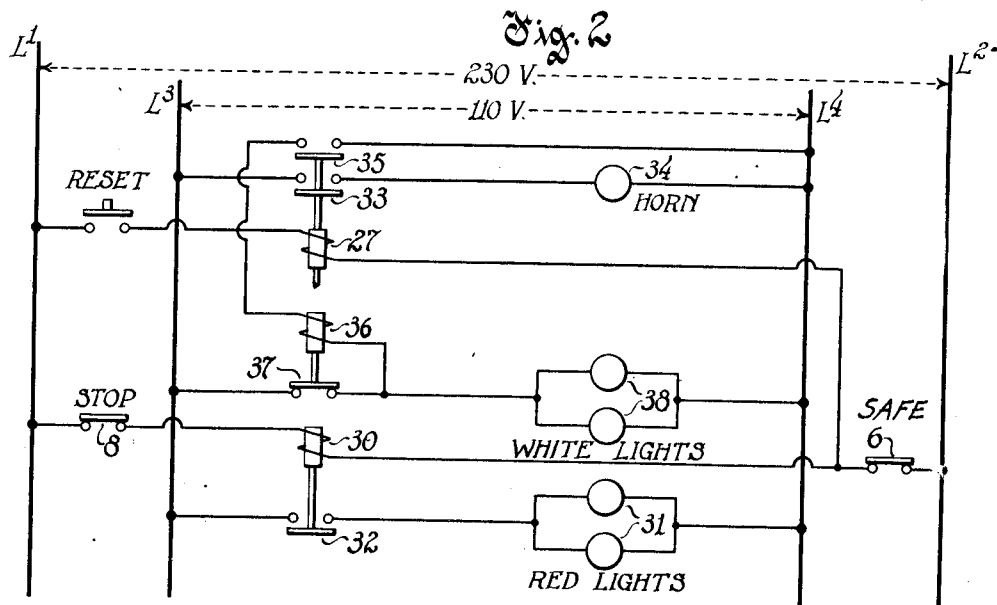
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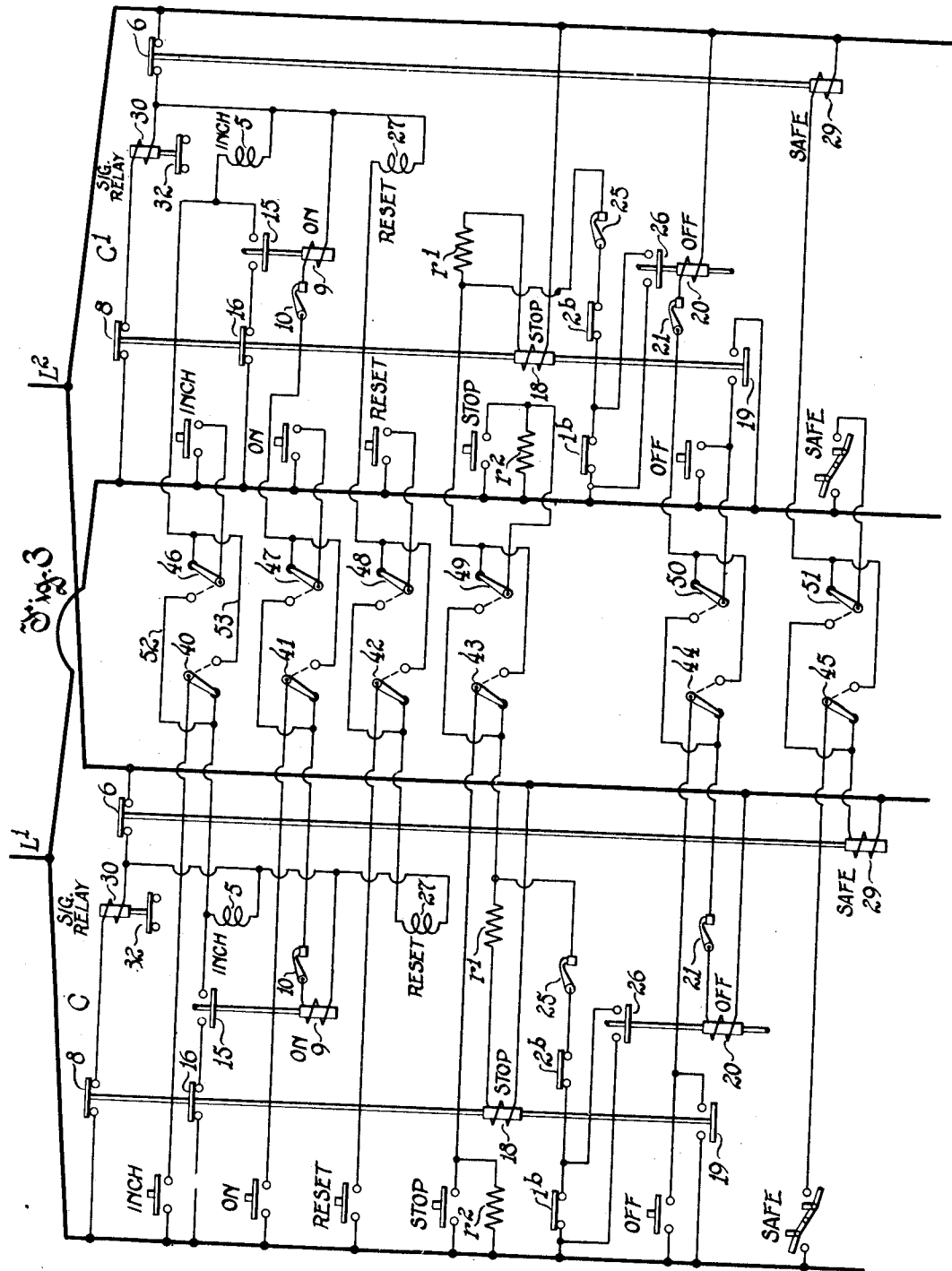
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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

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MOTOR CONTROLLER

Application filed April 27, 1922. Serial No. 556,939.

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

Certain features of the present invention are disclosed in my Patent No. 1,422,134, dated July 11, 1922, and to the extent of these features the present application is a continuation of the application for said patent which was copending herewith.

While not limited thereto the present invention is particularly applicable to controllers for printing presses and to controllers of that type embodying a so-called reset switch requiring manual operation preparatory to starting, to provide for additional safety.

An object of the invention is to provide a controller with improved signaling means to give warning when the press or other driven machine has been prepared for starting.

Another object is to provide a controller with means providing for flashing, for signaling purposes, the lamps employed for illuminating the press or other machine, the flashing of such lamps preferably being continued throughout the period of manual retention of the reset switch or other instrumentality employed to prepare for starting.

Another object is to provide a controller with signaling means in addition to the aforementioned means to afford an audible warning.

Another object is to provide a controller with means in addition to the aforementioned means to give warning throughout the interval between operation of the reset switch or other instrumentality employed to prepare the press or other machine for starting and operation of the instrumentality employed to effect stopping.

Another object is to provide commutable control means for a press or other machine comprising a plurality of sections to be driven in different combinations wherein the signaling means for the various sections may be readily rendered independent of one another or co-ordinated according to operating conditions.

Various other objects and advantages of the invention will hereinafter appear.

One embodiment of the invention is diagrammatically illustrated in the accompanying drawings which will now be described it being understood that the embodiment illustrated is susceptible of various modifications without departing from the scope of the appended claims.

Referring to the drawings,

Figure 1 diagrammatically illustrates a single controller embodying a portion of the signaling means to be employed;

Fig. 2 diagrammatically illustrates in further detail the signaling system for a single controller.

Fig. 3 diagrammatically illustrates portions of two controllers of the type shown in Fig. 1 together with certain circuit commutating means therefor; and

Fig. 4 diagrammatically illustrates two signal systems of the type illustrated in Fig. 2, one for each of the two controllers shown in Fig. 3 and certain circuit commutating means for such circuit systems.

The controller shown in Fig. 1 is of a conventional type now employed for printing presses having a so-called double motor drive. Such drive includes a small motor for starting and inching and a large motor for high speed operation and the controller illustrated comprises electro-responsive switches 1 and 2 to control such motors respectively in any of the well known ways.

Switches 1 and 2 are controllable by a push button control station 3 through the medium of certain relays hereinafter described and a controller 4 of the crosshead type driven by a pilot motor M having an armature *a*, and a series field winding *f*. The controller 4 is of a well known type the crosshead being operable in reverse directions by reversal of motor M and the crosshead when in the position illustrated rendering both switches 1 and 2 unresponsive, assuming the relays to be in the positions illustrated. However, the crosshead in this position enables completion of the energizing circuit of switch 1 for operation of the small motor for inching but subject to de-energization upon release of the inching instrumentality. On the other hand when the crosshead is set

in operation it first completes the energizing circuit of switch 1 and thereafter completes the energizing circuit of switch 2 interrupting the energizing circuit of switch 1 as will be apparent from the diagram.

The aforementioned relays have rather involved circuit connections and in order to simplify illustration of such connections the several contacts and operating winding of each relay have been separated but all contacts of each relay together with the operating winding thereof have been aligned vertically under a legend denoting the function of such relay. Also the contacts have been illustrated to indicate the character and normal positions thereof.

The control station 3 includes a separate control switch for the winding of each of the aforementioned relays, each control switch bearing the legend applied to its respective relay.

While the operation of the controller will be obvious the same will be nevertheless briefly described. Depression of the inch switch connects the winding 5 of the inch relay across lines L' and L^2 through the normally closed contacts 6 of the safe relay and said inch relay upon responding engages its main contacts 7 to complete the energizing circuit of the small motor switch 1. This circuit extends from line L' through the normally engaged auxiliary contacts 8 of the stop relay to and through the contacts 7 of the inch relay and thence through the crosshead of controller 4 to and through the winding of switch 1 to line L^2 . Switch 1 thereupon responds for inching subject to de-energization upon release of the inch button.

Depression of the on button connects the winding 9 of the on relay across the line through a limit switch 10 and the safe relay, and said on relay upon responding engages its normally disengaged contacts 11 and 12 to complete the circuit of pilot motor M. Contacts 12 are connected to line L' through contacts 1^a of small motor switch 1 and contacts 8 of the stop relay, the small motor switch being energized by depression of the on button through the medium of the inch relay as hereinafter set forth. When the crosshead reaches contact 13 small motor switch 1 is maintained energized independently of the on button and further movement of the crosshead to engage contact 14 connects the winding of large motor switch 2 across the line through the contacts 8 of the stop relay, at the same time interrupting the maintaining circuit of switch 1. The large motor switch upon responding engages its contacts 2^a to parallel contacts 1^a of switch 1.

Response of on relay energizes the inch relay by engagement of its contacts 15 to thereby connect the winding of said relay to line L' through the contacts 16 of the stop

relay. The inch relay thereupon responds to energize small motor switch 1 as described and through its contacts 17 short circuits a resistance normally in circuit with the winding of switch 2 to protect the latter switch. However, upon de-energization of the on relay by release of the on button the inch relay is de-energized to effect reinclusion of resistance r .

The stop button when depressed connects the winding 18 of the stop relay across lines L' and L^2 through a protective resistance r' and said relay upon responding disengages its contacts 8 to deenergize the active motor switch. Also response of the stop relay effects engagement of its main contacts 19 to connect the winding 20 of the off relay across the line through a limit switch 21 and the off relay upon responding effects engagement of its main contacts 22 and 23 to complete the energizing circuit of the pilot motor for reverse operation of the latter to restore the crosshead to the position illustrated. The off relay is thereupon de-energized by its associated limit switch 21 while the stop relay remains energized, its push button switch being paralleled by resistance r^2 to provide a maintaining circuit therefor.

Also the stop button is paralleled by a circuit including contacts 1^b and 2^b of the motor switches 1 and 2 respectively and a limit switch 25 all in series whereby release of both motor switches assuming closure of limit switch 25 effects energization of the stop relay. Further the contacts 1^b of the small motor switch 1 are paralleled by contacts 26 of the off relay whereby response of the off relay at a time when the large motor switch is de-energized and the limit switch 25 is closed will also effect energization of the stop relay.

Manifestly when the stop relay is energized as described it must be de-energized to prepare the controller for restarting and this is accomplished by depression of the reset button which connects the winding 27 of the reset relay across the line through the safe relay, said reset relay thereupon responding to engage its contacts 28 to short-circuit the winding 18 of the stop relay. The stop relay upon release thereof permits restarting as above set forth.

Depression of the off button provides for energization of the off relay at will connecting the winding thereof across the line through limit switch 21.

The safe switch of the control station which is normally open may be closed to connect the winding 29 of the safe relay across the line for response of said relay to disengage its normally engaged contacts 6. This renders the inch, on and reset buttons together with their relays ineffective pending de-energization of the safe relay.

The controller shown in Fig. 1 also includes a signal relay 30 functioning as hereinafter set forth. The relay 30 has its winding connected to line L' through the contacts 8 of the stop relay and to line L^2 through the safe relay. Accordingly said signal relay is energized when the safe relay and the stop relay are de-energized preparatory to starting and as the safe relay and stop relay must be maintained de-energized throughout operation of the driven machine the signal relay is accordingly maintained energized throughout such a period. On the other hand when the safe relay or the stop relay is energized this signal relay is de-energized.

Referring now to Fig. 2 the relay 30 is shown as controlling the continuity of circuit of signal lamps 31 said lamps being supplied with current from circuit L^3 and L^4 of lower voltage than the circuits $L'-L^2$. In practice the circuits $L'-L^2$ may be any suitable voltage whereas the light circuit is preferably 110 volts although it is of course to be understood that all of the signal devices might be supplied from circuit L', L^2 if preferred. The relay 30 is shown as having its winding connected across lines $L'-L^2$ as above described and as having normally disengaged contacts 32 in circuit with the lamps 31. Accordingly assuming closure of contacts 8 of the stop relay and contacts 6 of the safe relay the relay 30 is caused to respond to effect energization of the lamps 31 which preferably provide a red light indicating during both operation of the driven machine and preparedness thereof for starting.

Further referring to Fig. 2 the same illustrates the reset relay of Fig. 1 said relay being here shown as provided with the contacts 33 to control the circuit of a horn 34. The arrangement is such that upon response of the relay to de-energize the stop relay as aforescribed, it engages its contacts 33 to connect horn 34 across lines L^3 and L^4 . This provides for sounding of the horn, pending release of the reset button to disconnect the reset relay from line L' .

The reset relay as shown in Fig. 2 is further provided with contacts 35 controlling the energizing circuit of a second signal relay 36 having normally engaged contacts 37 connecting additional signal lights 38 across lines L^3, L^4 . Assuming the reset relay to be de-energized as is the case except during the period that the reset button is held depressed its contacts 35 are separated whereby the relay 36 completes the circuit of the lamps 38 as described, said lamps preferably affording a white light for illumination of the driven machine. One the other hand upon depression of the reset button and consequent response of the reset relay to prepare the controller for starting its

contacts 35 are engaged to connect the winding of the relay 36 across the lines L^3 and L^4 through its own contacts 37. The relay 36 then responds momentarily to interrupt the circuit of the lamps 38 whereupon it is de-energized by disengagement of its own contacts 37 and consequently caused to re-establish the circuit of lamps 38 and manifestly so long as the reset button is held depressed the relay 36 will vibrate to cause flashing of the lamps. This gives warning of preparation of the controller for re-starting in addition to the contemporaneous warning by the horn and the further warning afforded by the lamps upon de-energization of the stop relay following response of the reset relay.

Referring to Fig. 3, the same illustrates the relays and control switches of two controllers C and C', both being in all respects similar to one another and identical with the corresponding portion of the controller shown in Fig. 1. Also this figure shows commutating means for these portions of the two controllers whereby the controllers may be used wholly independently of one another or whereby certain instrumentalities of either may be co-ordinated with the corresponding instrumentalities of the other controller.

More specifically the controller C has double throw knife switches 40, 41, 42, 43, 44 and 45 respectively interposed between the inch, on, reset, stop, off and safe switches and the relay windings controlled by such switches while controller C' has similar knife switches 46 to 51 interposed between the switches of its control station and the winding of the relays controlled thereby. With the knife switches positioned as illustrated the controllers are rendered entirely independent of one another, the control station of each functioning to control its respective relays as above set forth.

However, the knife switches of the two controllers are interconnected whereby the control stations of both controllers may be paralleled to control the relays of either controller independently of the relays of the other controller. For example, assuming knife switch 40 to be positioned as illustrated and the knife switch 46 to be set in its dotted line position the inch buttons of the two controllers are paralleled to control the inch relay of controller C, the inch button of controller C' being disconnected from the inch relay of the latter controller. Under such conditions the inch button of controller C will function with respect to its inch relay as above described, whereas depression of the inch button of controller C' will complete circuit from line L' through knife switch 46 by conductor 52 to the contact of knife switch 40 permanently connected to the inch relay

of controller C whereby the two inch buttons are paralleled as above set forth. On the other hand assuming knife switch 46 to be positioned as illustrated and knife switch 40 to be set in its dotted line position then both inch buttons are paralleled for control of the inch relay of controller C', the inch relay of controller C being disconnected from circuit. Under such conditions the inch button of controller C will complete circuit from line L' through knife switch 40 by conductor 53 to that contact of knife switch 46 permanently connected to the winding of inch relay of controller C' thus paralleling the inch button of controller C'.

The remaining knife switches are similarly interconnected in pairs to function with respect to their associated push button switches and relays in the same manner as described in connection with knife switches 40 and 46. Thus assuming the control stations to be located adjacent different sections of the press or other machine and that it is desired to provide for operation of the sections independently or jointly by one set of driving motors, each control station may be given control of the motor set selected for drive of its respective machine section.

Referring now to Fig. 4 the same illustrates duplicate signaling means for the controllers of Fig. 3 and assuming the sets of signaling instrumentalities to be arranged about different sections of the driven machine their control circuits must of course be commutated in accordance with the circuit commutations of the controllers. More specifically when the sections of the machine are driven independently of one another their sets of signaling instrumentalities should be independently controlled and when both sections are driven by one set of motors the two sets of signaling instrumentalities should be placed under control of the switches controlling the selected set of motors.

First considering the audible signaling means the same comprises duplicate horns 34 for the two sections of the machine to be controlled by their respective relay contacts 33 through double throw knife switches 54 and 55 respectively. Assuming these knife switches to be in the positions illustrated the horns are controlled wholly independently of one another by their respective relays. On the other hand assuming knife switch 54 to be placed in its dotted line position both horns will be connected in parallel to the contacts 33 of controller C' whereas assuming return of the switch 54 to its full line position and setting of the switch 55 in its dotted line position both horns will be connected in parallel to the contacts 33 of controller C. The circuit commutations thus afforded by the switches 54 and 55 being obvious, the same will not be further described.

Next considering the red light signals the

sets of lamps 31 and relay contacts 32 are shown in duplicate, these sets of lamps being connected to their respective relays through double throw knife switches 56 and 57 which are duplicates of the aforescribed knife switches 54 and 55 and function to afford similar commutations. More specifically assuming setting of switch 56 in its dotted line position both sets of lamps 31 will be connected in parallel to the relay contacts 32 of controller C' whereas assuming full line position of switch 56 and setting of the switch 57 in its dotted line position both sets of lamps will be connected in parallel to the relay 32 of controller C.

Finally considering the flashing lights, the lamps 38 and their relays 36 are shown in duplicate and as having associated therewith commutating knife switches 58 and 59 of the double throw type. With the knife switches 58 and 59 in the positions illustrated the two sets of lamps 38 are connected respectively to their control contacts 37 for wholly independent action. On the other hand assuming knife switch 58 to be set in its dotted line position both sets of lamps 38 will be placed under the control of the relay contacts 37 of controller C' whereas assuming setting of the switch 59 in its dotted line position both sets of lamps will be connected to the relay contacts 37 of controller C. As will be apparent, when both sets of lamps are under the control of either relay the other relay will be disconnected therefrom.

Further it will be apparent that while only two controllers and two sets of signaling instrumentalities have been illustrated similar commutations may be effected as between any number thereof or as between two controllers each having a multiplicity of control stations and a multiplicity of sets of signaling instrumentalities. Moreover it is to be understood that any other preferred commutating means may be substituted for the means illustrated and described.

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

1. The combination with a plurality of motor controllers each including manual control switches and electroresponsive switches controlled by the former switches, of signaling means associated with each of said controllers and subject to control by certain of the manual and electroresponsive switches thereof and commutable connections whereby the signaling means of one controller may be subjected to control by the corresponding switches of another of said controllers.

2. The combination with a plurality of motor controllers each including manual control switches and electroresponsive switches controlled by the former switches, of signaling means associated with each of said controllers and subject to control by certain of

the manual and electroresponsive switches thereof and commutatable connections whereby the signaling means of either controller may be subjected to control by the corresponding switches of another of said controllers.

3. The combination with a plurality of motor controllers each including manual control switches and electroresponsive switches controlled by the former switches, of signaling means associated with each of said controllers and subject to control by certain of the manual and electroresponsive switches thereof and commutatable connections whereby the signaling means of one controller may be subjected to control by the corresponding switches of another of said controllers, and rendered dependent for action upon actuation of some element of the latter controller.

4. The combination with a plurality of motor controllers each including manual control switches and electroresponsive switches controlled by the former switches, of signaling means associated with each of said controllers and subject to control by certain of the manual and electroresponsive switches thereof and commutatable connections whereby the manual control switches and signaling means of one controller may be disconnected from the electroresponsive switches of their respective controller and co-ordinated with the corresponding elements of another of said controllers.

5. The combination with a plurality of motor controllers each including manual control switches and electroresponsive switches controlled by the former switches, of signaling means associated with each of said controllers and subject to control by certain of the manual and electroresponsive switches thereof and commutatable connections whereby the manual control switches and signaling means of either controller may be disconnected from their respective electroresponsive switches and co-ordinated with the corresponding elements of another of said controllers.

In witness whereof, I have hereunto subscribed my name.

THOMAS H. RODMAN.

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