A. J. HORTON.

CIRCUIT CONTROLLER.

APPLICATION FILED JAN. 18, 1912.

1,161,477.

Patented Nov. 23, 1915.

Fig. 1.

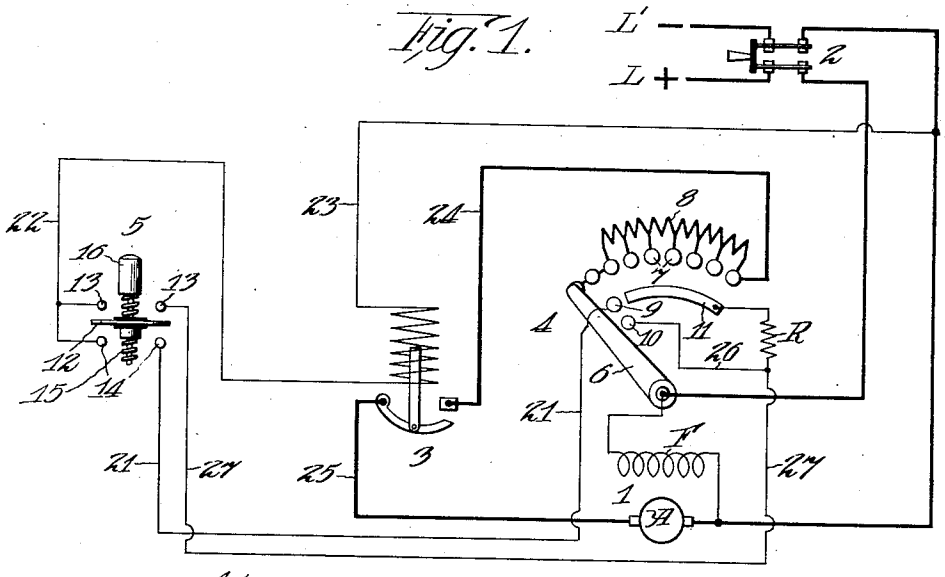


Fig. 2.

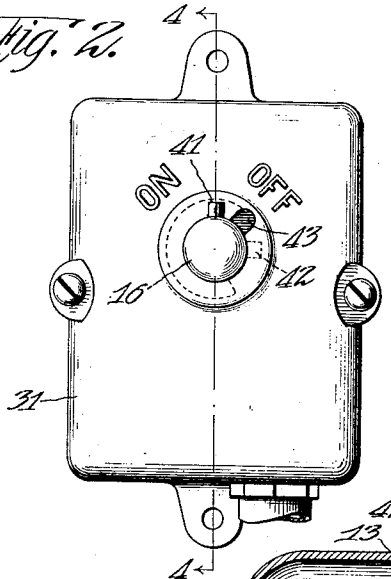
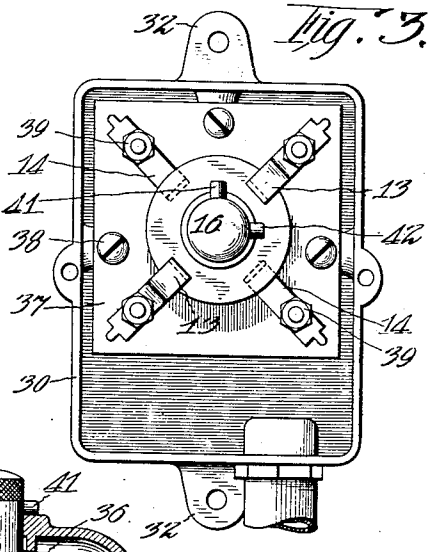


Fig. 3.



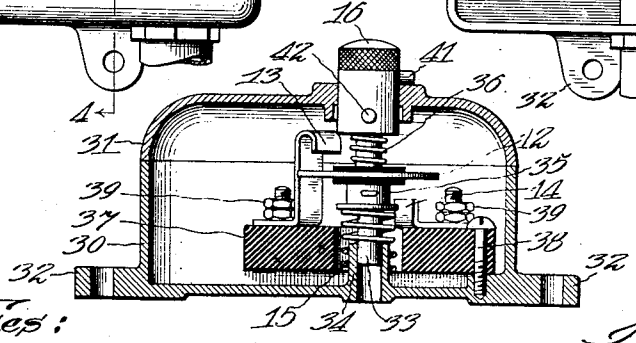


Fig. 4.

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UNITED STATES PATENT OFFICE.

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CIRCUIT-CONTROLLER.

1,161,477. Specification of Letters Patent. Patented Nov. 23, 1915.

Application filed January 18, 1912. Serial No. 671,814.

To all whom it may concern:

Be it known that I, ALBERT J. HORTON, a citizen of the United States, residing at White Plains, in the county of Westchester and State of New York, have invented new and useful Improvements in Circuit-Controllers, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawing, forming a part of this specification.

My invention relates to improvements in circuit controllers.

The various objects and advantages of my invention may be more clearly explained and better understood in connection with one specific embodiment and application thereof.

For the purpose of clearly and fully setting forth the nature and characteristic features of my invention, I shall describe the embodiment thereof illustrated in the accompanying drawing. It should be understood, however, that my invention is not limited to the specific embodiment or application thereof, shown in the accompanying drawing.

In the accompanying drawing: Figure 1 is a simplified diagram of a motor controller embodying my invention in one form, and Figs. 2, 3 and 4 are views showing one form of mechanical structure of a switch diagrammatically illustrated in Fig. 1.

The controller diagrammatically illustrated in Fig. 1 is particularly applicable to motor driven printing presses and other devices where a jogging or inching operation is desired. Of course in practice the controller would in most instances be much more elaborate than illustrated but the simplified diagram shown will suffice for the purposes of this explanation.

The controller is illustrated as controlling a shunt motor 1 having an armature A and a shunt field winding F. Of course in practice the controller might be used for other types of motors. The motor is supplied with current from lines L and L′ through a suitable double pole switch 2.

The controller includes an electro-responsive main switch 3, a rheostat 4 and a push button switch 5 for controlling the circuit of the operating winding of main switch 3. The rheostat is of a conventional form comprising a pivoted arm 6 movable over a series of contact buttons 7 to which is connected an armature resistance 8. Of course in practice the rheostat might control a field resistance instead of an armature resistance or might control both. The arm 6 is also adapted to be moved into engagement with coöperating contact buttons 9 and 10 and an elongated contact segment 11. The contact buttons and segment are so arranged that the arm 6, when in normal position, will be out of engagement with all of the same but when moved from normal position will engage all of the same prior to causing any variation of the resistance 8. The function of the button 9 is to render it possible when the arm 6 engages the same to energize and deënergize the switch 3 at will by the push button switch 5 to inch or jog the motor driven device. The function of the button 10 is to enable energization of the main switch by the rheostat arm 6 when the push button switch 5 is in a predetermined position, thus enabling the motor to be set in operation and brought up to the desired speed merely by movement of the rheostat arm. The arm 6 leaves the button 10 upon the first step of resistance variation and hence the provision of the elongated segment 11 which when engaged by the arm 6 establishes a maintaining circuit for the main switch independent of the button 10. A resistance R included in this maintaining circuit forms an interlock between the rheostat and the main switch which necessitates insertion of all or a predetermined amount of the resistance 8 in the motor circuit before the main switch 3 can be energized.

The switch 5 is operable to start and stop the motor for inching purposes and also to stop the motor under high speed conditions. In practice any number of push buttons may be employed and located at desired points about the driven machine. By means of a novel construction of the switch 5, which I shall later describe, and by connecting the same in circuit in the manner shown, I am enabled to secure the aforesaid results by operation of a single push button, whereas in all previous controllers at least two separately operated switches have been required to accomplish these results. Still further, I am enabled to positively lock the switch 5 in such a position as to positively prevent starting of the motor.

As diagrammatically illustrated, the switch 5 comprises a contact disk 12 disposed between two sets of coöperating con-

tacts 13—13 and 14—14, said disk being biased toward the contacts 13 by a spring 15. The contact disk 12 has an operating button 16 adapted to move the same away from contacts 13 and, when desired, into engagement with the contacts 14 against the action of the spring 15. As will later be explained, the switch 5 may be so adjusted as to cause the disk 12 to either normally stand in engagement with the contacts 13 or in the positions illustrated.

In the position illustrated, the circuit of the operating winding of the main switch is opened and accordingly the motor circuit is opened. Under such conditions, however, the switch 5 is free to be moved to jog or inch the motor as soon as the rheostat arm is moved on to the contact 9. Thus assuming the arm 6 to rest upon contact 9 and assuming the switch 5 to be depressed to cause contact disk 12 to bridge contacts 14, circuit will be closed from main line L through the rheostat arm and contact 9 by conductor 21 through contacts 14 and disk 12 by conductor 22 through the operating winding of main switch 3 by conductor 23 to main line L′. Main switch 3 will thereupon respond, closing the motor circuit from line L through the rheostat arm and all the resistance 8 by conductor 24 through said main switch by conductor 25 through the motor armature A to line L′. The shunt field winding F is connected permanently across the lines L and L′ and accordingly the motor will at once operate but at a slow jogging or inching speed due to the insertion of the resistance 8 in its armature circuit. The motor will continue to operate at this slow speed until the switch 5 is released, whereupon the disk 12 will, under the influence of the spring 15, immediately leave the contacts 14 breaking the energizing circuit of the main switch. The main switch thereupon opens, disconnecting the motor from circuit. The motor may thus be jogged or inched by pressing and releasing the switch 5, it being understood that the motor is stopped immediately upon release of said switch.

When desired to operate the motor by manipulation of the rheostat arm, the switch 5 is adjusted in a manner hereinafter described to normally engage the contacts 13. Under these conditions, upon movement of the rheostat arm onto button 10, circuit is closed from line L′ through said rheostat arm to button 10 by conductors 26 and 27 through the contacts 13 and disk 12 by conductor 22 through the operating winding of main switch 3 by conductor 23 to line L′. The motor is thus started as before described. Continued movement of the rheostat arm gradually cuts out the resistance 8, increasing the speed of the motor. Prior to the arm 6 leaving the button 10, said arm engages segment 11 establishing a maintaining circuit for the main switch through the resistance R. Under these conditions the motor may be stopped in either of two ways. It may be stopped by returning the rheostat arm to off position or it may be stopped by pressing the switch 5 to break contact between contacts 13, which, of course, deënergizes the main switch, causing interruption of the motor circuit.

As has been seen, it is necessary for the disk 12 of switch 5 to be moved into engagement with one or the othe set of contacts before the main switch 3 can be closed. Accordingly, by positively locking the disk 12 in the position illustrated, I can positively insure against starting of the motor. This is a distinctly advantageous feature in that it safeguards attendants engaged in inspecting or overhauling the motor or the machinery driven thereby.

I shall now describe the mechanical structure of the switch 5 as illustrated in Figs. 2, 3 and 4. The various parts of the switch are contained in a box member 30 having a removable front cover 31 and suitable supporting lugs or ears 32. The contact disk 12 is loosely mounted upon a rod or spindle 33 adapted to reciprocate in a cylindrical bearing 34 provided in the back of the box and said shaft or spindle carrying at its outer end the push button 16 adapted to reciprocate in a suitable bearing provided in the front cover of the box. The contact disk 12 is resiliently held against a collar 35 fixed to the shaft 33 by a helical spring 36, surrounding said shaft and interposed between said disk and the end of push button 16. The biasing spring 15, previously specified, surrounds the shaft 33 and is confined between the collar 35 and the back wall of the box. The stationary contacts are mounted upon an insulating block 37 secured to the back wall of the box by suitable means, such as screws 38. Said contacts are disposed radially to the axis of the shaft 33 with the contacts of each set disposed directly opposite one another. The contacts 14 comprise angle pieces secured to the base 37 by bolts 39 which bolts also serve as binding posts. The contacts 13 are similarly secured to the base and are provided with elongated portions projecting past the contact disk and having their extremities turned back to project into the path of said disk. Thus the disk is arranged between the extremities of the two sets of contacts and is accordingly movable in opposite directions to engage the same. The spring 15, however, as previously described, tends to bias said disk in a direction to engage contacts 13.

As before stated, the switch 5 is capable of three adjustments. First, it may be adjusted to positively hold the disk 12 out of engagement with the contacts 13, but leave the disk free to engage and disengage the

contacts 14 for inching purposes. Second, it may be adjusted to positively prevent the disk 12 from engaging contacts 14 but permit it to normally engage contacts 13 and to be disengaged therefrom at will for stopping the motor when running at high speed. Third, it may be positively locked in the position shown in Fig. 1, out of engagement with both sets of contacts to prevent completion of either of the two circuits. The foregoing results are obtained by means of pins 41 and 42 mounted upon the push button 16 radially of its axis. These pins are preferably disposed at right angles to one another and upon opposite sides of the front wall of the inclosing box.

The various adjustments are accomplished by moving the pins 41 and 42 into and out of alinement with an opening or slot 43 extending through the front wall of the inclosing box. The pin 41 on the outside of the inclosing box constitutes an indicator for directing the adjustment of the pins and indicating the normal position of the disk 12. Assuming the pin 41 to be in alinement with the opening of 43 the pin 42 will be out of alinement with said opening and will accordingly engage the inner side of the front wall of the box. This pin is so disposed upon the push button that when it engages the wall of the box, it holds contact disk 12 out of engagement with contacts 13, or in the position shown in Fig. 1. The pin 41 being in alinement with the opening 43 will under these conditions allow the push button to be pressed inwardly to throw the disk 12 into engagement with contacts 14, the spring 15 moving the disk away from said contacts as soon as the push button is released. This gives the first adjustment above mentioned, enabling the switch to be used for inching purposes.

To secure the second adjustment, the push button is turned to move pin 41 out of alinement with the opening 43 and to bring the pin 42 in alinement therewith. The spring 15 thereupon moves the contact disk 12 into engagement with contacts 13, this movement being permitted by the passage of the pin 42 through the opening 43. Pressure of the push button under these conditions moves the contact disk out of engagement with contacts 13 while the pin 41 by its engagement with the outside wall of the box so limits the inward movement of the push button as to prevent the disk 12 from engaging contacts 14. Thus the second adjustment is provided for, the switch under these conditions serving only as a stopping switch under running conditions.

To lock the switch in such position that the disk 12 is maintained out of engagement with both sets of contacts, it is merely necessary to press the push button inwardly to free the pin 42 from the slot 43 and then turn the button until the pin 41 stands vertically. Under these conditions both pins are out of alinement with the opening 43 and in engagement with opposite sides of the front wall of the box, thereby locking the push button against movement in either direction.

The extremities of a three quarter annular flange provided on the inner side of the box front coöperate with the pin 42 to limit the push button to an angular movement of 45 degrees, at opposite limits of which movement it alternately brings the pins 41 and 42 into alinement with the opening or slot 43. Thus alinement of the pins and opening is insured without requiring the exercise of any care upon the part of the operator. The operator has merely to turn the push button to one limit or the other according to which pin he desires to aline with the opening.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A circuit controller provided with a push-button operated contact movable from one operative position to another operative position by its push-button, means biasing said contact from the latter position to the former position, and means adapted to be set to limit said contact to movement to and from said former position.

2. A circuit controller provided with a push-button operated contact biased to one operative position and movable by its push-button to another operative position, and means adjustable to limit the movement of said contact in either direction selectively to thereby restrict said contact to movement to and from either of said positions as selected.

3. A circuit controller provided with a push-button operated contact biased to one position and operable by its push-button to another position, and limiting means for said contact adjustable to restrict said contact to movement between one of said positions and an intermediate position or to lock said contact in said intermediate position.

4. A circuit controller having a switch member movable between two positions, and means operable by said member to selectively lock the same in a position intermediate of said former positions or to restrict said member to movement to and from one of said former positions.

5. A circuit controller having a switch member biased to one position and movable therefrom to another position and adjustable limiting means for said member adjustable thereby to lock the same in a third position or to restrict its range of movement leaving the same free for movement to and from one of said former positions but not the other.

6. A circuit controller provided with a

switch member biased to move in one direction and having coöperating contacts at opposite limits of its movement, and limiting means for said switch member adjustable thereby to lock the same against engagement with either of said contacts at will but permitting its movement into and out of engagement with the other of said contacts.

7. In a circuit controller, the combination with a plurality of stationary contacts and a contact movable into engagement therewith selectively, a reciprocable operating member for said movable contact capable of rotary adjustment, a fixed stop and pins secured to said operating member and movable into the path of said stop by rotary adjustment of said member to restrain said movable contact from engaging either of said stationary contacts selectively but leaving it free to engage and disengage another of said contacts.

8. In a circuit controller, the combination with a plurality of stationary contacts, a contact movable into engagement therewith selectively, a reciprocable operating member for said movable contact capable of rotary adjustment, a fixed stop and two pins secured to said operating member and adjustable with respect to said stop by rotary adjustment of said member to either lock said movable contact out of engagement with said stationary contacts or to lock the same out of engagement with one of said stationary contacts leaving it free to engage and disengage another one of the same.

9. In a circuit controller, the combination with two spaced stationary contacts, a movable contact biased into engagement with one of said stationary contacts, a push-button for operating said movable contact from its normal position into engagement with the other of said stationary contacts and means including a fixed stop and coöperating parts adjustable by rotation of said push-button to lock said movable contact out of engagement with both of said stationary contacts or out of engagement with one of the same leaving it free to engage and disengage the other.

In witness whereof, I have hereunto subscribed my name in the presence of two witnesses.

ALBERT J. HORTON.

Witnesses:
R. A. SPALDING, Jr.,
W. L. CULLY.