June 26, 1934. R. B. HUNTER ET AL 1,964,467

ELECTRIC CIRCUIT CONTROLLING DEVICE

Filed Jan. 18, 1932

Fig. 2

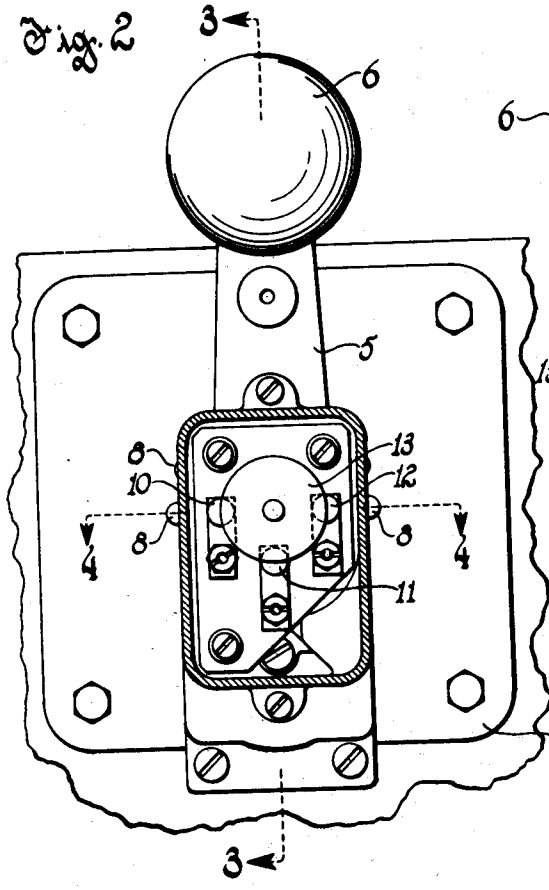


Fig. 3

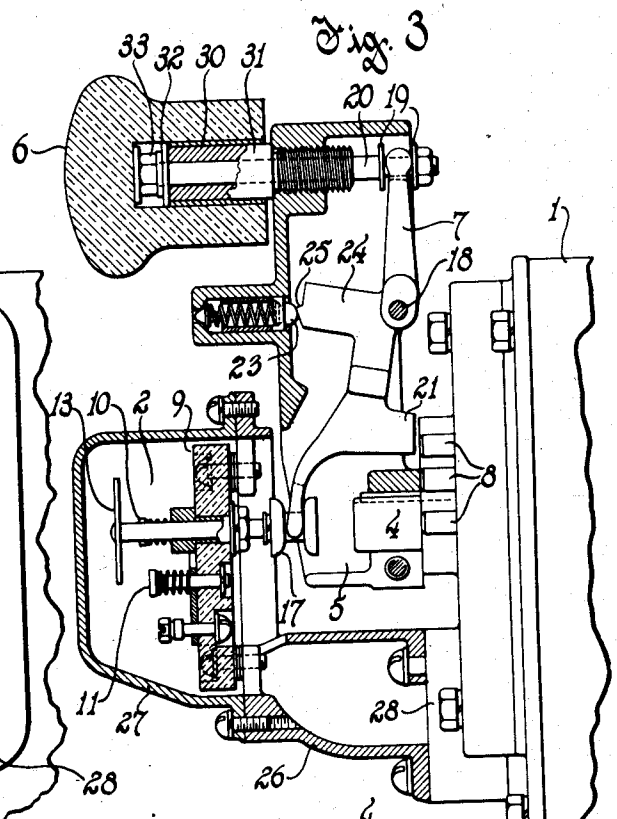


Fig. 4

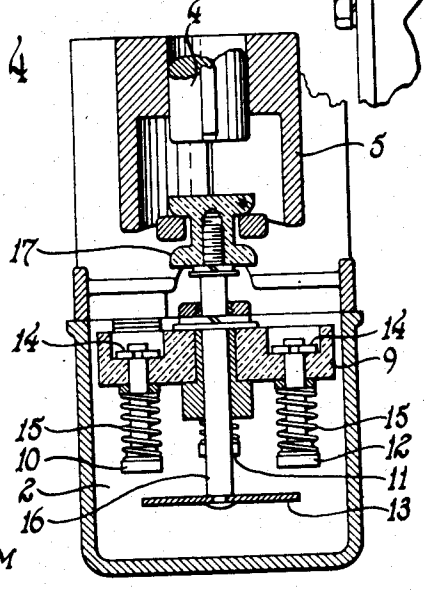
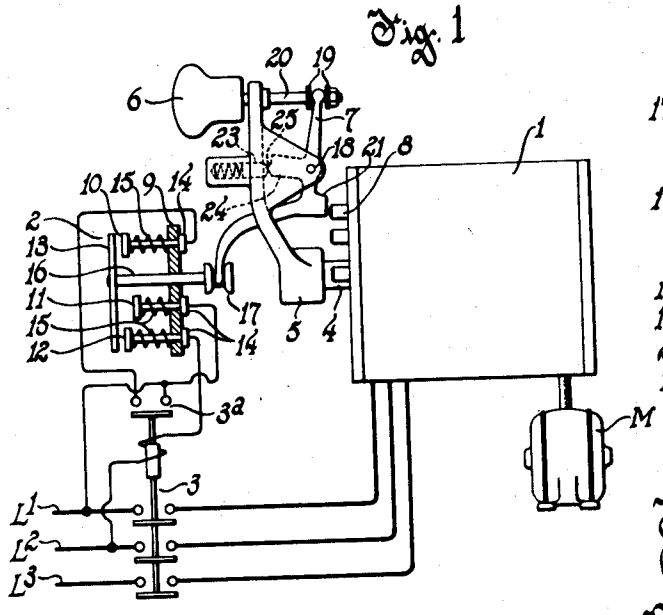


Fig. 1



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ELECTRIC CIRCUIT CONTROLLING DEVICE

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9 Claims. (Cl. 175—294)

This invention relates to electric circuit controlling devices.

Control systems have heretofore been provided including a manual circuit commutating device, and an electromagnetic line switch for establishing and interrupting the circuits controlled by the device. In such systems the line switch is controlled by a switch associated with the operating handle of the device and interlocking means is provided for preventing operation of the handle switch unless the device is in given circuit controlling positions and to insure opening of the handle switch during movement of the device between such positions. This method of control has numerous advantages but heretofore no provision was made for effecting low voltage protection. The electromagnetic line switch would of course drop out under low voltage conditions, but unless the handle switch was returned to off position the line switch would reclose immediately upon restoration of voltage.

The present invention has among its objects to provide an improved handle switch for use in systems of the aforesaid character which is adapted to control the line switch in a manner to provide low voltage protection.

Another object is to provide an improved handle switch of the aforesaid character which can be readily applied to circuit controllers of various types and which is of simple, rugged and inexpensive construction.

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

The accompanying drawing illustrates an embodiment of the invention which will now be described, it being understood that the embodiment illustrated is susceptible of modification without departing from the spirit and scope of the appended claims.

In the drawing,

Figure 1 schematically illustrates a motor controller having a handle switch embodying the invention associated therewith;

Fig. 2 is a front elevational view of an embodiment of the switch shown in Fig. 1, and

Figs. 3 and 4 are sections respectively on lines 3—3 and 4—4 of Fig. 2.

Referring to Fig. 1, the same illustrates a multi-speed three phase alternating current motor M and a supply circuit therefor indicated by lines L^1, L^2, L^3. A selector device 1 is provided for commutating the motor circuit to provide for operation of the motor at its various speeds, and a handle switch 2 associated with said device provides for control of an electroresponsive switch 3 which controls line connections for said motor.

As shown schematically in Fig. 1, and also in Figs. 2, 3 and 4, selector device 1 is provided with an operating shaft 4 having an arm 5 fixed thereto, and said arm has a knob 6 mounted upon the upper end thereof which is operatively connected to switch 2 through the medium of a lever 7. As hereinafter set forth lever 7 is arranged to cooperate with fixed stops 8 associated with the selector device 1 to permit operation of switch 2 only when the selector device is in given circuit controlling positions, and to insure opening of said switch during movement of the selector device between such positions.

More specifically switch 2 is provided with an insulating base 9 which carries contact pins 10, 11 and 12 and a cooperating bridging contact 13. Said contact pins are slidably mounted within openings in base 9 and for a purpose hereinafter set forth contact pin 11 is shorter than contact pins 10 and 12, and the latter contact pins are of substantially the same length. Each of said contact pins has a washer 14 fixed to its inner end for engaging the rear face of base 9 and each has an enlarged head on the outer end thereof and is biased to move outwardly by a spring 15 held under compression between said head and the front face of said base.

Bridging contact 13 is fixed to a rod 16 which is slidably mounted within an opening in base 9, and said base is mounted in front of an arm 5 in a position wherein the axis of said rod is in alinement with the axis of shaft 4. The inner end of rod 16 has a spool member 17 fixed thereto which is engaged by a bifurcated portion on the lower end of lever 7. Arm 5 is recessed to receive the lower end of lever 7 and said lever is pivoted at a point intermediate its ends upon a pin 18 carried by inwardly extending projections on opposite sides of said arm. The upper end of lever 7 is provided with a bifurcated portion which is arranged between a pair of washers 19—19 mounted upon a pin 20, and said pin is slidably mounted within an opening in arm 5 and has its outer end fixed to the knob 6.

With the parts arranged as hereinbefore described it is apparent that bridging contact 13 is movable by lever 7 into and out of engagement with its cooperating contact pins 10, 11 and 12 upon outward and inward movements of knob 6. However, as hereinbefore stated said lever is arranged to cooperate with fixed stops 8 associated with selector device 1 to permit operation of switch 2 only when said device is in given circuit

controlling positions and to insure opening of said switch during movement of said selector device between such positions. Stops 8 project outwardly and are arranged to provide spaces therebetween corresponding to the circuit controlling positions of device 1 and lever 7 has an inwardly extending projection 21 thereon which is arranged below pivot pin 18 for cooperation with said stops. Projection 21 thus moves inwardly upon closing movement of bridging contact 13 and the stops 8 are arranged to be engaged by said projection to prevent closing movement of said bridging contact unless the device 1 is in given circuit controlling positions, and to prevent movement of said device between such positions unless the bridging contact is in open position.

As hereinbefore stated, contact pin 11 is shorter than contact pins 10 and 12 and the latter contact pins are of substantially the same length. Thus bridging contact 13 is movable inwardly into a position to bridge contact pins 10, 11 and 12 and is returnable to an intermediate position to disengage contact pin 11 while remaining in engagement with contact pins 10 and 12. For a purpose hereinafter set forth lever 7 has means associated therewith for releasably holding bridging contact 13 in this intermediate position. In the embodiment illustrated such holding means includes a reciprocable spring pressed stop 23 carried by arm 5 and an outwardly extending projection 24 on lever 7 having a shoulder 25 thereon to be engaged by said stop upon outward movement of bridging contact 13 into an intermediate position. The cooperating faces of stop 23 and shoulder 25 are so designed that the same can be disengaged by applying inward pressure upon knob 6.

The function and operation of the aforedescribed handle switch will now be more fully set forth. To establish power connections for the motor when contact device 1 is in any of its circuit controlling positions, knob 6 is pulled outwardly to effect movement of bridging contact 13 into engagement with its cooperating stationary contact pins 10, 11 and 12. The line switch 3 is then energized by a circuit extending from line L^1 to contact pin 11 through bridging contact 13 to contact pin 12 and thence through the operating winding of said line switch to line L^2. Upon release of knob 6 the springs 15 on contact pins 10 and 12 move bridging contact 13 out of engagement with contact pin 11 and immediately following disengagement of said bridging contact from contact pin 11 the shoulder 25 on lever 7 engages stop 23 to releasably hold said bridging contact in engagement with contact pins 10 and 12. The above described energizing circuit for line switch 3 is thus interrupted and said switch is then maintained energized by a circuit extending from line L^1 through auxiliary contacts 3^a associated with said line switch to contact pin 10 through bridging contact 13 to contact pin 12, and thence through the operating winding of said line switch to line L^2.

It should be noted that under no voltage conditions line switch 3 will drop out, and upon restoration of voltage the same cannot reclose since the aforedescribed maintaining circuit is interrupted by auxiliary contacts 3^a. Also it should be noted that when bridging contact 13 is in engagement with contact pins 10 and 12 the projection 21 on lever 7 is located between certain of the stops 8 to prevent a change in the setting of device 1. However, by applying inward pressure on knob 6 the restraining action of stop 23 is overcome and bridging contact 13 is thus moved to off position to insure opening of switch 3, and the device 1 can then be adjusted since projection 21 on lever 7 clears the stops 8.

In the embodiment of the handle switch shown in Figs. 2, 3 and 4 the insulating base 9 is mounted upon a bracket 26 and the contacts of said switch are enclosed by a housing 27 carried by said bracket. Bracket 26 is fixed to a plate 28 and the stops 8 comprise pins fixed within drilled openings in said plate. Plate 28 is designed for mounting upon the body of the selector device 1, and as is apparent said plate can be designed to suit the selector device and the pins 8 can be mounted thereon to suit the circuit controlling positions of the device.

As shown in Fig. 3, the operating knob 6 is provided with an opening having a bushing 30 fixed therein and said bushing is slidable upon a pin 31 which is threaded into an opening in arm 5 and is provided with an opening for receiving pin 20. Pin 20 has a washer 32 fixed to the outer end thereof by a nut 33 and said pin is secured within the knob 6 by engagement of said washer with the bushing 30.

As is apparent, the aforedescribed handle switch is not limited to use in connection with motor control devices but can be employed in systems of various types which are provided with a circuit commutating device and an electromagnetic switch for controlling the circuits commutated by the device.

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

1. The combination with a circuit controlling device having an operating handle associated therewith, of an auxiliary switch mechanism operable by said handle and having means associated therewith for preventing operation thereof except upon positioning of said device in given circuit controlling positions, said switch mechanism being operable to establish two control circuits and to interrupt one of said circuits while maintaining the other, and latching means for holding said switch mechanism in a position to maintain said latter circuit, said latching means being releasable by said handle at will.

2. The combination with a circuit controlling device having an operating handle associated therewith, of an auxiliary switch mechanism operable by said handle and having means associated therewith for preventing operation thereof except upon positioning of said device in given circuit controlling positions, said switch mechanism including a control part movable by said handle in one direction out of a given off position to establish a plurality of control circuits and returnable towards off position upon release of said handle to interrupt one of said circuits while maintaining another of said circuits, and latching means releasable by said handle for holding said control part in a position to maintain said latter circuit.

3. The combination with a circuit controlling device having an operating handle associated therewith and an electro-responsive switch for controlling the continuity of circuits controlled by said device, of an auxiliary switch mechanism associated with the operating handle of said device and operable thereby to establish an operating circuit and a maintaining circuit for said electroresponsive switch and to effect interruption of said operating circuit without interruption of said maintaining circuit, said switch mechanism

having means associated therewith for preventing operation thereof by said handle except when said device is in given circuit controlling positions.

4. The combination with a circuit controlling device having an operating handle associated therewith and an electroresponsive switch for controlling the continuity of circuits controlled by said device, of an auxiliary switch mechanism associated with the operating handle of said device and operable thereby to establish an operating circuit and a maintaining circuit for said electromagnetic switch, and to effect interruption of said operating circuit without interruption of said maintaining circuit, means for rendering said switch mechanism inoperative except in given circuit controlling positions of said device and a releasable latching device for holding said switch mechanism in position for establishment of said maintaining circuit.

5. The combination with a circuit controlling device provided with a rotatable operating part, of an operating handle mounted upon said part and movable with respect thereto between given extreme positions, and an auxiliary switch mechanism operable upon movement of said handle with respect to said operating part, said switch mechanism being adapted upon movement of said part into one extreme position to establish a plurality of circuits, and being adapted upon return of said handle to an intermediate position to interrupt one of said circuits, means associated with said switch mechanism for preventing operation thereof to establish said circuits except upon positioning of said device in given circuit controlling positions and a releasable latching device for holding said handle in said intermediate position.

6. The combination with a circuit controlling device provided with a rotatable operating part, of an operating handle mounted upon said part and movable with respect thereto between given extreme positions, an auxiliary switch mechanism operable by said part, said switch mechanism including a plurality of spring contacts and a cooperating contact element operatively connected to said handle and adapted in one extreme position of said handle to engage all of said spring contacts, and in an intermediate position of said handle to disengage certain of said spring contacts, means insuring positioning of said handle to maintain said auxiliary switch mechanism in open position during movement of said device between given circuit controlling positions and means associated with said handle for releasably holding the same in said intermediate position to prevent disengagement of said contact element with the other of said spring contacts.

7. The combination with a circuit controlling device provided with a rotatable operating arm, of an operating handle slidably mounted upon the outer end of said arm, an auxiliary switch mechanism including a movable contact element having a slidable operating part, the axis of which is arranged concentrically with respect to the axis of said arm, a pivoted lever carried by said arm and operatively connecting the operating part of said switch to said knob, said switch mechanism being adapted upon sliding movement of said handle into a given extreme position to establish a plurality of circuits, and being adapted upon return of said handle to an intermediate position to interrupt one of said circuits, a releasable latching device associated with said lever for holding said switch mechanism in said intermediate position, and mechanical interlocking means between said lever and said control device to prevent operation of said switch except upon positioning of said control device in given circuit controlling positions.

8. The combination with a circuit commutating device, of means for controlling power connections for said device including a manually controlled auxiliary switch operable to establish a plurality of control circuits and to interrupt one of said circuits while maintaining another, and interlocking means between said device and said auxiliary switch for rendering said auxiliary switch inoperable except upon positioning of said device in given circuit controlling positions.

9. The combination with a circuit commutating device, of means for controlling power connections for said device including a manual control switch and means for interlocking said control switch with said device to render said control switch operative only upon positioning of said device in given circuit establishing positions, said control switch being operable to establish and interrupt two control circuits selectively and to insure establishment of one of said control circuits upon interruption of the other of said control circuits.

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