June 26, 1934. C. T. EVANS 1,964,199

ELECTRIC CONTROL DEVICE

Filed Dec. 19, 1932

Fig. 1

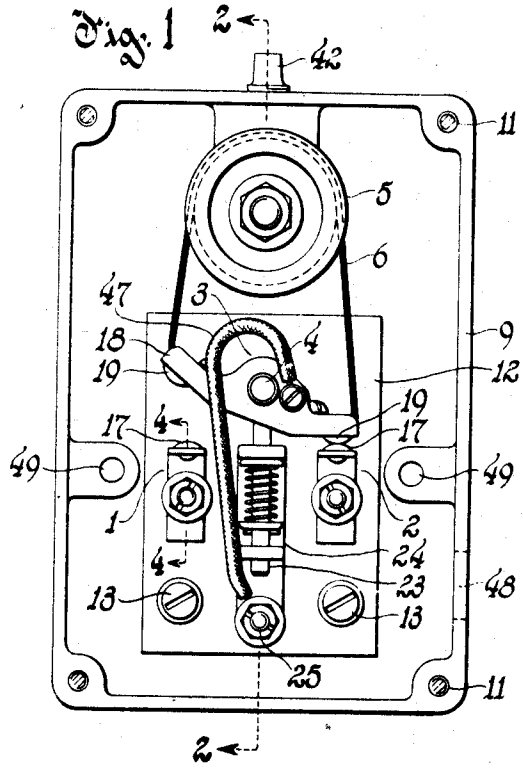


Fig. 2

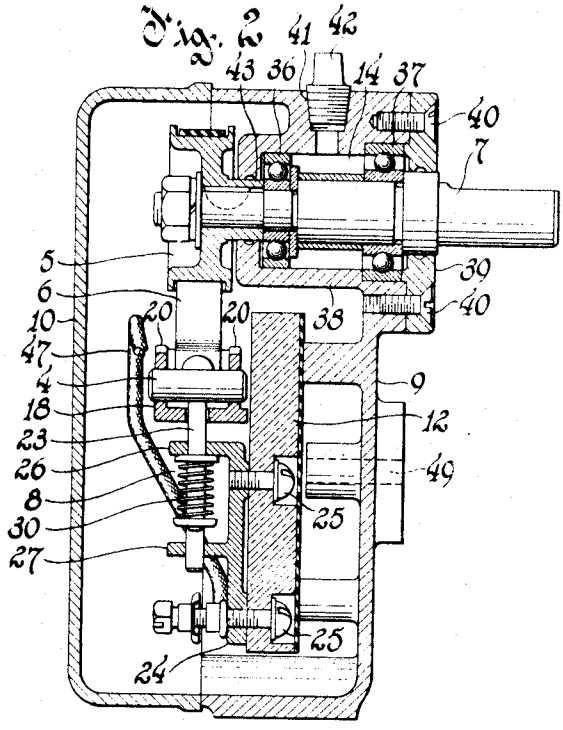


Fig. 3

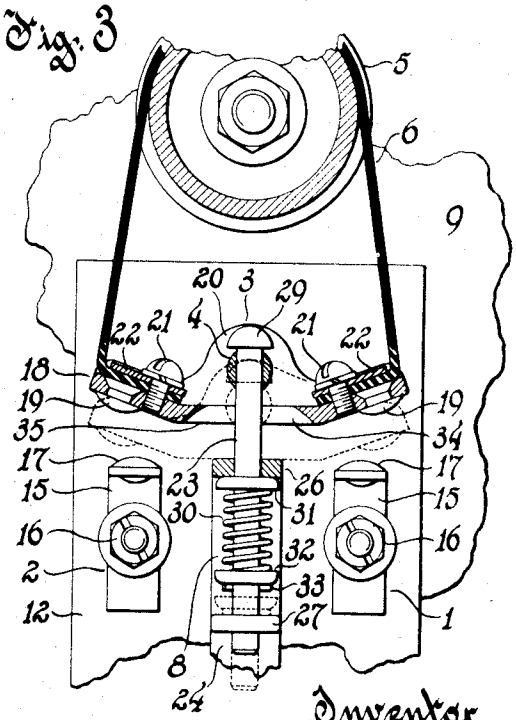


Fig. 5

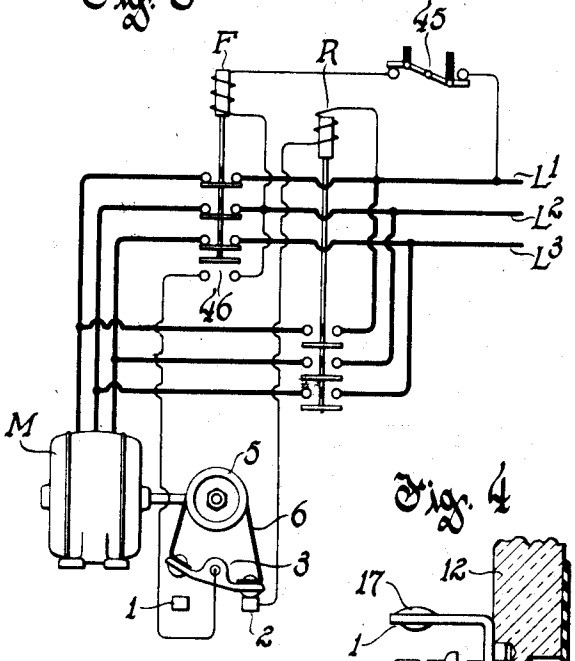
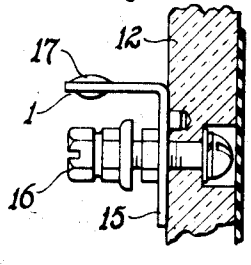


Fig. 4



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Patented June 26, 1934 1,964,199

UNITED STATES PATENT OFFICE

1,964,199

ELECTRIC CONTROL DEVICE

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Application December 19, 1932, Serial No. 647,951

8 Claims. (Cl. 200—6)

This invention relates to electric control devices, and while not limited thereto is particularly applicable to frictionally operated switches for use in alternating current motor control systems to effect control of plugging connections.

The invention has among its objects to provide an improved frictionally operated switch for use in systems of the aforesaid character which is of simple, rugged and compact construction.

Another object is to provide a switch of the aforesaid character having novel and efficient friction operating means associated therewith.

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 is a front elevational view of an enclosed frictionally operated switch embodying the invention, the cover of the enclosing casing being removed.

Figs. 2 and 4 are vertical sectional views taken on lines 2—2 and 4—4, respectively, of Fig. 1.

Fig. 3 is an enlarged fragmentary view, partly in section, of certain of the switch parts shown in Fig. 1.

Fig. 5 diagrammatically illustrates the switch as applied to a plugging control system for induction motors.

The control switch illustrated in the drawing includes spaced stationary contacts 1 and 2, and a cooperating movable contact element 3 pivotally mounted at a point intermediate said stationary contacts upon a pin 4. The operating mechanism for contact element 3 comprises a pulley 5 and a belt 6 looped over said pulley and connected to opposite ends of said contact element, said pulley being fixed to a drive shaft 7, and said belt being held under tension by a spring pressure device 8 associated with pivot pin 4.

The aforementioned switch parts are mounted within a box shaped enclosing casing 9 provided with a removable cover 10 which is secured to said casing by screws 11, shown in section in Fig. 1. An insulating base 12 fixed to the rear wall of casing 9 by screws 13 carries stationary contacts 1 and 2, movable contact element 3, and the spring pressure device 8, and the drive shaft 7 is rotatably mounted within a bearing 14 provided in the upper end of said casing.

More specifically, each of the stationary contacts 1 and 2 is provided with an inverted L-shaped bracket 15 fixed to the front face of insulating base 12 by a terminal device 16 including a securing screw located within an opening in said insulating base, as shown in Fig. 4. The brackets 15 have contact tips 17—17 fixed to the upper ends thereof, and the movable contact element 3 is provided with a support 18 having contact tips 19—19 mounted upon the lower face thereof to cooperate with the former contact tips. The upper face of contact support 18 is provided with spaced lugs 20—20 having openings therein for receiving pivot pin 4, and as shown in Fig. 3 belt 6 is secured to opposite ends of said contact support by screws 21 having clamping plates 22 associated therewith.

The spring pressure device 8 includes a vertically arranged pin 23 carried by a bracket 24 fixed to insulating base 12 by screws 25. Pin 23 is slidably mounted within openings in spaced forwardly extending lugs 26 and 27 on bracket 24, and the upper end of said pin is located within an opening in pivot pin 4 and is provided with an enlarged head 29 for engaging said pivot pin on the upper side thereof. Pin 23 is biased to move downwardly by a coiled spring 30 which surrounds said pin and is held under compression between a washer 31 which abuts the upper lug 26 on bracket 24, and a washer 32 which abuts a cotter pin 33 located within an opening in pin 23. As shown in Fig. 3 the contact support 18 is slotted at 34 to clear the pin 23, and for a purpose hereinafter set forth the under side of said support is provided with a flat face 35 for cooperation with the top face of the upper lug 26 on bracket 24.

As hereinbefore stated, the drive shaft 7 is rotatably mounted within a bearing 14 provided in the upper end of casing 9. As shown in Fig. 2 the bearing 14 includes spaced ball bearings 36 and 37 having their inner races mounted upon shaft 7 and having their outer races supported within a hollow cylindrical projection 38 extending forwardly from the rear wall of casing 9. Shaft 7 and its associated ball bearings are held in assembled relation within projection 38 by a retaining ring 39 fixed to the rear wall of casing 9 by screws 40, and said shaft has a portion projecting rearwardly beyond said retaining ring for connection to a driving part such as the shaft of a reversible electric motor. An opening 41 having a removable screw plug 42 associated therewith is provided for introducing a lubricant to the ball bearings 36 and 37, and to prevent leakage of the lubricant a projecting hub portion

43 on pulley 5 fits within a grooved opening in the front end of the hollow cylindrical projection 38 and shaft 7 fits within a grooved opening in retaining ring 39.

The function and operation of the aforedescribed device will now be more fully described. As is apparent, the spring pressure device 8 tends to move the contact support 18 into the position shown in dotted lines in Fig. 3. However, the belt 6 is of such length as to hold contact support 18 in an elevated position, and the belt is thereby placed under tension by the spring pressure device 8. Thus the belt provides a slip driving connection between pulley 5 and the movable contact element 3. As is apparent from Figs. 1 and 3, upon rotation of pulley 5 in a clockwise direction the movable contact element 3 is maintained in engagement with stationary contact 2 and out of engagement with stationary contact 1, and upon rotation of said pulley in a counterclockwise direction said movable contact is maintained in engagement with stationary contact 1, and out of engagement with stationary contact 2. Also as is apparent from Figs. 1 and 3, upon a change in the direction of operation of pulley 5 the movable contact element 3 is immediately tilted upon its pivot pin 4 to change the position thereof. In connection with the foregoing it should be noted that if the belt 6 breaks or slips off of the pulley 5 spring pressure device 8 moves the contact element 3 into the position shown in dotted lines in Fig. 3, and in this position the face 35 on contact support 18 engages the top face of the lug 26 on bracket 24 to maintain said contact element out of engagement with its cooperating stationary contacts 1 and 2.

The above described device may be used in a system such as shown in Fig. 5 to control plugging of a three phase induction motor M. In the system shown in this figure the supply circuit for the motor is indicated by lines L^1—L^2—L^3, and electroresponsive switches F and R are provided for selectively establishing forward and reverse power connections for the motor. The energizing circuit for the operating winding of switch F is controlled by a manually operated switch 45 and the above described frictionally operated switch is connected to the shaft of motor M and is arranged to control the energizing circuit of switch R through the medium of normally closed auxiliary contacts 46 associated with switch F. As is apparent from Fig. 5, closure of switch 45 effects response of switch F by connecting the operating winding of said switch across lines L^1—L^2. Switch F establishes power connections for motor M to cause rotation thereof in a direction to maintain the contact element 3 in engagement with its cooperating stationary contact 2. Opening of switch 45 deenergizes switch F and immediately upon dropping out of said switch, switch R is energized by a circuit extending from line L^1 through the operating winding of said latter switch, through stationary contact 2 and movable contact 3 of the frictionally operated switch and auxiliary contacts 46 of switch F to line L^2. Switch R in responding establishes reverse power connections for the motor to effect plugging thereof. At the instant the motor reverses under the action of said reverse power connections contact element 3 moves out of engagement with stationary contact 2 to interrupt the energizing circuit for switch R, whereupon the motor is brought to rest.

As shown in Fig. 1, the lower screw 25 associated with bracket 24 is connected to the movable contact element 3 by a flexible lead 47 and serves as a wiring terminal for said contact element. Also as shown in Fig. 1 one of the side walls of casing 9 has a wiring opening 48 therein, and the rear wall of said casing has openings 49 therein through which bolts may be passed for securement of the device to a suitable support.

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

1. In a frictionally operated switch, the combination with a contact element movable in opposite directions between given circuit-controlling positions, of a driving pulley therefor, a belt looped over said driving pulley and connected to said contact element to provide a slip operating connection for frictionally holding said element in one position upon rotation of said pulley in one direction, and to move the same into its opposite position upon initial rotation of said pulley in a reverse direction and spring means to effect tensioning of said belt.

2. In a frictionally operated switch, the combination with a contact element movable in opposite directions between given circuit-controlling positions, of a driving pulley therefor, a frictional operating connection between said pulley and said element to frictionally hold said element in one of said positions upon rotation of said pulley in one direction and to move the same into its opposite position upon initial rotation of said pulley in a reverse direction, and means for biasing said element to insure positioning thereof in an intermediate position but only upon failure of said frictional operating connection.

3. In a frictionally operated switch, the combination with a contact element movable in opposite directions between given circuit controlling positions, of a driving pulley therefor, a belt looped over said pulley and connected to said contact element to provide a slip operating connection for frictionally holding said element in one position upon rotation of said pulley in one direction, and to move the same into its opposite extreme position upon initial rotation of said pulley in a reverse direction, and spring means associated with said element for biasing the same to effect tensioning of said belt.

4. In a frictionally operated switch, the combination with a pivoted contact element movable in opposite directions between given circuit-controlling positions, of a driving pulley therefor, a belt looped over said pulley and operatively connected to said contact element on opposite sides of the pivot thereof, and a spring pressure device for biasing the pivot of said contact element in a direction to effect tensioning of said belt.

5. In a frictionally operated switch, the combination with a pair of stationary contacts and a cooperating movable contact element having an associated pivot pin arranged intermediate said stationary contacts, of a reversible driving pulley, a belt looped over said pulley and connected to said contact element on opposite sides of said pivot pin to provide a slip operating connection for moving said contact element into and out of engagement with one or the other of said stationary contacts in accordance with the direction of rotation of said pulley, a spring associated with said pivot pin to bias said contact element in a direction to effect tensioning of said belt, and a fixed stop, said contact element being movable into engagement with said stop under the action of said spring upon failure of said belt, to insure

disengagement of said contact element with said stationary contacts.

6. In a frictionally operated switch, the combination with a stationary contact and a cooperating movable contact element having a pivot pin associated therewith, of a reversible driving pulley, a belt looped over said driving pulley and connected to said contact element on opposite sides of said pivot pin to provide a slip operating connection for moving said contact element into and out of engagement with said stationary contact upon rotation of said pulley in opposite directions, a spring associated with said pivot pin to bias said contact element in a direction to effect tensioning of said belt, and a fixed stop for limiting movement of said contact element under the action of said spring upon failure of said belt, said stop and said contact element having cooperating surfaces which insure movement of said contact element out of engagement with said stationary contact upon failure of said belt.

7. In a frictionally operated switch, in combination, an enclosing casing, an insulating base mounted within said casing, a switch mechanism mounted upon said base, including a stationary contact and a cooperating movable contact element having a pivot pin associated therewith, a pulley within said casing having an associated drive shaft journaled in one of the walls of said casing, a belt looped over said pulley and connected to said contact element on opposite sides of its associated pivot pin to provide for movement of said contact element into and out of engagement with said stationary contact upon rotation of said pulley in opposite directions, and a spring pressed pin slidably mounted upon said insulating base and connected to the pivot pin associated with said contact element to bias the latter in a direction to effect tensioning of said belt.

8. In a frictionally operated switch, in combination, an enclosing casing, an insulating base mounted upon the rear wall of said casing, a switch mechanism mounted upon said base including a stationary contact and a cooperating movable contact element having a pivot pin associated therewith, a pulley within said casing having an associated drive shaft journaled in the rear wall of said casing, a belt looped over said pulley and connected to said contact element on opposite sides of its associated pivot pin to provide for movement of said contact element into and out of engagement with said stationary contact upon rotation of said pulley in opposite directions, a bracket mounted upon said insulating base, a spring pressed pin slidably mounted upon said bracket and connected to the pivot pin associated with said contact element to bias the latter in a direction to effect tensioning of said belt, said contact element and said bracket having cooperating surfaces adapted to engage upon failure of said belt to insure disengagement of said contact element with said stationary contact.

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