Sept. 20, 1932. C. A. RINGBLOOM 1,878,602

CIRCUIT BREAKER CONTROL SWITCH

Filed Sept. 10, 1931 2 Sheets-Sheet 1

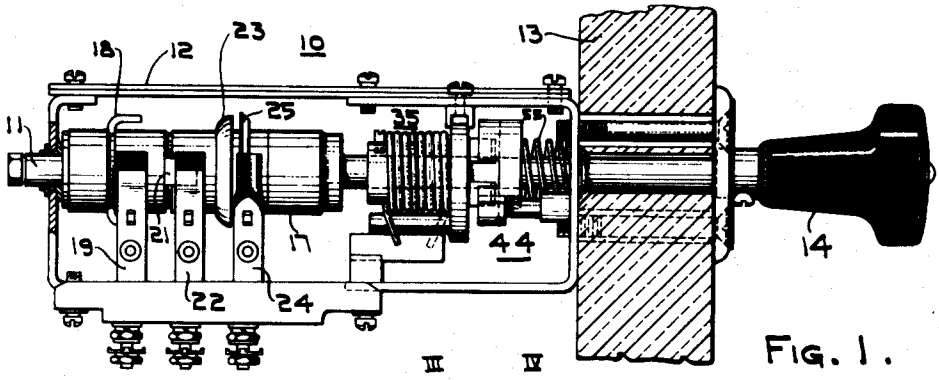



FIG. 1.

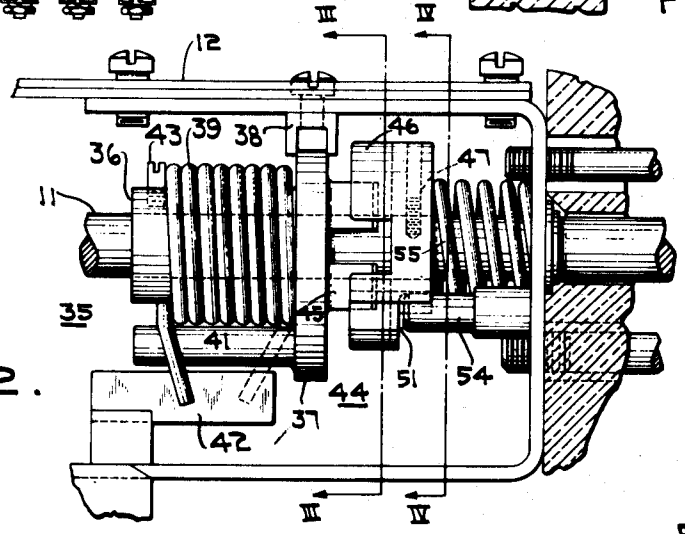
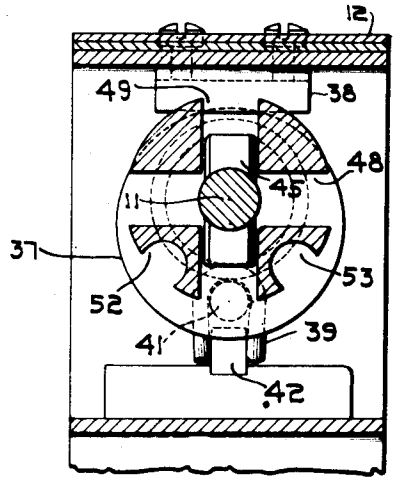



FIG. 2.

FIG. 4.



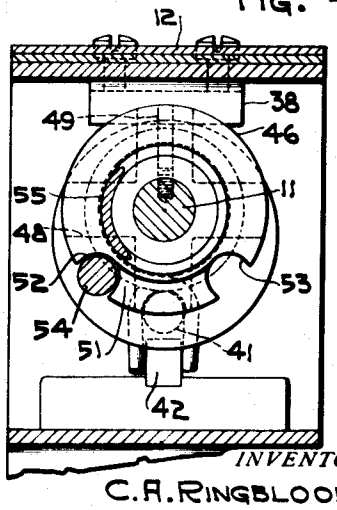




FIG. 3.

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CIRCUIT BREAKER CONTROL SWITCH

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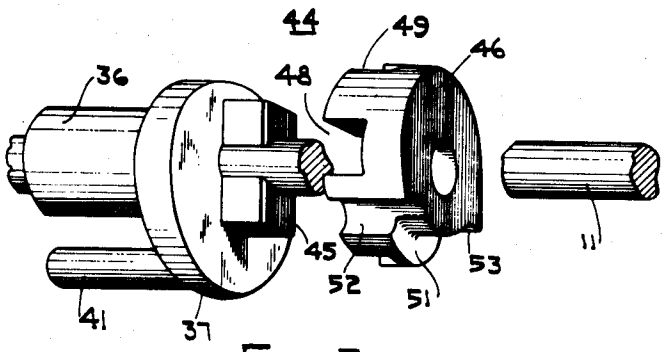



FIG. 5.

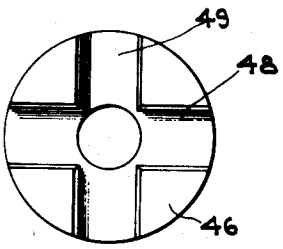



FIG. 6.

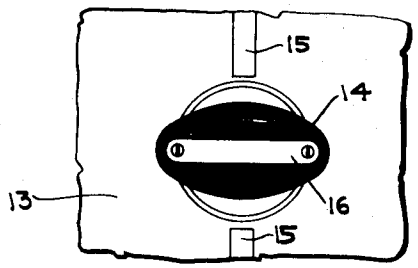



FIG. 7.

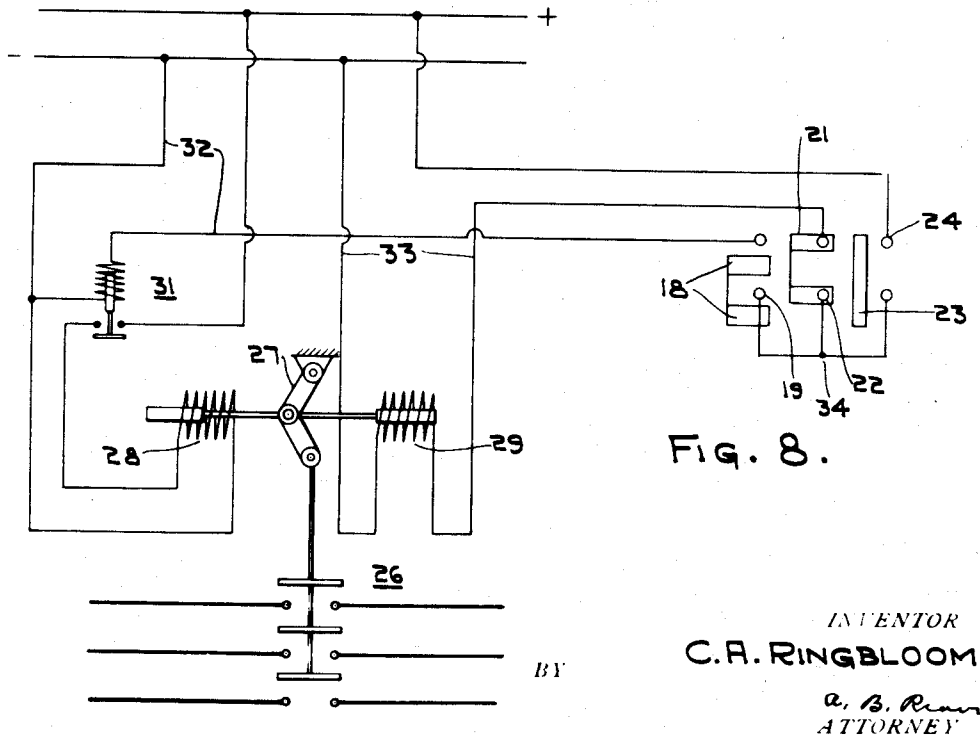



FIG. 8.

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# UNITED STATES PATENT OFFICE

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## CIRCUIT BREAKER CONTROL SWITCH

Application filed September 10, 1931. Serial No. 562,013.

My invention relates to a control mechanism, more particularly an electric control switch, and it has for its object to provide a control mechanism which indicates the last operation effected by it.

A more particular object is to provide a control switch having a control member which remains in the position indicating the last operation which it has effected.

A further object is to provide a control switch having a control member biased to the position indicating the last operation, so that after a subsequent incomplete movement, it will return to said position.

A further object is to provide a control switch having a control member which must be operated in a deliberate manner to effect the desired operation, whereby accidental or unintentional movement of the control member will not result in an undesired operation.

Another particular object is to provide a control member which is turned to different positions to effect different operations and which must be pulled out before completing an operation, whereby danger of accidental operation is avoided.

A further object is to provide a control switch having the characteristics of simplicity, durability and low cost.

In accordance with my invention, I provide a spring mechanism for biasing the control member, and a clutch mechanism for connecting the spring mechanism to the control mechanism. When the control member is actuated to effect an operation, the clutch mechanism releases the spring mechanism and thereafter reconnects the control member to the spring mechanism with the latter in neutral position, so that it will bias the control member to a new position to indicate the last operation effected thereby.

The above and other objects are effected by my invention, as will be apparent from the following description and claims taken in connection with the accompanying drawings, in which:

Fig. 1 is a side elevation of the control switch;

Fig. 2 is an enlarged partial side elevation;

Fig. 3 is a cross-sectional view taken along the line III—III of Fig. 2;

Fig. 4 is a cross-sectional view taken on the line IV—IV of Fig. 2;

Fig. 5 is a perspective view of the clutch elements embodied in the control switch;

Fig. 6 is an elevational view of one of the clutch elements;

Fig. 7 is a front elevation of the control member of the switch; and,

Fig. 8 is a wiring diagram of the circuits controlled by the control switch.

Referring now to the drawings more in detail, I show, in Fig. 1, a control switch 10 which may be used in various applications in which a plurality of circuits are to be controlled to effect various operations. For the present description, the control switch will be described as controlling the operation of a circuit breaker. The control switch 10 includes a shaft 11 mounted in a stationary frame 12, the latter being secured to a switchboard panel 13. The shaft 11 is movable to a limited extent both angularly and axially in the frame 12.

On the end of the shaft 11 projecting through the panel 13 is an oval-shaped handle 14, the shaft 11 and the handle 14 constituting the control member. As shown in Fig. 7, the panel 13 bears a miniature bus 15, or other representation of a bus, and the handle 14 also bears a short section 16 of miniature bus. In the vertical position of the handle 14, the bus section 16 is continuous with the miniature bus 15 and this position of the handle 15 indicates that the control switch 10 was last operated to close the circuit breaker controlled by the switch. The horizontal position of the handle 14, as shown in Fig. 7, in which the bus section 16 is transverse of the miniature bus 15, indicates that the switch was last used to open the breaker.

A contact drum 17 is mounted on the shaft 11. The drum 17 carries a bridging contact member 18 which is adapted to contact with stationary contacts 19 in one angular position of the shaft 11, and a second bridging contact member 21, which is adapted to bridge the stationary contacts 22 in a different angular position of the shaft 11, prefer-

ably at 90 degrees to the first-mentioned angular position. Each of these sets of contacts is adapted, when engaged, to remain in contact throughout the limited axial movement of the shaft 11. The contact drum 17 further includes an annular contact member 23 which is adapted to bridge a pair of stationary contacts 24, in any angular position of the shaft 11, but only when the shaft is moved axially forwardly, which is to the right from the position shown in Figs. 1 and 2. The stationary contacts 24 bear against an insulating ring 25, carried on the drum 17, when out of engagement with the contact member 23.

The contacts of the control switch 10 may be connected up, as shown in Fig. 8, to control a circuit breaker 26. The breaker 26 includes a toggle 27, which is actuated by a closing coil 28 to close the breaker and by a tripping or opening coil 29 to open the breaker. The closing coil 28 is controlled by a relay 31, which in turn is controlled by a circuit 32 in which the stationary contacts 19 and the contact member 18 are arranged in series with the contacts 24 and contact member 23. The opening coil 29 is controlled by a circuit 33 in which there are disposed in series the stationary contacts 22 and the contact member 21 and also the stationary contacts 24 and the contact member 23. The circuit 33 joins the circuit 32 at the junction point 34, so that the contacts 24 and the contact member 23 are common to both circuits.

A spring return mechanism 35 is provided for angularly biasing the shaft 11. This mechanism includes a sleeve 36 mounted on the shaft 11 but freely movable relative thereto both angularly and axially. The sleeve 36 has at its forward end an eccentric flange 37, engaged on opposite sides by the jaws of a U-shaped member 38, which maintains the sleeve 36 at all times in the same axial position. A coil spring 39 is mounted on the sleeve 36, and the ends thereof bear against opposite sides of a pin 41 carried by the flange 37 and a stationary pin 42 mounted on the frame 12. The spring 39 is held axially between the flange 37 and a set screw 43.

The spring 39 biases the spring mechanism 35 at all times to the neutral position shown on the drawings, particularly Fig. 3, in which the projection is in vertical position. If the spring mechanism is moved in clockwise direction from this position, the left hand end of the spring engages the pin 41 to bias the spring mechanism back to neutral position, while the right hand end bears against the stationary pin 42. Upon movement in counter-clockwise direction from neutral position, the right hand end of the spring 39 engages the pin 41 while the left hand end bears against the stationary pin 42.

A clutch mechanism 44 is provided for connecting the spring mechanism 35 to the shaft 11. The clutch mechanism includes a longitudinal projection 45 on the front face of the sleeve 36, constituting one of the clutch elements and a collar 46 which constitutes the second clutch element and is secured in a fixed position on the shaft 11 by means of a taper pin 47. The collar 46 is formed with slots 48 and 49, which are arranged at right angles to each other, and in one or the other of which the projection 45 is received.

The frame 12 carries a lug 54 which projects rearwardly toward the collar 46. The collar 46 is formed on its forward side with a recess 51, which receives the lug 54 and extends for about one-fourth of the circumference of the collar 46 to permit and limit angular movement of the shaft 11 to an extent of about 90 degrees. At the opposite ends of the recess 51, the collar 46 is formed with circular slots 52 and 53, which are adapted to receive the lug 54 upon forward axial movement of the shaft 11. The body of the collar 46 adjacent the recess 51 is adapted to abut against the end of the lug 54 to prevent axial movement of the shaft 11 and disengagement of the clutch elements, while the shaft is intermediate the limits of its angular travel. A compression spring 55, interposed between the frame 12 and the collar 46, biases the shaft 11 rearwardly, or to the left as shown in Figs. 1 and 2.

The operation of the above-described mechanism is as follows: In the position of the mechanism shown on the drawings, the circuit breaker 26 is open and the handle 14 is in horizontal position, indicating that the last operation effected by the control mechanism was to open the circuit breaker 26.

Assuming, now, that it is desired to close the breaker 26, the handle 14 is first turned angularly in clockwise direction through an angle of ninety degrees, to bring it to vertical position. This movement of the control member moves the contact member 21 out of engagement with the contacts 22 and moves the contact member 18 into engagement with the contacts 19. The circuit 32, however, is not yet completed, being open at the contacts 24. Throughout this angular movement, the spring mechanism 39 biases the control member to return to the horizontal position indicating opening of the breaker as the last operation.

To complete the circuit 32 and effect the closing of the breaker 26, the handle 14 is pulled out, that is, to the right as shown in Figs. 1 and 2, against the force of the spring 55, which movement brings the contact member 23 into engagement with the contacts 24. The circuit 32 then causes the relay 31 to energize the closing coil 28, which moves the toggle 27 to the right to close the breaker 26. As the handle 14 is pulled out, the collar or

clutch element 46 disengages the clutch element or projection 45, permitting the spring mechanism 35 to return to neutral position. While the handle 14 is pulled out, it cannot turn angularly, due to the engagement of the lug 54 in the recess 53 of the collar 46.

When the handle 14 is released, the spring 55 returns the control member to re-engage the clutch elements 45 and 46, the collar 46 having been turned so that the slot 48 is now in vertical position and the slot 49 in horizontal position. The projection or clutch element 45, therefore, engages in the slot 48, and the spring mechanism 35 is then effective to bias the handle 14 to vertical position, which indicates that the last operation effected by the control mechanism was to close the breaker 26, and that, unless it has since been opened by automatic mechanism well known in the art but not shown on the drawings, the breaker is in closed position.

To again open the breaker 26, the handle 14 is turned in counter-clockwise direction to horizontal position and then pulled out. The angular movement moves the contact member 18 out of engagement with the contacts 19 and brings the contact member 21 into engagement with the contacts 22. When the handle 14 is pulled out, the contact member 23 engages the contacts 24 to close the circuit 33. The latter energizes the tripping or opening coil 29, which moves the toggle 27 to the left to open the breaker 26.

The pulling out of the handle 14 again disengages the clutch elements 45 and 46, permitting the spring mechanism 35 to return to neutral position. Upon releasing the handle 14, the spring 55 returns the control member to re-engage the clutch elements, the slot 49 this time being in vertical position and receiving the clutch element 45. The handle 14 now remains in horizontal position to indicate that the last operation of the control mechanism was to open the breaker.

It will be noted that, should the handle 14 be accidentally turned, it will do no harm, since it is necessary to pull out the handle to complete an operation. As soon as the handle is released, it returns to the angular position indicating the last operation effected. Likewise, should the handle 14 be turned by the operator and he should decide not to complete the operation, the handle 14 is returned by the spring mechanism 35. It is necessary, before the control mechanism can effect an operation, both to turn the handle through the proper angular travel and then to pull it out. The combination of these two movements is of such a character that there is no danger of effecting the same accidentally or unintentionally and requires that the handle 14 be deliberately actuated in order to effect an operation controlled thereby.

While I have shown my invention in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications, without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are imposed by the prior art or as are specifically set forth in the appended claims.

What I claim is:

1. In a control mechanism for effecting various operations, the combination of a control member whose position determines the operation to be effected, a spring mechanism connected to the control member, and means effective upon an operation being effected by the control mechanism for disconnecting the spring mechanism and the control member and thereafter effective to reconnect the same, with the spring mechanism in neutral position, so that the spring mechanism will bias the control member to a new position to indicate the last operation effected by the control mechanism.

2. In a control switch, the combination of electrical contacts, a control member for actuating said contacts, a spring mechanism for biasing the control member, clutch elements for connecting the control member to the spring mechanism, said clutch elements being disengageable when the control member is actuated to complete an operation, whereupon said spring mechanism returns to neutral position, said clutch elements being re-engaged, upon releasing the control member, in such relation that the spring mechanism biases the control member to a position indicating the last operation effected thereby.

3. In a control mechanism for force-actuated apparatus, the combination of force-interrupting means for controlling the application of force to the force-actuated apparatus, a control member for operating the force-interrupting means, a spring return mechanism for biasing the control member, a clutch mechanism for connecting the control member and the spring mechanism, said clutch mechanism disengaging the control member and the spring return mechanism when the control member renders the force-interrupting means operative and thereafter re-engaging the same with the spring return mechanism in neutral position and the control member in a position indicating the last operation of the force-actuated mechanism effected by the control mechanism, whereby the spring return mechanism will bias the control member to said last-mentioned position.

4. In a control mechanism, a rotary control member movable to various angular positions for effecting different operations, means responsive to axial movement of the control member in the proper angular position for effecting a desired operation, a spring mechanism for biasing the control member to an

angular position, clutch elements connecting the spring mechanism and the control member, said clutch elements being disengaged upon axial movement of the control member to complete an operation for permitting the spring mechanism to return to neutral position and being re-engaged upon return axial movement of the control member in such relation that the spring mechanism biases the control member to the angular position in which it effected the last operation so as to indicate such operation.

5. In a control switch, the combination of an angularly and axially movable control member comprising a shaft and a handle fixed thereon, a plurality of sets of electrical contacts closed by the control member in different predetermined angular positions thereof and other contacts closed by axial movement of the control member, each of the several sets of first-mentioned contacts being in circuit with the second-mentioned contacts, a spring mechanism for angularly biasing the control member, a clutch mechanism comprising a clutch element fixed on said shaft and a second clutch element connected to the spring mechanism and adapted to be engaged by the first clutch element in a plurality of relative positions, said clutch elements being engaged when the control member is in the axial position opening the second-mentioned contacts and disengaged when it is moved axially to close the second-mentioned contacts, means for biasing the control member in axial circuit-opening direction, and means for restraining contact-closing axial movement of the control member to angular positions in which a set of first-mentioned contacts is closed, whereby, upon angular and axial movement of the control member to close a circuit, the clutch elements are disengaged to permit the spring mechanism to return to neutral position, and, upon return axial movement of the control member in circuit-opening direction, the clutch elements are re-engaged in such relation that the spring mechanism biases the control member to the angular position in which it last closed a circuit.

In testimony whereof, I have hereunto subscribed my name this second day of September, 1931.

CARL A. RINGBLOOM.