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C. I. HALL

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SWITCHING MEANS

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Fig. 1.

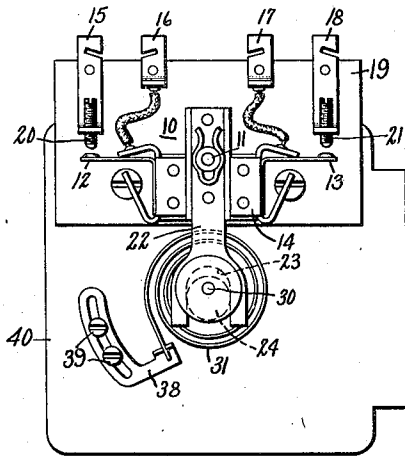


Fig. 2.

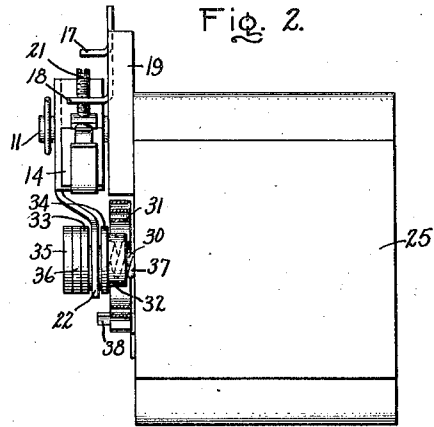
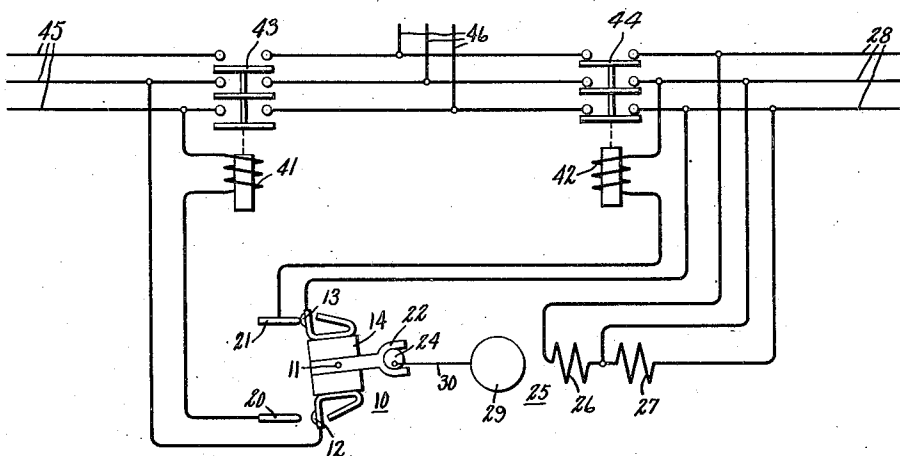


Fig. 3.



Inventor:  
Chester I. Hall,  
by *Harry E. Durham*  
His Attorney.

## UNITED STATES PATENT OFFICE

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## SWITCHING MEANS

Chester I. Hall, Vischer's Ferry, N. Y., assignor to:  
General Electric Company, a corporation of  
New York

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My invention relates to switching means, more particularly motor operated switching means, and has for its object simple and reliable shock-proof voltage responsive switching means for transferring a load circuit from a normal supply circuit to an emergency supply circuit in the event of failure of the normal supply circuit.

In carrying out my invention, I control the operation of supply source transfer switches by a relay switching device which is operated in response to voltage by means of a small electric motor connected to the normal supply source. Under normal voltage conditions, this motor turns against a biasing spring to move the relay to a position in which the normal supply source is connected to the load circuit. In the event of a decrease in the voltage of the normal supply circuit to a predetermined minimum value or the opening of any one of the three feeder lines due to damage, the torque of the motor is overcome by the biasing spring and the motor and relay switch turned to another position in which the transfer switches are reversed to connect the emergency supply circuit to the load circuit.

For a more complete understanding of my invention, reference should be had to the accompanying drawing in which Fig. 1 is an elevation view of a control relay embodying my invention; Fig. 2 is a side elevation view of the device shown in Fig. 1; while Fig. 3 is a diagrammatic representation of the relay of Figs. 1 and 2 connected to operate the transfer switches.

Referring to the drawing, in one form of my invention I provide a relay switch comprising a pivoted switch member 10 mounted on a stationary pivot 11 and provided with two movable contacts 12 and 13 which are electrically insulated from each other. Preferably, as shown, the relay is provided with a block 14 of electrically insulating material to opposite sides of which the movable contacts are secured, this block being pivotally mounted adjacent its upper side, as viewed in Figs. 1 and 2 on the pivot 11. Preferably, as shown, the movable contacts are mounted on the ends of spring arms which are adapted to flex to give a wiping action between the engaging contacts. Suitable terminal connectors 15, 16, 17 and 18 are provided on a support 19 made of electrically insulating material by means of which electric connections are made to the movable contacts, and also to the stationary contacts 20 and 21, the stationary contacts being mounted on the insulating support 19.

Secured also to the block 14 is a metal arm 22

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which extends downward, as seen in Figs. 1 and 2, and has its lower end bifurcated to provide a slot 23 having a circular bottom. In this slot an operating eccentric 24 moves in engagement with opposite side walls of the slot for actuation of the block 14 and the movable contacts about the pivot 11 into engagement with one or the other of the stationary contacts.

For the actuation of the eccentric 24, a voltage responsive actuating means is provided consisting, as shown, of an electric motor 25 of a suitable two-phase type having two windings 26 and 27 connected as shown in Fig. 3 to two phases of the normal three-phase supply source 28. As shown, the motor is provided with a squirrel cage rotor 29 on the shaft 30 of which the eccentric 24 is mounted. The motor is furthermore adapted to remain electrically connected to the supply source 28 for an indefinite time after its rotor has been brought to rest mechanically.

As shown, the slot 23 and the eccentric 24 are arranged relative to each other so that the eccentric has approximately 180 degrees freedom of movement. In its position shown in Fig. 1, the eccentric is midway between its two extreme positions and can be moved substantially 90 degrees in each direction from this central position. Under normal operating conditions, it will be understood that the eccentric will not remain in this mid position since it will be turned in one direction, such as clockwise, by a spiral biasing spring 31 ninety degrees to one extreme position or it will be turned in the opposite direction by the motor to its other extreme position. In each of these two extreme positions, the eccentric engages the circular bottom of the slot or the recess 23 whereby it is brought to rest.

It will be observed that, in each of these two extreme positions defined by 90 degrees rotation from the position shown in Fig. 1, the eccentric is in a locked or dead center position with respect to the sides of the slot 23. In other words, in each of these extreme positions, a force tending to move the switch arm 10 about its pivot is applied by one arm or the other of the slot to the eccentric in a direction to pass through the axis of the shaft 30 and the eccentric. Thus the eccentric and the arm 22 form dead center crank operating means which locks the pivoted switching device in each of these extreme positions. This is an important feature of my invention and assures that the relay will not be inadvertently operated by heavy shocks.

For the purpose of absorbing the energy of the rotor 29 and other moving parts, I provide a

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frictional driving connection between the shaft 30 and the eccentric. To this end the eccentric is mounted on a sleeve 32 which is slidably and rotatably mounted on the shaft 30. This sleeve is provided with two circular discs or flanges 33 and 34 on opposite sides of the eccentric and having their centers coincident with the axis of the shaft. As shown, the forked portion of the member 22 is positioned between these two circular members 33 and 34 which serve to maintain it in driving relation with the eccentric. Secured rigidly to the outer end of the shaft 30 is a disc 35 of the same size as the disc 33, and between these two discs is a friction disc 36 made of a suitable material, such as felt. A helical spring 37 surrounding the shaft 30 (Fig. 2) has its left-hand end bearing against the sleeve 32 and forcing the disc 33 against the friction disc 36. The other end of the spring bears against a suitable flange (not shown) on the shaft 30.

The spiral spring 31 has its inner end secured to the sleeve 32 while its outer end is secured to an adjustable bracket 38 adjustably secured by screws 39 to a support 40 to which is secured the support 19 and also the electric motor 25.

In the operation of my invention, the relay 10 is connected to control the energization of two operating coils 41 and 42 which operate switches 43 and 44 normally biased to their open positions controlling the connection of the normal three-phase supply source 28 and an emergency supply source 45 to a load circuit 46. As shown in Fig. 3, the relay 10 is turned by the motor 25 against the biasing spring 31 to a position to energize the coil 42 and close the switch 44 with electric power applied to the circuits, while the coil 41 is de-energized for opening of the switch 43 in accordance with its bias.

When power is applied to the sources 28 and 45 by suitable switches (not shown) if the voltage of the source 28 is above a predetermined minimum value such as 80 per cent of its normal value, the torque exerted by the motor is sufficient to overcome the biasing force of the spring 31 and the motor therefore turns the eccentric 180 degrees in a counterclockwise direction, to the position seen in Fig. 3, thereby to deenergize the coil 41 and energize the coil 42 for closure of the switch 44 and opening of the switch 43 in accordance with its bias. This connects the normal supply source 28 to the load circuit for normal operation.

In the event that for any reason the voltage of the normal supply source 28 fails or decreases to a value below the predetermined minimum voltage for which the relative torques of the motor and the biasing spring are adjusted, or in the event of failure of one phase resulting in loss of torque in the motor, the spring overcomes the force of the motor and turns the eccentric clockwise back to its biased position. This de-energizes the coil 42 for opening of the switch 44 and energizes the coil 41 for closure of the switch 43 thereby connecting the emergency supply source to the load circuit. Later on, in the event that the normal supply source voltage increases to a value above the predetermined minimum, the motor torque overcomes the bias of the spring and turns the relay to the position shown in Fig. 3, thereby automatically reconnecting the normal supply source to the load circuit.

While I have shown a particular embodiment of my invention, it will be understood, of course, that I do not wish to be limited thereto since many modifications may be made, and I therefore

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contemplate by the appended claims to cover any such modifications as fall within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. A shockproof switch operating mechanism comprising a support, an operating member pivotally mounted at one end upon said support for movement between two angularly spaced switching positions, the other end of said operating member being bifurcated to provide an actuating slot having side walls joined by a bottom wall, an eccentric pivotally mounted for rotation between said side walls thereby to move said operating member between said switching positions upon rotation of said eccentric substantially 180 degrees between two control positions, said eccentric being arranged to engage said bottom wall of said slot and be brought to rest thereby with said operating member in each of said switching positions and with said eccentric in a locked dead center position with respect to said side walls thereby to hold said operating member in each of said switching positions against the force of a shock applied to said support, electric driving means, and a slip clutch connecting said driving means to said eccentric providing for continued movement of said driving means after said eccentric is brought to rest against said bottom wall when said driving means is operated to turn said eccentric from one control position to the other.

2. A shockproof switch operating mechanism comprising a support, an operating member pivotally mounted at one end on said support for movement between two angularly spaced switching positions, the other end of said switch operating mechanism being bifurcated to provide an actuating slot having side walls joined by a bottom wall, an eccentric pivotally mounted for rotation between said side walls of said slot, a torque motor, a slip clutch connecting said torque motor to turn said eccentric in one direction thereby to move said operating member to one switching position, said eccentric being arranged to engage said bottom wall of said slot and thereby be brought to rest with said operating member in said switching position and said eccentric in a locked dead center position with respect to said side walls of said slot thereby to hold said operating member in said position against the force of a shock applied to said support, and a spring connected to said eccentric to apply a rotational biasing force thereto in opposition to the force applied by said torque motor for turning said eccentric substantially 180 degrees in the opposite direction until brought to rest by engagement with said bottom wall thereby to move said operating member to a second switching position when the torque of said motor is decreased to a predetermined minimum value.

3. A shockproof selector switch operating mechanism comprising a support, a pivoted switch operating member mounted at one end on said support and bifurcated at its other end to provide an actuating slot having side walls extending lengthwise of said member and parallel with the pivot of said member joined by an arcuate bottom wall, an eccentric pivotally mounted for rotation between said side walls of said slot, electric driving means connected to turn said eccentric in one direction thereby to move said operating member on its pivot to one switching position, said eccentric being arranged to engage said bottom wall of said slot and thereby be brought to rest and stall said driving means with said

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operating member in said switching position and said eccentric in a locked dead center position with respect to said side walls of said slot thereby to hold said operating member in said position against the force of a shock applied to said support, a frictional driving connection between said driving means and said eccentric, and a spring connected to said eccentric to apply a rotational biasing force thereto in opposition to the force applied by said driving means for turning said eccentric substantially 180 degrees in the opposite direction until brought to rest by engagement with said bottom wall thereby to move said operating member to its other switching position when the torque of said driving means is decreased to a predetermined minimum value.

CHESTER I. HALL.

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