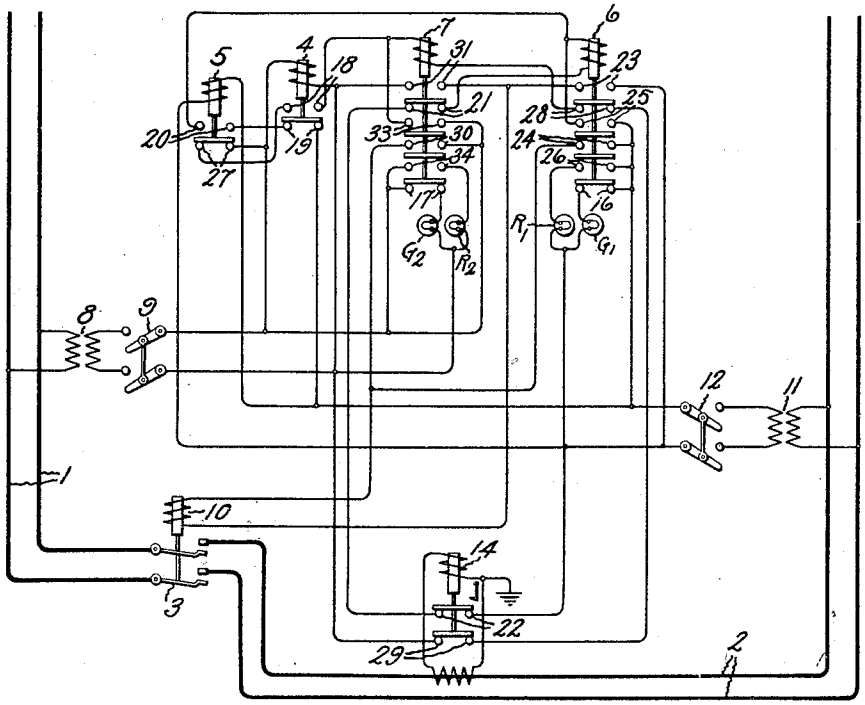
Jan. 5, 1932. R. E. BEAR 1,840,077

INDICATING SYSTEM

Filed May 10, 1928



Inventor:
Ralston E. Bear,
by Charles E. Mullen
His Attorney.

Patented Jan. 5, 1932 1,840,077

UNITED STATES PATENT OFFICE

RALSTON E. BEAR, OF LOS ANGELES, CALIFORNIA, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK

INDICATING SYSTEM

Application filed May 10, 1928. Serial No. 276,736.

My invention relates to indicating systems and particularly to a system for indicating on which of a plurality of circuits a certain electrical condition occurred.

In certain systems of distribution, arrangements are provided whereby two normally disconnected independently energized circuits are automatically connected together whenever one of the circuits becomes deenergized while the other is energized. One object of my invention is to provide in such an arrangement an indicating arrangement whereby one may tell whether or not the two circuits are connected together and if they are connected together which circuit failed and effected the connection of the two circuits.

My invention will be better understood from the following description taken in connection with the accompanying drawing and its scope will be pointed out in the appended claim.

Referring to the drawing which is a diagram of an electric system embodying my invention, 1 and 2 represent two normally disconnected electric circuits which are arranged to be energized by suitable sources of current, not shown. The two circuits 1 and 2 are arranged to be connected together by a suitable switch 3 which is arranged to be closed automatically when one of the electric circuits becomes deenergized while the other is energized. In the arrangement shown in the drawing this result is obtained by means of the voltage relays 4 and 5, which are respectively connected so that they are responsive to the voltages of the circuits 1 and 2, and the control relays 6 and 7 associated respectively with the voltage relays 4 and 5. The voltage relay 4, which is connected across the circuit 1 by means of a potential transformer 8 and a control switch 9, is arranged to complete a circuit for the control relay 6 across the circuit 2 when the voltage of the electric circuit 1 decreases below a predetermined value. The control relay 6 when energized effects the completion of a circuit for the closing coil 10 of the switch 3 so that the circuits 1 and 2 are connected together and the voltage of the circuit 1 is restored to its normal value. The energization of the control relay 6 also completes a locking circuit for itself which is independent of the voltage relay 4 so that the control relay 6 is not deenergized by the voltage relay 4 when the circuit 1 is reenergized by the closing of the switch 3.

The voltage relay 5 which is connected across the electric circuit 2 by means of a transformer 11 and control switch 12 is arranged to complete a circuit for the control relay 7 across the circuit 1 when the voltage of the circuit 2 decreases below a predetermined value. The control relay 7 when energized effects the completion of a circuit for the closing coil 10 of the switch 3 so that the circuits 1 and 2 are connected together and the voltage of the circuit 2 is restored to its normal value. The energization of the control relay 7 also completes a locking circuit for itself so that it is not deenergized by the voltage relay 5 when the circuit 2 is reenergized by the closing of the switch 3.

In order to effect the opening of the switch 10 in case a fault occurs on one of the electric circuits while the switch 3 is closed and causes an abnormal current to flow through the switch, an overload responsive relay 14 which is connected so as to be responsive to the current flow through switch 3 is provided for effecting the opening of switch 3. In some cases it may be desirable to arrange the system in any suitable manner so that the switch 3 cannot be reclosed automatically after the overload relay has been operated. This result may be obtained in the arrangement shown by employing an overload relay of the type well known in the art as a lock out relay which is so arranged that it is mechanically held in its actuated position until reset by hand. Overload relay 14 is diagrammatically shown as such a relay in the drawing.

In the arrangement shown in the drawing it is desirable to have an indicating arrangement whereby one can tell without inspecting the apparatus whether or not the switch 3 is closed and if it is closed which circuit voltage failed and caused the switch to close. In the preferred embodiment of my invention shown in the drawing two indicating lamps G1 and R1 are associated with the circuit 1

and indicating lamps G2 and R2 are associated with the circuit 2. The circuits of these lamps are selectively controlled by the control relays 6 and 7 so that when the switch 3 is open and both of the circuits 1 and 2 are energized the lamps G1 and G2 are lighted. If the voltage of circuit 1 fails so that relay 6 is operated to close the switch 3 the circuit of lamp G1 is opened and the circuit of lamp R1 is completed so that the lamps G2 and R1 are simultaneously lighted. If, however, the voltage of circuit 2 fails so that the control relay 7 is operated to effect the closing of switch 3, the circuit of lamp G2 is opened and the circuit of lamp R2 is completed so that the lamps G1 and R2 are simultaneously lighted.

The operation of the arrangement shown in the drawing is as follows: When both of the electric circuits are independently energized and the switch 3 is open and the control switches 9 and 12 are closed, the voltage relays 4 and 5 are energized and the control relays 6 and 7 are deenergized. Under these conditions the circuit of the lamp G1 is completed through contacts 16 of relay 6 and the circuit of lamp G2 is completed through contacts 17 of relay 7 so that the lamps G1 and G2 are simultaneously lighted. This is an indication that both of the circuits 1 and 2 are energized and the switch 3 is open.

When the voltage of the circuit 1 decreases below a predetermined value the voltage relay 4 operates to open its contacts 18 and close its contacts 19. The closing of the contacts 19 completes a circuit for the control relay 6. This circuit is from one terminal of the secondary winding of transformer 11 through switch 12, contacts 19 of relay 4, contacts 20 of relay 5, coil of relay 6, contacts 21 of relay 7, contacts 22 of overload relay 14, contacts of control switch 12 to the other secondary terminal of the transformer 11. Control relay 6 by closing its contacts 23 and 24 connects the closing coil 10 of the switch 3 across the secondary of the transformer 11 so that the switch 3 is closed to connect the deenergized circuit 1 to the energized circuit 2. Relay 6 by closing its contacts 25 completes a shunt circuit around the contacts 19 of relay 4 and contacts 20 of relay 5. This locking circuit for the relay 6 maintains the coil thereof energized after the voltage relay 4 opens its contacts 19 due to the reenergization of the circuit 1. Relay 6 by opening its contacts 16 opens the circuit of the lamp G1 and by closing its contacts 26 completes the circuit of the lamp R1 across the secondary of the transformer 11. The lighted lamps G2 and R1 are an indication that the switch 3 is closed and that the closing thereof was effected by the deenergization of the circuit 1.

When the two circuits 1 and 2 are independently energized and the voltage of the source 2 decreases below a predetermined value, the voltage relay 5 opens its contacts 20 and closes its contacts 27. The closing of the contacts 27 completes a circuit for the control relay 7 which becomes energized and effects the closing of the switch 3. The circuit of the coil of the relay 7 is from one secondary terminal of the transformer 8 through the control switch 9, contacts 27 of relay 5, contacts 18 of relay 4, coil of relay 7, contacts 28 of relay 6, contacts 29 of overload relay 14, contacts of switch 9 to the other secondary terminal of the relay 8. Control relay 7 by closing its contacts 30 and 31 completes the circuit of the closing coil 10 of the switch 3 across the secondary of the transformer 8. Control relay 7 by closing its contacts 33 completes a shunt around the contacts 27 of the relay 5 and contacts 18 of relay 4. Due to the closing of this locking circuit the relay 7 remains energized after the relay 5 opens its contacts 27 due to the reenergization of the circuit 2. The relay 7 by opening its contacts 17 opens the circuit of the lamp G2 and by closing its contacts 34 completes the circuit of the lamp R2 across the secondary of the transformer 8. The lighted lamps G1 and R2 are an indication that the switch 3 is closed and that the closing thereof was effected by the deenergization of the circuit 2.

While I have, in accordance with the patent statutes shown and described my invention as applied to a particular system and as embodying various devices diagrammatically indicated, changes and modifications will be obvious to those skilled in the art and I, therefore aim in the appended claim to cover all such changes and 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:—

In combination, two normally disconnected independently energized electric circuits, a switch for connecting said circuits, a closing coil for said switch, a control relay, means whereby said control relay when energized effects the energization of said closing coil, a voltage relay responsive to the voltage of one of said circuits, means whereby said voltage relay effects the energization of said control relay when the voltage of said one of said circuits is below a predetermined value, means responsive to the energization of said control relay for maintaining said control relay energized independently of said voltage relay, an indicating device, and a circuit for said device arranged to be completed by said control relay when energized, a second control relay, means whereby said second control relay when energized effects the energization of said closing coil, a second voltage relay responsive to the voltage of the other circuit, means whereby said second voltage relay effects the energization of said second control relay when the voltage of said other

circuit is below a predetermined value, means responsive to the energization of said second control relay for maintaining it energized independently of said second voltage relay, a second indicating device, and a circuit for said second indicating device completed by said second control relay when energized.

In witness whereof, I have hereunto set my hand this fourth day of May, 1928.

RALSTON E. BEAR.