

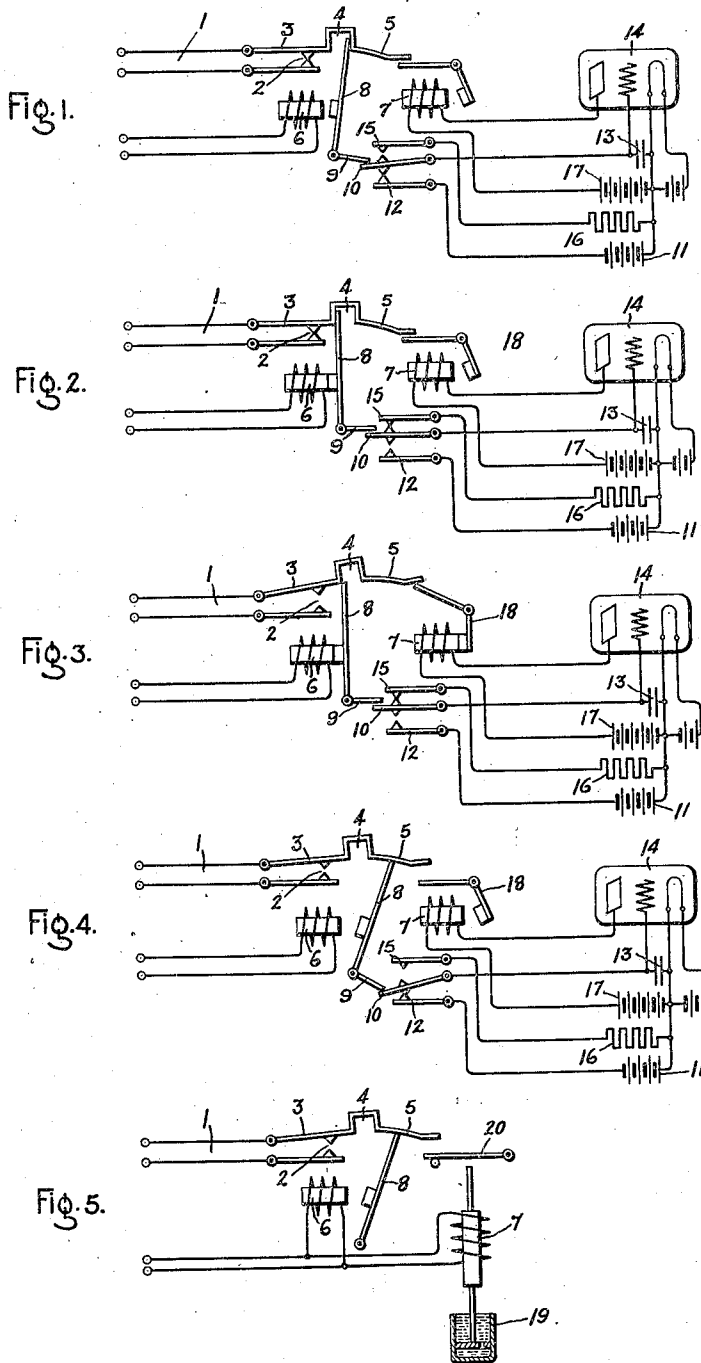
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REMOTE CONTROL SWITCHING SYSTEM

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# UNITED STATES PATENT OFFICE

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## REMOTE-CONTROL SWITCHING SYSTEM

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My present invention relates to remote control systems.

It is an object of my invention to provide a simple and reliable means for closing and opening a remote circuit. I accomplish this result by means of a pair of relays, one of which effects the closure and the other the opening of the distant circuit. When a current impulse of short duration is supplied to one of the relays, the remote circuit is closed and maintained in a closed position. When it is desired to open the circuit, a current impulse of longer duration than the first impulse is supplied to this relay. In the latter case the second relay becomes operative after a predetermined period of time and opens the remote circuit. The circuit is maintained open after the long impulse ceases and until another impulse is supplied to the system.

The novel features which I believe to be characteristic of my invention are set forth with particularity in the appended claims. My invention itself, however, both as to its organization and method of operation, will best be understood by reference to the following specification taken in connection with the accompanying drawing, in which Fig. 1 shows the inactive or quiet position of the apparatus with the remote circuit closed and the relays deenergized; Fig. 2 shows the position of the apparatus at the beginning of an impulse sent to open the remote circuit; Fig. 3 shows the position when the second relay has become operative; while Fig. 4 shows the position after a long operating impulse has ceased to flow to the first relay; Fig. 5 shows a modified form of time delay relay.

Referring to the drawing, I have indicated at 1 a remote circuit which is controlled by a main switch 2 having a movable member 3 which is provided with a recess 4 and an extension 5. Cooperating with member 3 are a plurality of relays 6 and 7 which are adapted to effect the closure and opening of switch 2.

In Fig. 1 of the drawing, switch 2 occupies its normal closed position, and no current is supplied to either relay 6 or 7. In

this position of switch 2, the armature 8 of relay 6 occupies the right hand portion of recess 4, and an extension 9, connected to the armature, operates a spring contact 10 to close a circuit from a battery 11 through contacts 12 and 10 to a condenser 13. This circuit supplies a charge to condenser 13, and at the same time supplies a negative bias to the grid element of an electron discharge device or tube 14, so that no current flows through either the latter or relay 7 which is in circuit with the tube.

When it is desired to open switch 2, a relatively long current impulse is supplied to relay 6. Armature 8 is moved to the position indicated in Fig. 2 at the beginning of impulse. Movement of armature 8 allows contact 10 to become disengaged from contact 12, and permits closure of an auxiliary switch, comprising contacts 10 and 15. Closure of the auxiliary switch completes a circuit from condenser 13 through a resistance element 16, allowing the condenser to discharge, and permitting a gradually increasing current to flow from a battery 17 through tube 14 and relay 7. When this current reaches a predetermined value, relay 7 attracts its armature member 18, and raises the pivoted switch member 3 to open the remote circuit, as indicated in Fig. 3.

When relay 6 is deenergized, armature 8 will be moved to the position shown in Fig. 4, either by its own weight or by means of a spring, not shown. Energization of relay 7 will be maintained after the deenergization of relay 6 until armature 8 has moved beyond the interlocking recess 4. This is due to the fact that current will flow to relay 7 through tube 14, until contact 10 is moved into engagement with contact 12 to supply a negative bias to the grid of the tube from battery 11 and thus interrupt the flow of current through tube 14 and its associated relay 7.

If it is desired to close switch 2, a relatively short current impulse is supplied to relay 6. Energization of the latter moves armature 8 from the position shown in Fig. 4 to the position shown in Fig. 2. Although a circuit will be closed at this time for the discharge of condenser 13, the length of time that contacts

10 and 15 are closed will not be of sufficient duration to allow the current through the tube to build up to a value great enough to operate relay 7. When relay 6 is deenergized armature 8 will be moved to the right hand portion of recess 4 as indicated in Fig. 1. Switch 2 will remain closed due to the interlocking action of recess 4 and armature 8. Contacts 10 and 15, however, will be separated and contacts 10 and 12 engaged so that no current will flow through tube 14 or relay 7.

In the form of my invention shown in Fig. 5 I employ a time delay relay including a dashpot 19. The operation of the arrangement shown in this figure is substantially identical with the operation disclosed in the previous figures. When a short current impulse is supplied to relay 6, armature 8 will be actuated and the remote switch 2 will be closed. Although relay 7 will be energized at the same time as relay 6, the pivoted arm 20 will not be actuated due to the effect of the dashpot 19. When a long current impulse is supplied to relay 6, relay 7 will be energized, and after a predetermined period of time relay 7 will actuate arm 20 to raise the switch member 3 and release armature 8. Arm 20 will remain elevated for a certain period of time after deenergization of relays 6 and 7, owing to the action of dashpot 19. In this manner, armature 8 will be permitted to pass beyond the recess 4 to the position indicated in Fig. 5.

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

1. The method of controlling the opening and closing of an electric circuit by means of a pair of relays arranged to be energized in response to received energy, which comprises energizing one of the relays to effect closing of the circuit and energizing both of the relays and producing a time interval between the operation thereof to effect opening of the circuit, said time interval being of such duration that said circuit is selectively opened and closed dependent upon the duration of said received energy.

2. In combination, an electric circuit and a plurality of relays arranged to be energized in response to received energy to control said circuit, one of the relays being operable to effect closing of the circuit and the other to open the circuit, and means whereby said relays must be energized simultaneously to effect opening of the circuit, said other relay being operable only after the first mentioned relay has been operated for a predetermined period of time, said predetermined period of time being of such duration that said circuit is selectively opened and closed dependent upon the duration of said received energy.

3. In combination, a switch comprising a movable element, a pair of electromagnets

cooperating with said element, one of said electromagnets having a movable armature adapted when operated to effect closing of the switch, and means controlled by the movement of the armature for simultaneously energizing the other electromagnet to open the switch, said means including an electron discharge device.

4. In combination, means for controlling an electric circuit, said means comprising an electromagnet, means for energizing the electromagnet to close the circuit, means whereby the circuit may be maintained closed, and means controlled by said electromagnet for opening said circuit, said last mentioned means being operable to open the circuit whenever said electromagnet is energized.

5. In a switching system, a main switch and an auxiliary switch, a single electromagnet cooperating with said switches to effect the closure thereof, and means responsive to the closing of said auxiliary switch for effecting the opening of said main switch a predetermined period of time after the closure of said auxiliary switch.

6. In a switching system, a main and an auxiliary switch, means responsive to a current impulse for closing said switches, and means in circuit with said auxiliary switch for controlling the opening of said main switch said means comprising an electron discharge device.

7. In combination, an electric circuit, means for opening and closing said circuit, said means including a plurality of relays, means whereby the energization of one of said relays closes the circuit, and means including an electron discharge device for controlling the energization of a second relay to open said circuit.

8. In combination, a switch having a movable element provided with a recess and an extension, a single means cooperating with said extension and recess for maintaining said switch in open position and for permitting said switch to be closed, and a second means cooperating with said extension and adapted to automatically open said switch.

9. In combination, a control member having a plurality of positions, an electromagnet, means responsive to energization of said electromagnet for operating said member to one position, means responsive to energization of said magnet for an interval longer than that required to operate said member to said one position for mechanically engaging said member and operating it to another position, and means for retaining said member in either of said positions after said magnet is deenergized.

10. In combination, a circuit controlling member having circuit closing and circuit opening positions, said member being biased to one of said positions, an electroresponsive device comprising a second control member

arranged to cooperate with said circuit controlling member to retain it in the other of said positions and operable in response to energization of said electroresponsive device to release said circuit controlling member whereby said member is actuated to said one position, and means operable in response to energization of said electroresponsive device for a predetermined period longer than that required to operate said member to said one position to operate said circuit controlling member to said other position in which said member is retained by said second member.

11. In combination, a circuit controlling member having a circuit closing position and a circuit opening position, a pair of electroresponsive devices, one of said devices being arranged to operate said member to one of said positions in response to energization thereof and the other of said devices being arranged in response to energization thereof to operate said member to the other position, and means responsive to energization of said first electroresponsive device for energizing said second electroresponsive device after a predetermined interval subsequent to energization of the first electroresponsive device.

12. In combination, a controlling member having a plurality of positions, an electroresponsive device, a mechanical interconnection between said member and said electroresponsive device whereby in response to energization of said electroresponsive device said member is operated from one position to the other, and means responsive to energization of said electroresponsive device for a period longer than that required to operate said member to said other position for operating said member to said one position.

13. In combination, a primary circuit, a secondary circuit, a pair of electroresponsive devices, said electroresponsive devices being connected and arranged to become energized in response to energization of said primary circuit and one of said electroresponsive devices being arranged to close said secondary circuit and the other of said electroresponsive devices being arranged to open said secondary circuit, and means for causing a time delay between operation of said electroresponsive devices whereby said secondary circuit may be selectively opened and closed as a result of different durations of energization of the primary circuit.

14. In combination, an electric circuit, means for opening and closing said circuit, said means comprising a relay having a common circuit controlling element, additional elements mechanically cooperating therewith, means including one of said additional elements whereby the energization of said relay closes the circuit, and means including another of said additional elements whereby said circuit will be opened if the energization

of said relay persists for a predetermined period of time.

15. In combination, a relay comprising an armature having different circuit controlling positions, and a pair of electromagnets, one of said magnets being arranged to operate said armature to one of said positions and the other magnet being arranged to operate said armature to another position, a circuit, and means whereby when current is supplied to said circuit said electromagnets become energized in succession.

16. In combination, a relay comprising an armature having different circuit controlling positions, and a pair of electromagnets, one of said magnets being arranged to operate said armature to one of said positions and the other magnet being arranged to operate said armature to another position, means for energizing both of said magnets, and means for producing a time delay between operation thereof whereby upon energization of said magnets for a certain interval said armature is operated to one position and upon energization of said magnets for a longer interval said armature is operated to a different position.

In witness whereof, I have hereunto set my hand this 4th day of August, 1925.

LESTER F. BIRD.