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ALARM SIGNAL SYSTEM FOR TELEPHONE EXCHANGES.

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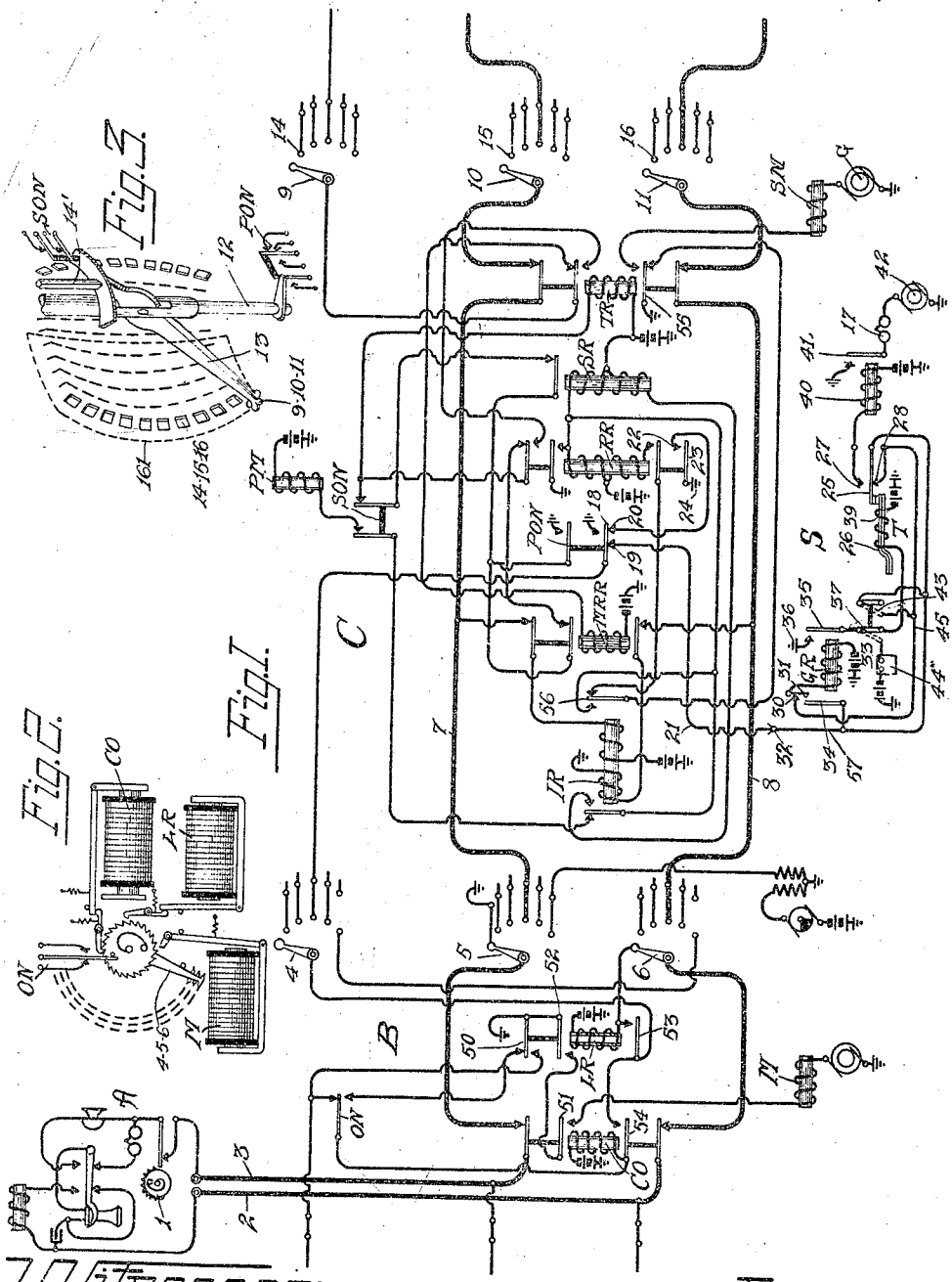

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ALARM-SIGNAL SYSTEM FOR TELEPHONE-EXCHANGES.

1,200,841. Specification of Letters Patent. Patented Oct. 10, 1916.

Application filed June 29, 1914. Serial No. 847,820.

To all whom it may concern:

Be it known that I, HARRY H. IDE, a citizen of the United States of America, residing at La Grange, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Alarm-Signal Systems for Telephone-Exchanges, of which the following is a specification.

My invention relates to alarm signal systems and has to do more particularly with the systems of this character adapted for use in connection with automatic switches such as are used in automatic and semi-automatic telephone exchange systems, an object of my invention being to provide an improved signal arrangement for indicating an abnormal condition of the switch circuits or mechanism. To this end I provide an alarm system operative to indicate an abnormal condition such as wherein the switch is left in an abnormal condition for more than a predetermined period.

In the preferred form of my invention I utilize a thermal element which will respond only after the lapse of a predetermined time interval to operate an alarm so as to apprise the attendant that some part of the mechanism has been abnormal beyond the time limit.

I will explain my invention more in detail by referring to the accompanying drawing illustrating one form of its application in which—

Figure 1 is a diagrammatic view of a line circuit and first selector arranged in accordance with my invention; Fig. 2 is a more or less diagrammatic view illustrating the mechanical arrangement of the line switch, and Fig. 3 is a more or less diagrammatic view illustrating the mechanical arrangement of the first selector.

Referring more particularly to Fig. 1, I have shown a subscriber's substation A having the ordinary telephone equipment and a calling device 1, united by means of the line conductors 2 and 3 with a central station at which is provided the line switch B consisting of the line relay LR and the cut-off relay CO. A motor magnet M is likewise provided, all arranged as shown more in detail in Fig. 2, and including likewise the off-normal contacts ON. The line switch through the agency of the wipers 4, 5, and 6 completes the circuit of line conductors 2 and 3 through to the talking conductors 7 and 8 of the first selector C. This first selector of course is adapted through the wipers 9, 10, 11 to extend the circuit to a second selector or connector as the case may be, all as is well understood in the art. The first selector and other switches as well as the connector switches may preferably be in the form illustrated in Fig. 3, being of the two dimension type, that is, the type in which the bank contacts are divided into groups, and in which a primary adjustment of the switch is effected to select a group and thereafter a secondary adjustment produced automatically to select a contact of the selected group. To this end the selector switch has the rotating shaft 12, the movable arm 13 and the vertically movable shaft 14', to associate the arm 13 carrying the wipers 9, 10, 11 for instance with contacts 14, 15, 16 for instance, these contacts being shown diagrammatically to represent three separate insulated contacts. The path of the arm is along the dotted line 161, for instance, completing its entire upward movement in releasing, and then swinging to the left and downwardly to its initial position illustrated in Fig. 3. All of this is in accordance with the system disclosed in an application of William Kaisling for automatic switches, Serial No. 600,664, filed January 3rd, 1911.

The first selector is provided with an impulse relay IR, a main release relay MRR, a differential release RR, a secondary relay SR, primary magnet PM, secondary magnet SM associated with the alternating current generator G, primary off-normal switches PON and the secondary off-normal switches SON, the test relay TR, all in accordance with the system disclosed in my application for automatic telephone systems, Serial No. 846,018, filed June 19th, 1914.

My improvement concerns itself particularly with the provision of the alarm signal S, which is arranged to operate should an associated switch be in trouble or its parts in an abnormal condition. For this purpose, I provide a group relay GR which is preferably common to a plurality of devices such as selectors C, being connected at the common point 32 to conductors 21 extending to the different associated switches C. A thermal element T is also provided and controlled by the relay GR, said element T having a normal contact 28 and an alternate contact 27. When the relay GR operates it

closes its contacts 35, 36 and thereby establishes a circuit through the winding of element T causing an operation thereof, providing relay GR is maintained energized for a long enough period. The continued energization of GR is dependent upon an abnormal condition of any of the switches C, that is should a ground connection be maintained upon any of the conductors 21 for an abnormally long period, then relay GR is maintained energized during such period causing an operation of element T which will effect the energization of the signal relay 40 and the signal 17. Should the attendant desire to disconnect the element T for some reason, for instance if it becomes too hot, then switch arms 37, 43 are thrown to their dotted position to disconnect element T and connect a signal such as a buzzer 44 in circuit with relay GR so that the buzzer 44 will temporarily take the place of T and also its continued operation will indicate to the attendant that the element T is disconnected.

In the present embodiment of my invention I have shown the relay GR connected to a primary off-normal contact 19, which contact is grounded through normal contact 20 and alternate contact 23 as soon as selector C has been seized. That is, when selector C is selected, the relay IR energizes followed by the energization of RR, thereby connecting ground at alternate contact 23 of RR to the conductor 21. This condition is maintained until the switch C is operated when switch PON moves off-normal and disconnects ground from the conductor 21. In ordinary practice switch C is operated to extend the call within a few seconds after being selected, which period is not sufficient to operate the thermal element T, but should switch C be stuck at normal, or a subscriber remove his receiver to select the switch C and then fail to extend his call, the alarm signal will be operated.

Operation: Having referred more in a general way to the embodiment of my invention as herein illustrated, a more detailed description of its operation will now be given. Assuming a subscriber at substation A removes his receiver to initiate a call, a circuit for line relay LR will be established from ground at wiper 5 over the calling line back through wiper 6 and LR to battery. Relay LR therefore energizes closing its alternate contact 50 connecting ground through ON and CO to battery. Relay CO therefore energizes and motor magnet M is connected through alternate contacts 51, 52 to ground, advancing wipers 4, 5, 6, and as long as wiper 4 is engaging grounded test contacts a locking circuit is maintained for relays LR and CO through their alternate contacts 53, 54, but as soon as wiper 4 reaches an idle or ungrounded test contact, relay CO immediately deënergizes interrupting the circuit of magnet M and rendering the wipers inert. Relay LR being a slow relay maintains its armature attracted until a locking circuit from C is provided, but upon deënergization of CO the impulse relay IR of the selected switch C is connected in bridge of the calling line and is energized followed immediately by the energization of relay RR over a circuit traced from ground at normal contact 55 of relay TR, alternate contact 56, a winding of RR to battery. Relay RR therefore closes its contacts 22, 23, connecting ground 24 to contact arm 18 and thus to the test conductor and wiper 4 to relay LR, maintaining it energized. The ground connection to contact spring 18 of PON from contacts 22, 23, also follows a path through contact 19, conductor 21, common conductor 57, contacts 25, 28, contacts 30, 31, and the winding of GR to battery causing the energization of GR. Its locking contacts 31, 34 are therefore closed establishing a direct circuit for GR independent of the contacts 25, 28. Contacts 35, 36 of GR are also closed establishing a circuit through the winding 39 of the thermal element, and assuming switch C is not operated for some reason, the relay GR remains energized and current continues to flow through the winding of T. The arm 26 of T therefore begins to heat and after a predetermined period, depending upon the adjustment and construction of the device, said arm moves upward and contacts 25 and 28 are interrupted. The continued movement of arm 26 also closes contacts 25, 27 thereby connecting relay 40 in circuit with the grounded conductor 21 causing the energization of the relay and closing its contact 41 to establish an operating circuit for the signal 17 from generator 42. As long as the abnormally long period of the grounded condition of conductor 21 is maintained, group relay GR remains energized and thus element T and relay 40, together with signal 17 remain operated, thus indicating to the attendant that something is wrong with one of the switches associated with the particular signal 17. Should the abnormal condition of conductor 21 be created by the subscriber keeping his receiver off the switchhook without sending a call, as soon as the receiver is replaced and the circuit of IR interrupted, a deënergization of RR is brought about thereby removing the abnormally grounded condition of conductor 21 so that relay 40 deënergizes and signal 17 is effaced, indicating to the attendant that the abnormal condition has been removed. He can then disconnect the element T so that it may more quickly cool off and restore to normal by throwing the switch arms 37, 43 to their dotted position. This connects the buzzer 44 in circuit with relay GR so that each time this relay GR is operated the

buzzer is actuated, in this case the locking circuit for GR being through the arm 43 while element T is restoring. Should the attendant fail to again connect the element T in circuit the continued operations of the buzzer 44 will indicate such a fact.

In the ordinary operation of an automatic system a subscriber after initiating a call and selecting a switch C will extend the call within a few seconds after removing his receiver in which case the primary off-normal switch PON moves to its alternate position and interrupts the normal contacts 19, 20, thereby preventing an abnormally long ground connection to conductor 21. Therefore assuming group relay GR has been energized by the selection of the switch C in a manner as before described, as soon as the ground connection is removed from conductor 21 (which we will assume is prior to an operation of T), the locking circuit for GR is interrupted causing the restoration thereof and the interruption of the circuit through T. Of course if calls overlap to such an extent that ground is maintained continuously upon the common conductor 57 from the different connected conductors 21, then relay GR remains locked up but even during the greatest rush of traffic the number of switches C to an alarm circuit S is such that a continued ground will not be maintained upon the common conductor 57 long enough to cause an operation of the element T to operate the signal 17.

Any momentary break between ground connections to conductor 57 will allow a restoration of GR and the element T is preferably so adjusted that it will not close its alarm contact 27 in response to intermittent energizations of its winding 39. In practice I have found that with an adjustment of the element T so that its normal contact 28 will break in about a minute and a quarter from a continued energization, and a closure of alternate contact 27 in response to about two and one half minutes continued energization, a satisfactory operation is secured. It will be understood though that these periods may be varied according to the exigency of the use to which it is put. Even during the greatest rush of traffic with proper grouping there would be very little chance of maintaining a continuous ground upon the conductor 57 due to overlapping calls, for a sufficient period to operate element T to close its signal contact 27 with said element adjusted so that its said contact 27 will not be closed in less than two and one half minutes.

As previously referred to group relay GR is common to a number of selectors C and this relation to some extent will be dependent upon the traffic conditions and may be varied as desired.

It will also be noted that should the relay GR be energized due to the grounding of conductor 57 upon initiation of a call, and such ground condition be maintained until the interruption of normal contact 28 of T but removed before the closure of alternate contact 27, then relay GR will restore and cannot again be energized to effect the thermal element T until normal contact 28 is again closed. With this arrangement it will be evident that although ground may be successively applied to conductor 57 to start the movement of element T, any further application of ground to conductor 57 will not effect element T until it fully restores. With this additional safeguard it is impossible for the thermal element to be actuated sufficiently to close the alarm contact 27 unless a continued ground connection is maintained upon the conductor 57 for the full period of time which it takes for the element T to move to its alarm position.

While I have illustrated my invention operating in connection with a well-known automatic system, I do not wish to be limited to this exact disclosure as my invention may be applied to other systems without departing from the spirit thereof, and I therefore aim to cover all such changes and modifications as come within the spirit and scope of the appended claims.

Having described my invention, what I claim as new and desire to secure by United States Letters Patent, is:

1. An automatic telephone exchange system having a selective switch adapted for successive association with a plurality of contacts, of alarm mechanism adapted to indicate an abnormal condition of said switch beyond a predetermined length of time, said mechanism including a thermostat, an electric circuit controlled by the abnormal condition of the switch for controlling the heating of said thermostat, and a self-locking relay for controlling said circuit.

2. An automatic telephone exchange system having a selective switch adapted for successive association with a plurality of contacts, of alarm mechanism adapted to indicate an abnormal condition of said switch beyond a predetermined length of time, said mechanism including a thermostat, an electric circuit controlled by the abnormal condition of the switch for controlling the heating of said thermostat, and a self-locking relay for controlling said circuit, said thermostat controlling the circuit through said relay to prevent a false signal due to continuous intermittent energizations of said relay.

3. An alarm signal system comprising an automatic switch, a group relay energized responsive to selection of said switch, a thermal element responsive to a prolonged energization of said relay, normally closed contacts for said element included in the ini-

tial energizing circuit for said relay and interrupted responsive to operation of the thermal element to open the conductors of said initial energizing circuit, and a locking circuit for said relay controlled from said switch and maintained independent of said thermal contacts.

4. An alarm signal system comprising automatic switches, a group relay common to said switches and connected thereto, means responsive to a selection of one of said switches to energize said relay, means effective upon the initial operation of said switch for deënergizing said relay, an alarm signal, and a signal controlling device responsive only to a predetermined period of energization of said group relay for operating said signal.

5. An alarm system comprising an automatic switch, a relay energized responsive to the selection of said switch, electromagnetic means for operating said switch, means effective upon the initial operation of said switch to deënergize said relay, an alarm signal, and means for controlling said alarm signal including said relay and a thermostat.

6. A telephone system comprising a subscriber's line, an automatic switch, subscriber controlled means for connecting said line with said switch, a relay energized responsive to such connection, subscriber controlled means for operating said switch from normal to deënergize said relay, an alarm signal, and a signal controlling device responsive to a prolonged energization of said relay for operating said signal.

7. A telephone system comprising subscribers' lines, automatic switches, subscriber controlled means for connecting their lines with said switches, a group relay responsive to the connection of a subscriber's line with one of said switches, an alarm signal, means responsive to a prolonged energization of said relay for operating said signal, and means controlled by the initial movement of said switch from normal for deënergizing said relay.

8. A telephone system comprising an automatic switch, a relay energized responsive to a selection of said switch, a signal device, a thermal element responsive to a prolonged energization of said relay to operate said signal, a manual switch, and means controlled by said switch for rendering said thermal device and said alarm inoperative.

9. A telephone system comprising an automatic switch, a relay energized responsive to a selection of said switch, a signal device, a thermal element responsive to a prolonged energization of said relay to operate said signal, a manual switch and means controlled by said switch for rendering said signal inoperative and for connecting a second signal in position to be operated immediately upon energization of said relay.

10. An alarm system including an automatic switch, a relay provided with an energizing circuit controlled by said automatic switch, an alarm signal, a slow acting device controlled by said relay and adapted to operate said alarm signal after a predetermined period of time, a second alarm signal adapted to be directly controlled by said relay, and a manual switch for operatively associating either of said alarm signals with said relay.

11. A telephone system including a plurality of automatic switches, a group relay common to said switches, means for seizing one of said automatic switches whereby said relay is operated, means for operating said automatic switch whereby said relay is deenergized, an alarm signal, and a slow acting device responsive to a prolonged energization of said relay for operating said alarm signal.

12. An alarm signaling system including an automatic switch, a relay provided with an energizing circuit controlled by said automatic switch, an alarm signal, a slow acting device controlled by said relay for operating said alarm signal, a second alarm signal controlled by said relay, and a manual switch for operatively associating either of said alarm signals with said relay.

Signed by me at Chicago, in the county of Cook and State of Illinois, in the presence of two witnesses.

HARRY H. IDE.

Witnesses:
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