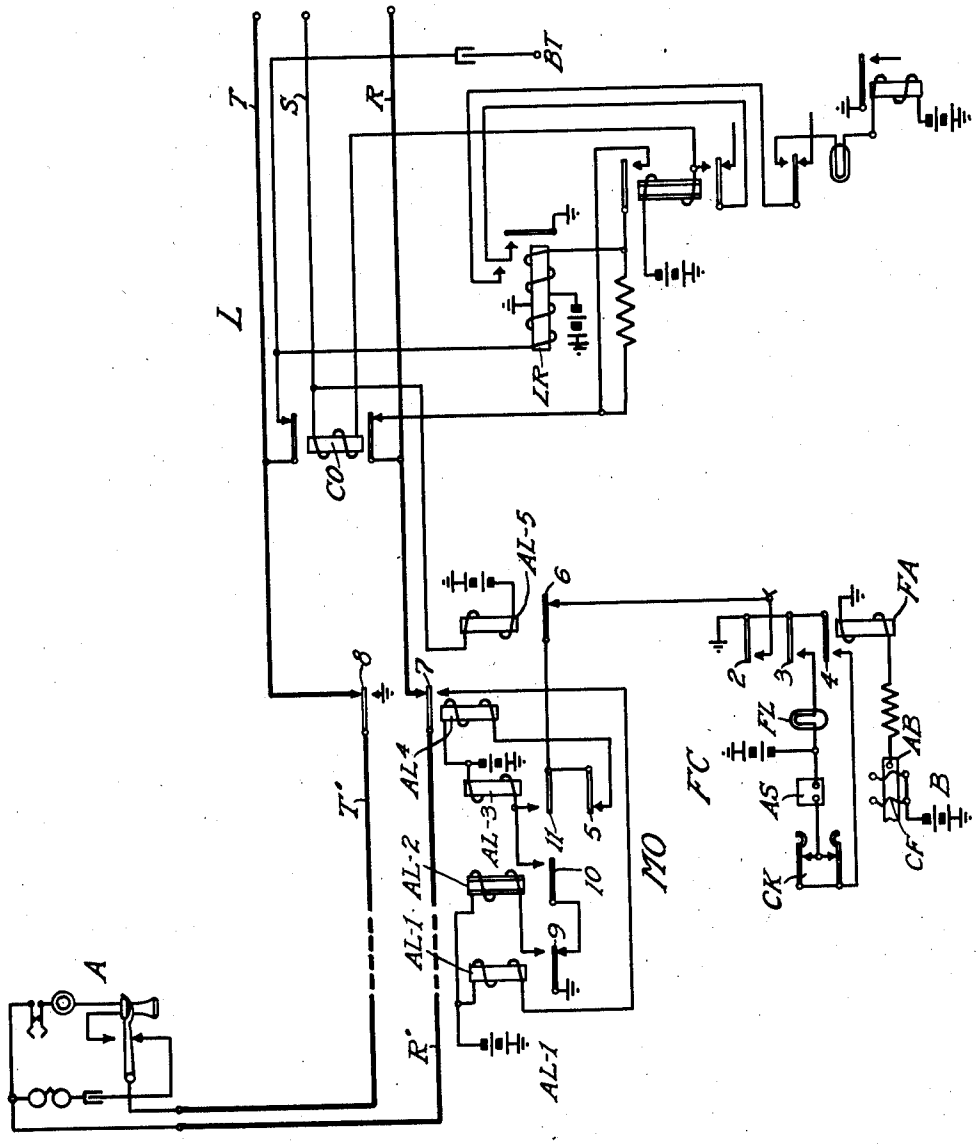
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ALARM SYSTEM

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ALARM SYSTEM

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This invention relates to alarm systems and more particularly to an alarm system associated with a substation line or a trunk which functions when an abnormal condition exists on such line or trunk to give the subscriber initiating a call, or the operator using such trunk, an indication of such condition.

The alarm circuit is particularly adapted for use in connection with a telephone system, in which connections are established by relay means and in which all of the various functions are performed by relays under the control of a dial or calling device at the calling subscriber's station.

A feature of the invention is the provision of an alarm circuit comprising a plurality of relays and associated with a station line which upon the initiating of a call on said line functions when an abnormal condition exists on the line to give the subscriber thereat an indication of such condition.

Another feature of the invention permits the subscriber on a line initiating a call to extend the same to the central office even though an indication of an abnormal condition of the line had been received by the subscriber merely by the transmission of a preliminary impulse from the calling device which will operate certain of the relays of the chain comprising the alarm circuit to extend the connection to the central office.

The above features and other features not specifically pointed out will be more fully hereinafter described with reference to the accompanying drawing which shows the alarm circuit operatively associated with a calling substation and its associated line circuit.

Referring to the drawing, in greater detail, the reference character A indicates a subscriber's station of known type, connected with a central office over a pair of line conductors T' and R' which terminate in the usual line circuit L comprising the line and cutoff relays LR and CO. The master alarm circuit MO comprises the relay chain including alarm relays AL—1, AL—2, AL—3, AL—4 and AL—5. A fuse alarm circuit FC local to the exchange comprises a fuse alarm relay FA controlling the fuse pilot lamp FL and an audible signal AS and a cutout key CK which controls the cutting "in" or "out" of the audible signal. An alarm bar AB and associated fuses CF are also shown.

Upon the initiation of a call at substation A the line relay LR of its associated line circuit L is operated and sets into operation a line finder switch (not shown) connected to the tip, ring and sleeve conductors T, R and S, respectively, and associated with a selector switch to connect this idle selector to the calling line. The subscriber at the calling substation A receives notification in the form of a distinctive tone when thus connected, to inform the calling subscriber that the dialing of the number of the called line may proceed. If all the selectors to which the calling substation A has access are in use, the calling subscriber will receive another distinctive tone to inform the subscriber of such busy condition.

The tip and ring conductors T' and R', which connect the substation A to its individual circuits L at the central station, extend through the back contacts 7 and 8 of an alarm relay AL—4 associated with the master office alarm circuit MO which comprises alarm relays AL—1, AL—2, AL—3, AL—4 and AL—5 and which is operatively associated with the substation A. A fuse alarm circuit FC, local to the central station, comprises a fuse alarm relay FA which when operated sets off a suitable alarm signal AS and also closes a circuit for a fuse pilot lamp FL for purposes which will presently be described.

As pointed out above, a call initiated at substation A energizes its associated line relay LR at the exchange through the substation bridge and back contacts 7 and 8 of the alarm relay AL—4. Under certain conditions, however, alarm relay AL—4 will be operated to open its back contacts 7 and 8 to prevent the extension of a call from the substation A to the exchange. If the individual circuit fuse CF associated with the calling line A is open due to "blowing," for example, then a circuit for the fuse alarm relay FA of the alarm circuit FC is closed, extending from battery B to ground through the relay FA. Relay FA is operated over this circuit to close its front contacts 2, 3 and 4. The closing of front contact 3 lights the fuse pilot lamp FL and the closing of front contact 4 closes a circuit for the audible alarm signal AS. The two signals FL and AS give the attendant at the exchange a visual signal and an audible signal that a fuse has "blown." A cutoff key CK associated with the signal AS, and through which the circuit of the audible alarm signal AS normally extends, when operated, opens the circuit of the audible signal AS. The closing of front contact 2 of the fuse alarm relay FA operates the alarm relay AL—4 of the master alarm circuit MO, from battery through relay AL—4, back contact 5 of the alarm relay AL—3, back contact 6 of the alarm relay AL—5

to ground at the front contact 2 of the fuse alarm relay FA.

Assuming that under these conditions, the subscriber at substation A initiates a call, no circuit is closed for its associated line relay LR since the substation line is interrupted at the back contacts 7 and 8. The operated alarm relay AL—4 thus prevents the extension of the calling line via a line finder to an idle selector. As a result, the subscriber at the calling substation does not receive a distinctive tone to inform him that the dialing of the number of the called line may proceed, nor does he receive a distinctive tone to signify that all of the selectors (to which the calling line has access) are busy. The absence of both of these distinctive tones gives the calling subscriber an indication that an alarm condition exists.

The actuation of relay AL—4 having closed its front contacts 7 and 8, a circuit for the alarm relay AL—1 is now established from battery through relay AL—1, front contact 7 of relay AL—4 through the bridge at the calling substation A to ground at front contact 8 of relay AL—4. The closing of front contact 9 of the operated relay AL—1 now operates the alarm relay AL—2 from battery through relay AL—2 to ground at front contact 9 of relay AL—1 and the alarm relays AL—1 and AL—2 remain energized and the subscriber at the calling substation A recognizing that an alarm condition exists due to the absence of distinctive dialing or busy tones, may terminate the attempted call by restoring the receiver to interrupt the substation bridge and restore alarm relays AL—1 and AL—2. However, the subscriber can optionally extend a call to the exchange from the calling substation A when these conditions exist.

The subscriber under the latter condition, dials a preliminary digit "one" and the transmission of this digit interrupts the substation bridge and the energizing circuit of the alarm relay AL—1 which deenergizes and at its front contact 9 opens the circuit of the alarm relay AL—2. The said alarm relay AL—2, however, holds up momentarily due to its slow release construction. This release of the alarm relay AL—1 closes a circuit for the alarm relay AL—3 from battery through relay AL—3, front contact 10 of the alarm relay AL—2 to ground at back contact 9 of the restored alarm relay AL—1. Alarm relay AL—3 operates to close its contact 11 and locks up from battery through relay AL—3, its front contact 11, back contact 6 of alarm relay AL—5, to ground at front contact 2 of the fuse alarm relay FA.

The opening of back contact 5 of the alarm relay AL—3 restores the alarm relay AL—4 and the opening of its front contacts 7 and 8 prevent operation of the alarm relay AL—1. The closing of back contacts 7 and 8 of the restored alarm relay AL—4 now extends the connection from the calling substation A to its associated line circuit L to operate the line relay LR over the substation bridge to cause the operation of a finder switch to extend the call to an idle selector in the regular manner. Assuming that the call has encountered an idle selector, link or trunk as the case may be, the subscriber at substation A will now receive a distinctive tone indicating that the dialing of the number of the called line may proceed.

Alarm relay AL—5 is operated by ground on the sleeve conductor S from the selector, link or trunk to which the call has been extended by the finder switch and the opening of back contact 6 of the alarm relay AL—5 opens the circuit of relay AL—3 which restores and prevents alarm relay AL—4 from being operated so long as the connection is being held.

Upon the termination of conversation, the apparatus is released and the removal of ground from the conductor S releases alarm relay AL—5. If the condition previously described still prevails, alarm relay AL—4 is again energized and any other call initiated by the subscriber at the substation A necessitates the procedure of extending such calls to the exchange in the same manner as previously described.

The master alarm circuit MO thus provides means whereby the subscriber associated with such alarm circuit is given an immediate indication of an abnormal condition of his line should such condition exist, as above described, upon the initiation of a call. This master alarm circuit also provides means whereby a subscriber at a substation associated with the master alarm circuit MO permit the extension of an initiated call to the central station even though such abnormal condition exists. This prevents the "tying up" of a line and the absence of tones warns the subscriber of such line condition so that it can be reported immediately to the attendant at the central office.

While I have shown the alarm circuit of my invention operating in conjunction with a substation line, it is to be understood that it is applicable for use in connection with trunk connections or the like without departing from the spirit or scope of the appended claims.

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

1. An alarm circuit for an automatic telephone system comprising relay alarm means for interrupting a calling substation circuit and locking the circuit open due to an abnormal condition of the systems; and relay means responsive to a dialed impulse from said calling station arranged to render said first named relay means ineffective whereby a calling circuit can be completed irrespective of the condition of said alarm means.

2. An automatic telephone system including means responsive to a calling station for completing a called circuit; electrical relay means arranged to normally prevent the completion of said circuit during abnormal conditions in said system; and relay means actuated by an impulse from the calling station for rendering said alarm means temporarily ineffective and permit completion of said circuit.

3. An alarm circuit for automatic telephone systems comprising a relay responsive to abnormal conditions in the system and operative to normally prevent completion of a circuit through the system; a circuit for maintaining said relay operated; a second relay operable from the calling station; a slow relay energized by the last named relay; a self-locking relay for breaking said circuit and a circuit for said self-locking relay completed through contacts of said second relay and said slow relay responsive to an impulse from a calling station, whereby to permit completion of a called circuit; said slow relay arranged to preserve an energizing circuit to the self-locking relay when an impulse from the calling station releases the second alarm relay.

4. In combination an automatic telephone system and an alarm circuit comprising an alarm relay means for interrupting a substation circuit

due to abnormal system conditions; fast and slow acting relay means responsive to receiver action at a calling station; and relay means responsive to a dialed impulse from said calling station arranged to render said alarm relay means ineffective whereby the called circuit may be completed independently of the condition of the system.

5. An automatic telephone system including means responsive to a calling station for completing a called circuit; an alarm relay arranged to normally prevent the completion of said circuit during abnormal conditions in said system; and relay means controllable from said calling station for rendering said alarm means ineffective and permit completion of said called circuit.

6. In combination an automatic telephone system having an alarm relay to render the system ineffective due to abnormal conditions therein; and relay means controllable from a calling station to render said alarm relay temporarily ineffective to permit completion of a call.

7. A telephone line, an alarm relay associated with said line, said relay being responsive to an abnormal condition on said line to render the system inoperative to extend a call from said line and means controllable over said line and responsive to the closure and momentary opening of said line to render said alarm relay temporarily ineffective in order to permit the completion of a call from said line.

8. In a telephone system, a telephone line, a relay, normally closed contacts of said relay in said line, means effective incident to an abnormal condition of the system to operate said relay and interrupt said line, and a second relay operable incident to closing and interrupting the continuity of said line to restore said first-mentioned relay and the continuity of said telephone line.

9. In an automatic telephone system, a telephone line, an electromagnet, contacts in said line arranged to be operated by said electromagnet, a circuit for said electromagnet, means effective, incident to an unstandard condition of said line for altering said circuit to effect operation of said electromagnet and said contacts to open said telephone line, and relay means responsive to a closure and momentary opening of said line to restore said electromagnet whereby a circuit from said telephone line may be completed regardless of the said unstandard condition of said line.

10. In a telephone system, a telephone line including a pair of conductors, an electromagnet, contacts in said conductors arranged to be operated by said electromagnet, a circuit for said electromagnet, means effective, incident to an unstandard condition of said system, to alter said circuit and cause said electromagnet to open said contacts, a relay, a circuit for said relay completed by closing a bridge across said conductors, a slow relay, a circuit for said slow relay closed by said first-mentioned relay upon energization thereof, a third relay having normally closed contacts included in said circuit for said electromagnet, and a circuit for said third relay arranged to be closed through front contacts of said slow relay and back contacts of said first-mentioned relay.

11. In a telephone system, a telephone line, a central office at which said line terminates, means at said central office, responsive to an unstandard condition of said line, for interrupting the continuity of said line, and a second means, controllable over said line and responsive to the closure and momentary opening of said line, for rendering said first-mentioned means ineffective to maintain said line interrupted.

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