

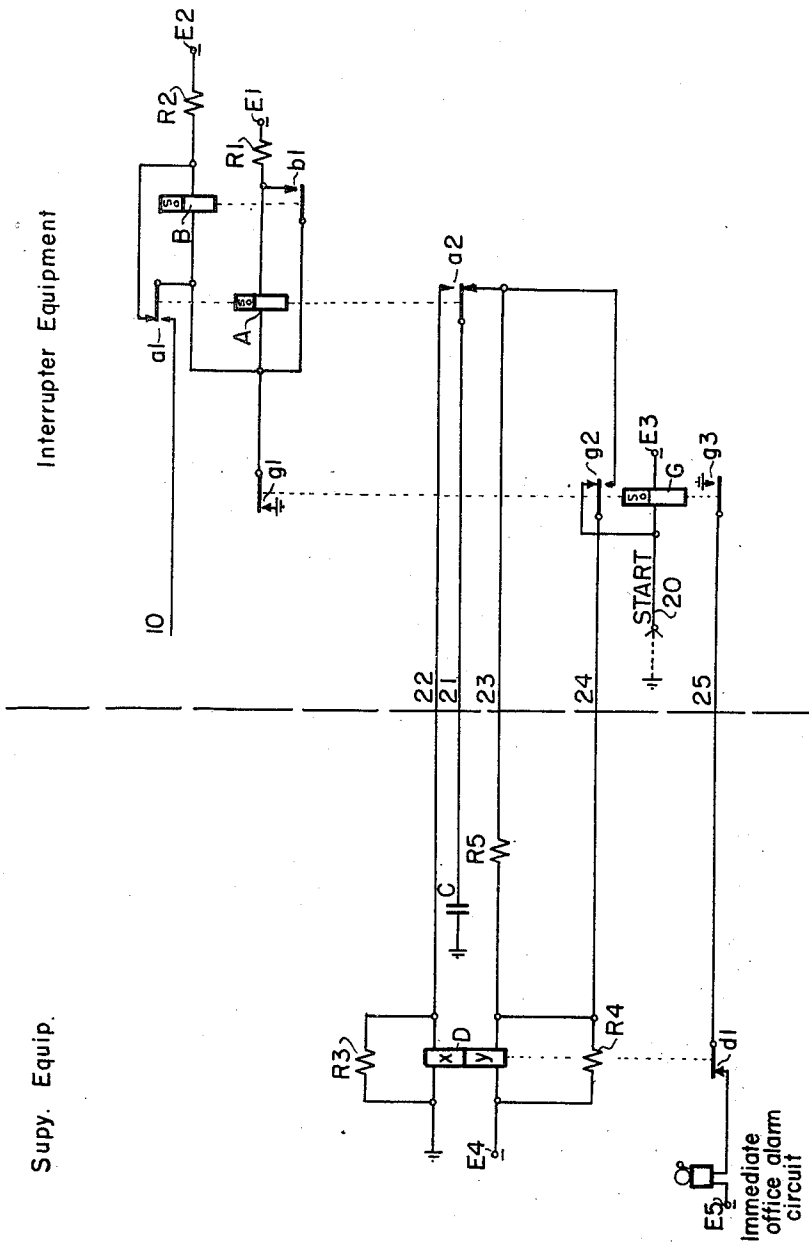
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SUPERVISORY ALARM SYSTEM FOR TELEPHONE INTERRUPTERS

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SUPERVISORY ALARM SYSTEM FOR TELEPHONE INTERRUPTERS

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This invention relates in general to systems of supervision, and more particularly, to novel arrangements for the supervision of interrupter equipment such as is commonly used in connection with ringing and signaling means in telephone exchange systems.

The main object of the invention is to provide an improved circuit arrangement for use in conjunction with interrupters and other like equipment in telephone exchanges or other similar systems, whereby efficient and reliable supervision can be obtained in a more economical manner.

A feature of the invention is the accomplishment of such supervision by alternately charging and discharging an electrolytic condenser through a relay contact operated by the interrupter.

Another feature is the self resetting of the supervisory relay after it has been operated to indicate an interrupter failure, in which the relay will automatically reenergize on the first charge or discharge function of the condenser caused by reoperation of the interrupter.

Another feature of the invention is the arrangement whereby the alarm circuit is connected so as to be independent of the timer functions.

A further feature is the self supervision of the electrolytic condenser whereby loss of capacity or breakdown of the condenser will result in proper supervisory indication.

This arrangement of supervisory control is adaptable to an exchange of any size and particularly to small or medium sized central automatic exchanges where a duplicate emergency interrupter is not a part of the exchange, in which case the applicant's invention may considerably shorten "out of service" periods by sending an alarm upon interrupter failure. The simplicity and low cost of this circuit arrangement are definite desirable advantages.

The invention, both as to its organization and method of operation, together with further objects and advantages thereof, will best be understood by reference to the specification and the accompanying drawing.

Referring now to the drawing, the equipment there illustrated consists of a 60 I. P. M. interrupter, such as a prime mover of a ringing interrupter or a busy interrupter, a supervisory circuit, an alarm circuit and the connections therebetween. This equipment is intended for use with any exchange and is generally associated at the exchange installation with connections

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to the immediate office alarm. The alarm circuit is shown connected thusly in the figure.

Essentially, the interrupter equipment consists of two resistors R1 and R2, a starting means with conductor 20, an outgoing 60 I. P. M. conductor 10, and three break-make switch relays A, B and G, having respectively associated therewith the break-make switches a1 and a2, b1 and g1, g2, g3.

The supervisory circuit comprises a condenser C, resistors R3, R4, R5, and a two winding relay D with break-make switch d1 associated therewith, the resistors R3 and R4 being respectively connected across winding x and y of relay D and resistor R5 being connected in series with conductor 23, the lower winding of D and the resistor R4. Conductors 21, 22, 23, 24 and 25 are connected between the supervisory circuit and the interrupter circuit. Line 25 further extends from the supervisory circuit to the immediate office alarm circuit.

In considering the detailed operation of the system, it will first be assumed that ground potential is applied to the common start conductor 20 by one of a number of commonly employed means, i. e., the off normal springs of some connector in the exchange.

Alternatively, the conductor may be continuously grounded as in the case of larger installations where continuous interrupter service is desired. Upon grounding conductor 20, a circuit is completed for energizing the lower winding of relay D from source E4, over conductor 24, through switch g2 and to ground over conductor 20, whereupon relay D operates and at its contacts d1, breaks the circuit to the alarm, thereby preventing the transmission of an alarm when the interrupter is started and contact g3 is closed. Conductor 20 at the same time completes another path from battery E3, through relay G to ground. Relay G however, is a slow to operate relay, and during the delay period of relay G, relay D operates to break the alarm circuit which g3 is about to complete. Also, during the delay period, the condenser, if any charge remains thereon, discharges over a path comprised of switch a2, conductor 23, resistor R5, conductor 24 and switch g2 to ground. After the short delay, relay G energizes and at its contacts g2 breaks the starting circuit to relay D and completes a charging path from source E4, through the lower winding of relay D, conductor 24, contact a2, to the condenser C, and at its contacts g1 completes a circuit for energizing the interrupter. The current in the interrupter flows from battery E1, through resistor R1, the relay

A. and switch *g1* to ground, whereupon relay A, after an interval sufficiently long to have allowed a partial charge on condenser C, operates and at its contact *a1* removes the short circuit from relay B, at the same time placing a grounded pulse on outgoing conductor 10, and at its contacts *a2* removes the condenser C from the charging path and places it in a discharge path. Removal of the short circuit from relay B by switch *a1* completes a path from battery E2, through resistor R2, relay B, switch *g1* to ground, whereupon, relay B operates after a short interval and short circuits relay A at its contacts *b1*. Relay A releases after a short interval and at its contacts *a1* removes the ground on conductor 10, thereby terminating the outgoing grounded pulse. Contacts *a1* at the same time short circuit relay B. Contact *a2* transfers the condenser C from its discharge circuit to its charging circuit. Relay B, as a result of its short circuit by *a1* releases after an interval and at its contacts *b1* removes the short circuit from relay A, whereupon relay A energizes and repeats the cycle just described. It is evident therefore, that the interrupter causes the condenser to be charged and discharged during the same period that the interrupter is sending an outgoing grounded pulse. Therefore, with the 60 I. P. M. interrupter assumed herein, the condenser will be subjected to a charge and discharge function once every second. Since relay G remains operated as long as the starting means holds conductor 20 to ground, the charging path will be broken only by the switch *a2* as described herein. Relay G at its contacts *g3* prepares a circuit for the immediate office alarm.

Relay D, originally energized by the starting means will therefore be maintained energized by the flow of current through its winding and switch *g2* to the condenser when relay G operates and will remain operated until the condenser becomes fully charged, unless the charging circuit is opened at *a2* before charging is complete, and thereby terminates current flow. As the condenser charges over the disclosed path, the interrupter actuates its contacts *a2* as previously disclosed and the condenser C is transferred to its discharge path. The current flow thereupon is from the condenser over conductor 21, contact *a2*, conductor 22, and the upper winding of relay D to ground. The current flow through the upper winding of relay D would therefore, maintain the relay energized until the condenser is completely discharged unless its circuit is opened by *a2* before complete discharge. Since the time constants of the charge and discharge circuits are approximately two seconds and contact *a2* is operated once every second when the interrupter is functioning properly, relay D will be maintained in an operated position by either the charging current through its lower winding or the discharge current through its upper winding. The resistances R3 and R4 are in shunt of the respective windings of relay D to prevent the relay from deenergizing during the open contact interval of *a2* when it is actuated by the interrupter.

In the event of interrupter failure of any nature, the break-make contact *a2* will stop in a position which places the condenser in either a charge or a discharge circuit. Assuming, first that the contact *a2* terminates in the position which places condenser C in the discharge path, the condenser C will continue its discharge until it has lost its potential at which point the current

flow through the upper winding of relay D will terminate, allowing relay D to release and causing *d1* to complete the circuit to the alarm.

Assuming the switch *a2* came to rest while condenser C is in a charge function, the charging will continue until condenser C reaches its capacity, at which point the current flow from source E4 is terminated and relay D releases and sounds the alarm as previously described.

If contact *a2* sustained a physical breakdown, the current flow would likewise be terminated and the alarm would be actuated. Also, if condenser C sustained a breakdown or loss of its capacity, the alarm will operate, thereby providing a circuit that is self-supervisory.

From the foregoing description, it will be observed that the time constant of the supervisory circuit must necessarily be larger than the time interval of operation of relay A in the interrupter circuit. The time interval of the 60 I. P. M. interrupter herein utilized is determined by two slow to operate relays of 1100 ohms each in series with a 750 ohm resistor. The resistors are in the circuit primarily for use as battery protectors when the relays are short circuited. The slow to operate relay G may have a value of 1600 ohms.

The relay used in the supervisory circuit may in this instance have two 2500 ohm windings with a 10,000 ohm resistor connected in shunt of each winding. The condenser discharge resistor R5 may have a value of 2500 ohms and the condenser C a capacity of 100 mf.

While a particular embodiment of the invention has been described, it will be understood that various modifications may be made therein which are within the true spirit and scope of the invention.

What is claimed is:

1. In a supervisory system, a relay having two windings, a switch having two positions, a source of potential, a starting circuit connected to said relay for initially operating same over said switch in one of said positions, a condenser; a charging circuit for said condenser including said switch in the other of said positions, one of said windings of said relay, and said source of potential; a discharge circuit for said condenser including the second said winding of said relay, means controlled by said starting circuit for connecting said condenser alternately to said charge circuit and said discharge circuit to thereby maintain said relay operated, and an alarm circuit controlled by said relay.

2. A system such as claimed in claim 1 including a resistor, and having a second discharge circuit closed by said switch in said one position and including said resistor.

3. In a supervisory circuit, a condenser, a time device comprising a pair of interrupter relays which operate alternately at predetermined time intervals when a starting circuit is connected thereto, contacts on one of said relays operated to open and close a work circuit, a charge circuit and a discharge circuit, a two-winding relay, a second set of contacts on said one relay operated to alternately open and close said charging and discharging circuits for the condenser through said two winding relay, said charge circuit including one winding of said relay, said discharge circuit including the other winding of said relay, said two-winding relay maintained operated when said charge and discharge circuits are closed for a lesser time than the charge or discharge times of the condenser, said two-winding relay operated when-

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ever either of the said circuits are closed for an interval greater than the charge or discharge times of the condenser, and a signaling circuit controlled by the operation of said two-winding relay to indicate failure of the work circuit.

4. A system as claimed in claim 3, having two resistors, one of said resistors connected in shunt of said one winding, the other resistor connected in shunt of said other winding, said resistors being effective to maintain said relay energized during the operating intervals of said device.

5. In a supervisory circuit, a control relay, a two winding supervisory relay, a starting circuit for initiating operation of said relays, a pair of interrupter relays operated responsive to operation of said control relay, a work circuit alternately opened and closed at predetermined intervals by said pair of interrupter relays, a condenser, a charge circuit and a discharge circuit for said condenser, a first means controlled by one of said interrupter relays for alternately closing said charging and discharging circuit for the condenser through said two winding relay to maintain the relay in the operated position

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as long as said first means operates within said predetermined interval, a signaling circuit, and a second means controlled by the release of said two winding relay to close said signaling circuit whenever said first means fails to close the charging or discharging circuits within said intervals to indicate failure of said work circuit.

6. In a system as claimed in claim 5 which has a third means controlled by said control relay to prepare said signaling circuit, said second means opening said signaling circuit prior to operation of said third means, when both relays are initially operated.

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