

July 27, 1937.

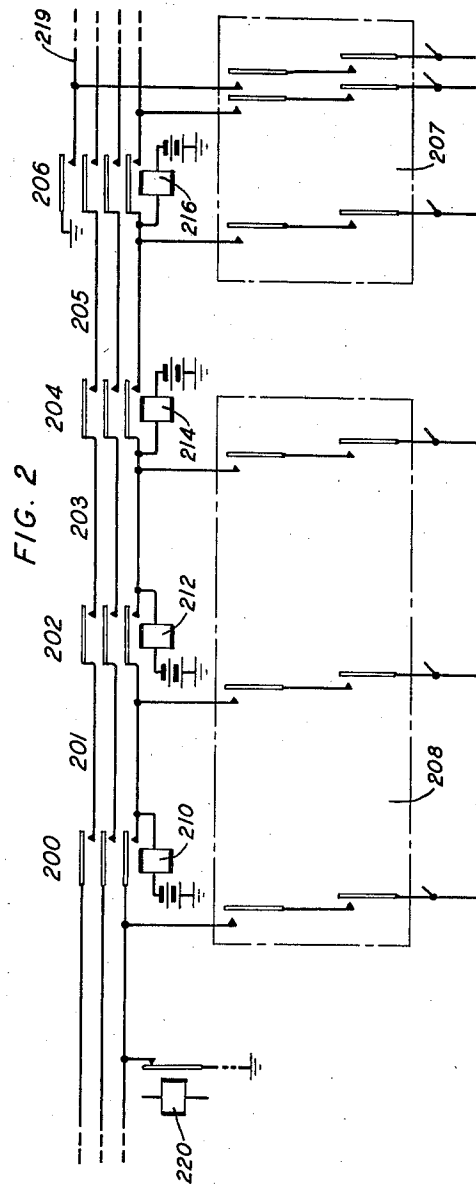
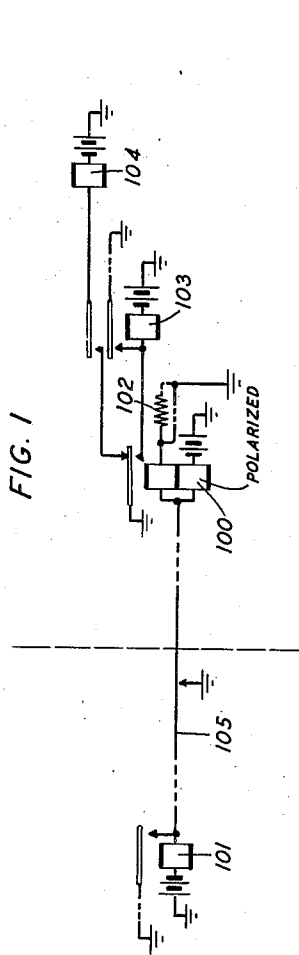
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2,088,305

TELEPHONE SYSTEM

Filed March 11, 1936

2 Sheets-Sheet 1



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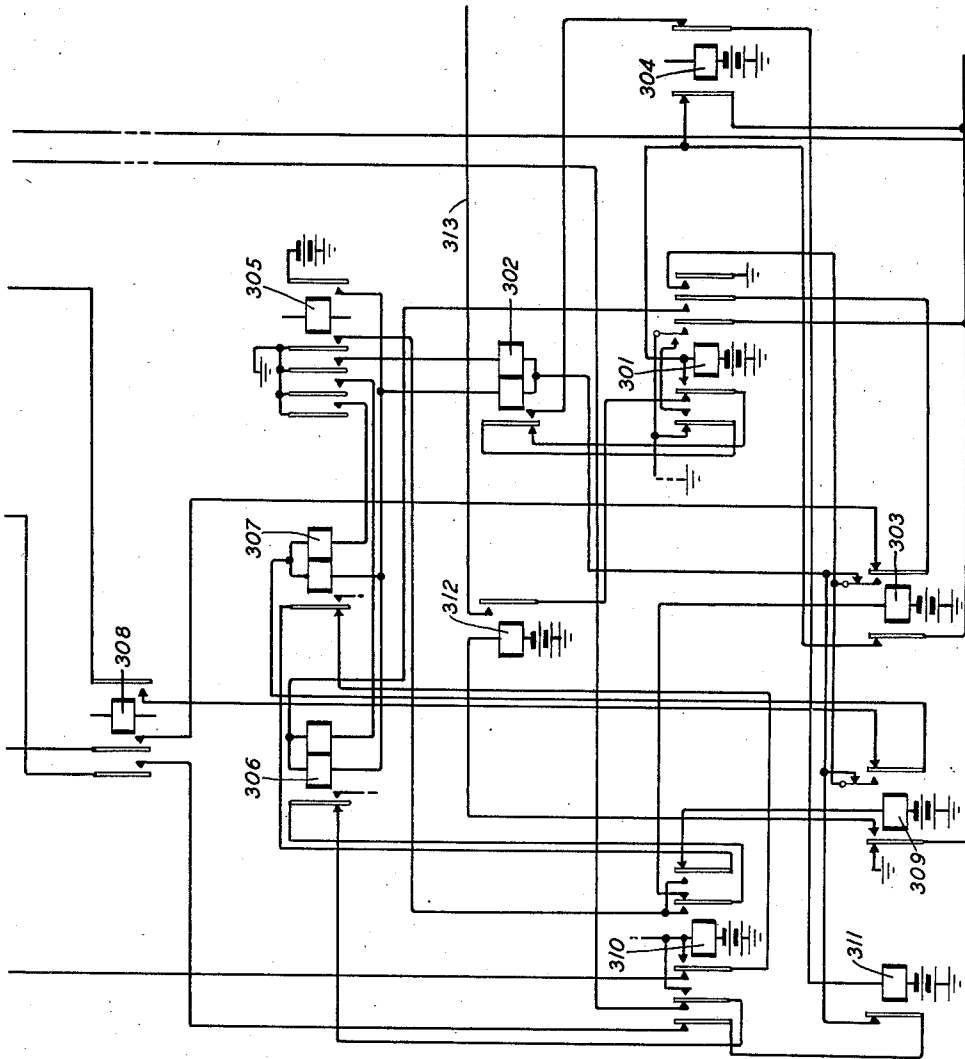


FIG. 3

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2,088,305

TELEPHONE SYSTEM

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Application March 11, 1936, Serial No. 68,259

7 Claims. (Cl. 179—18)

This application relates to telephone systems and has for its object to increase the reliability of such systems. In telephone systems there are numerous instances in which a relay associated with the talking circuit is operated from common apparatus to control certain functions. In some cases if this relay fails to operate, the wrong party may be signaled or charged, while in other cases the entire connection may fail. In addition, in the cross-bar system in particular, the timing and alarm equipment is associated with the common control apparatus and it is especially desirable that the switching functions be completed properly before the common apparatus is released.

In accordance with the present invention, means is provided for indicating when a relay is fully operated. More specifically this indicating means comprises a double-wound polarized relay so arranged that when both windings are energized, the relay armatures remain on their back contacts. The relay to be operated is connected to the two windings in parallel, thereby shunting the releasing winding and permitting the polarized relay to operate. The connected relay may either operate at once or be operated by a subsequent reduction of the resistance in series with the operating winding of the polarized relay. When the connected relay operates, it closes a characteristic potential to its operating circuit which may conveniently be ground, this potential shunting the operating winding of the polarized relay and permitting the releasing winding to become effective to open the contact of the polarized relay. The successful operation and release of the polarized relay controls an indicating means which may serve to advance the operation of the control apparatus or may cause it to release.

The invention will be more clearly understood from a consideration of the following description in connection with the drawings, in which Fig. 1 shows a simplified embodiment of the invention, and Figs. 2 and 3 show its application to actual working circuits.

Referring first to Fig. 1, when the equipment of which polarized relay 100 is a part is seized, the relay is included in a circuit from battery, through its windings to ground through resistance 102.

Under this condition, the relay remains released, with its back contact closed. When the equipment at the right of the dotted line is connected to the equipment at the left of the dotted line, relay 101 is connected to the two windings of relay 100 in parallel over conductor 105. This shunts the lower releasing winding of relay 100,

permitting the polarized relay to operate and close a circuit for relay 103, which locks independent of relay 100. When it is desired to operate relay 101, direct ground (or low resistance ground) is connected in shunt of resistance 102, operating relay 101. Relay 101 in turn locks and extends its locking ground in shunt of the upper operating winding of relay 100 which permits the releasing winding to become effective and restore the armature to its back contact. A circuit is now closed over the back contact of relay 100, front contact of relay 103, to the winding of relay 104 to indicate that relay 101 has operated and locked. If relay 101 fails to lock, relay 100 remains operated, relay 104 fails to operate and the time alarm indicates a trouble condition.

Relay 100 also serves to test conductor 105 which connects relays 101 and 100 for unstandard conditions. If the conductor is open, relay 100 cannot operate and the failure to operate relay 104 would cause the time alarm to function. Similarly, if a false ground were present, the lower winding of relay 100 would be energized to hold the armature on its back contact and relay 104 would bring in the alarm.

Such an arrangement could well be applied to setting the ringing control relays in the incoming junctor from the marker.

This arrangement also may be applied to the establishment and testing of a connection similar to the functions performed by the decoder marker in the application of W. W. Carpenter, Serial No. 27,305, filed June 19, 1935.

The connection between a calling district junctor and an outgoing trunk includes a primary district selector 200, a district link 201, a secondary district selector 202, an office junctor 203, a primary office selector 204, an office link 205 and a secondary office selector 206. Access from the marker decoder to the wanted trunk is obtained by means of an office frame connector 207 which includes several multicontact relays operated by the marker in accordance with the registered designation. Access is then obtained to the calling district junctor by means of a district frame connector 208, including multicontact relays individual to the marker decoder and to the district junctor. As a result, relay 301 is operated and locked under the control of relays 302, 303 and 304.

During the registration of the office code in the decoder marker relay 305 is operated, connecting battery to the left windings of relays 306, 307 and 302 and ground to the right windings of these

relays. Under this condition these relays hold their back contacts closed.

When the channels between the district junctor and trunk have been tested and an idle one selected, relay 308 operates, closing two test circuits. One extends from the hold magnet 210 of the primary district selector 200 through the district frame connector 208, inner left contact of relay 308, right back contact of relay 303, third right contact of relay 301, to the junction of the windings of relay 306. The other extends from the hold magnet 216 of the secondary office selector 206, right contact of relay 308, right back contact of relay 309 to the junction of the windings of relay 307.

Relays 306 and 307 will operate only when encountering battery through the hold magnets. If the corresponding leads are open or grounded relay 306 and 307 will not operate. The magnets operate in series with the right windings of the test relays.

Relay 310 was previously operated and locked over back contacts of relays 306 and 307 to ground at the inner left contact of relay 305. If both relay 306 and relay 307 operate relay 310 releases. With relay 310 released, a circuit is closed from battery through the windings of hold magnets 212 and 214 serving the secondary district selector and primary office selector respectively, through the district frame connector, outer left contact of relay 308, outer left back contact of relay 310, back contact of relay 311, over the normal contacts of either relay 309 or 303 to ground at the outer right contact of relay 301. This ground causes the operation of magnets 212 and 214, which extend their operating ground over the sleeve contacts of the switches to the district link and office link respectively. This ground holds magnets 210 and 216 operated but shunts the operating windings of relays 306 and 307, causing them to reclose their back contacts provided switches 202 and 204 have operated properly. With magnet 210 already operated, this ground is extended over the primary district selector through the district frame connector 208, inner left back contact of relay 310, back contact of relay 307, outer right back contact of relay 310 to the winding of relay 309 and battery. If the primary district selector operates properly relay 309 also operates. Similarly ground on the sleeve of the office link is extended, if the secondary office selector has closed satisfactorily, over the sleeve contact of that switch, through the office frame connector 207, middle left back contact of relay 310, back contact of relay 306, inner right back contact of relay 310 to the winding of relay 303 and battery, operating relay 303. With relays 309 and 303 operated, the ground from relay 301 is disconnected from the office junctor, leaving it connected to battery and ground through the windings of relay 302. Relays 303 and 309 connect ground from relay 301 over their alternate contacts to the windings of relays 306 and 307 respectively to hold the latter relays in their non-operated position.

Ground through the right winding of relay 302 is sufficient to hold magnets 210, 212, 214 and 216 operated, as well as relays 309 and 303. Relay 302 now operates provided there is no false ground on the holding magnet circuit caused by a double connection.

The release of relay 310 permitted relay 304 to operate opening one locking circuit of relay 301 and the operating circuit of relay 311. Relay

303 opens a second locking circuit of relay 301 and relay 302 opens the third, permitting relay 301 to release.

Switch 206 in operating, connects ground to conductor 219 to mark the trunk busy and this ground is extended through the office frame connector and over the front contact of relay 309 to the winding of relay 312. Relay 301 causes the release of relay 220 in the district junctor which connects ground to the sleeve of the primary district selector 200 to hold the hold magnets operated. This ground shunts the operating winding of relay 302 which releases if the holding ground is properly applied.

With relays 302 and 301 released and relay 312 operated ground is connected to conductor 313 to release the marker from the switches.

A somewhat similar arrangement may be used in testing the terminating end of a connection.

What is claimed is:

1. In a telephone system, a conductor, a relay connected to one end of said conductor, means to operate said relay over said conductor, means to connect a characteristic potential to said conductor responsive to the operation of said relay, and means connected to the other end of said conductor responsive to the connection of said relay to said conductor and the subsequent connection of said characteristic potential to said conductor to indicate that said relay has operated correctly.

2. In a telephone system, a conductor, a relay, means to operate said relay over said conductor, means to connect a characteristic potential to said conductor responsive to the operation of said relay, and means connected to said conductor responsive to the connection of said relay to said conductor and the subsequent connection of said characteristic potential to said conductor to indicate that the relay has operated correctly, said means comprising a double-wound polarized relay, so connected as to operate in response to a connection with said first relay and released in response to said characteristic potential.

3. In a telephone system, a relay, and means to indicate the operation of said relay, comprising a double-wound polarized relay, means to connect said polarized relay with said first relay to operate said relays, means responsive to the operation of said first relay to release said polarized relay and indicating means controlled by said polarized relay.

4. In a telephone system, a relay, and means to indicate the operation of said relay, comprising a double-wound polarized relay, means to connect one winding of said polarized relay with said first relay to operate said relays, means responsive to the operation of said first relay to hold said first relay operated and to shunt said winding of said polarized relay, and indicating means controlled by said polarized relay.

5. In a telephone system, a relay, and means to indicate the operation of said relay, comprising a double-wound polarized relay, means for energizing the windings of said polarized relay to hold said relay unoperated, means to connect said first relay to the windings of said polarized relay, shunting one winding to permit said polarized relay to operate, means to reduce the resistance in circuit with the other winding of said polarized relay to operate said first relay, means responsive to the operation of said first relay to shunt said other winding of said polarized relay releasing said relay, and means responsive to the operation and release of said

polarized relay to indicate that said first relay has operated properly.

6. In a telephone system, a relay, and means to indicate the operation of said relay comprising a polarized relay having an operating winding and a releasing winding, means to energize both windings of said relay, means to connect said first relay to the windings of said polarized relay to render said operating winding effective, means to reduce the resistance in circuit with the operating winding of said polarized relay to operate said first relay, means responsive to the operation of said first relay to render said releasing winding effective, and means responsive to the operation and release of said polarized relay to indicate that said first relay has operated properly.

7. In a telephone system, a conductor, a relay, means to operate said relay over said conductor, means to connect a characteristic potential to said conductor responsive to the operation of said relay, means connected to said conductor responsive to the connection of said relay to said conductor and the subsequent connection of said characteristic potential to said conductor to indicate that said relay has operated correctly, and means to prevent the operation of said indicating means in response to the premature presence of said characteristic potential on said conductor.

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