

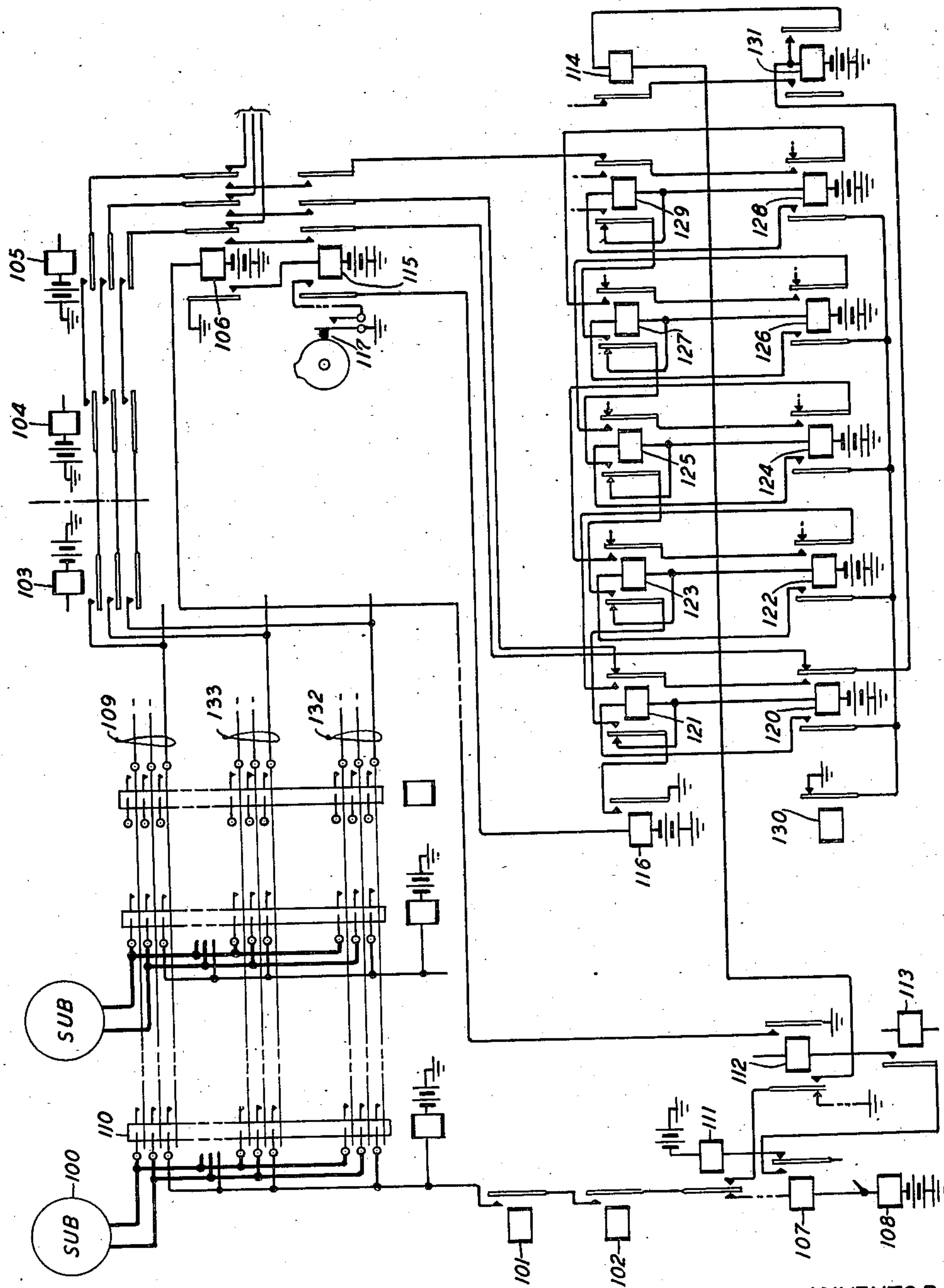
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TELEPHONE SYSTEM

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TELEPHONE SYSTEM

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6 Claims. (Cl. 179—27)

This relates to telephone systems and has for its object to facilitate the establishment of no-test connections.

In the application of F. A. Korn and O. Myers Serial 68,257, filed March 11, 1936, is set forth one method of establishing no-test connections in a telephone system employing cross-bar switches. In the disclosure of that application, connection is made with the wanted line by identifying and seizing the trunk connected with the subscriber's line.

The present invention provides an improved means of identifying the trunk connected with a busy subscriber's line. To this end, one terminal of a relay is connected with the test conductor of the wanted line and the other terminal connected successively to the test conductors of the busy trunks in the group having access thereto, the relay being shunted by the direct connection between the line and the trunk when the desired trunk is found.

The attached drawing shows a part of a primary line switch with two subscribers' lines appearing therein, together with a part of the terminating marker, by which connections are controlled.

When connection with a line is desired, the sleeve or test terminal of the line is connected to the marker through a line choice connector indicated by relays 101 and 102. After the location of the line has been determined the sleeve or test conductors of the line links serving the wanted line are connected through to the marker, relay 103 representing the line group control circuit, relay 104 the line choice connector and relay 105 the frame relay in the marker. Normally these link test circuits extend over the back contacts of relay 106 to channel test relays.

Assuming that connection with line 100 is desired on a no-test basis, and that the line is busy with a connection over line link 109, when the line test circuit is closed, low resistance ground on the sleeve of link 109 extends over the sleeve of cross point 110, front contacts of relays 101 and 102, back contact of relay 111, windings of relays 107 and 108 to battery, relay 107 operating, to open the circuit of relay 111. Since this connection was desired on a no-test basis, relay 113 is operated under the control of the no-test incoming junctor on which the call originated. Therefore when relay 107 operates to indicate that the wanted line is busy, relay 112 is operated in place of the busy back relay. Relay 112 causes circuit operations resulting in the release of relay 107 and the operation of re-

lay 111 thereby extending the sleeve of the wanted line over the front contact of relay 111, front contact of relay 112 to the winding of relay 114. Relay 112 also operates relay 106 which transfers the test leads connected to the line links from the channel test relays to contacts of relay 115 and operates that relay to further extend these test leads to the relay chain. Relay 115 also connects relay 116 to interrupter 117 through a pick-up arrangement (not shown) to insure a sufficient interval between the operations of relay 115 and relay 116.

When relay 116 operates for the first time it connects ground over the left back contact of relay 121 to the winding of relay 120 and battery. Relay 120 locks through the winding of relay 121 to ground at the back contact of release relay 130, but relay 121 does not operate until relay 116 releases to open the operating circuit of relay 120 which shunted relay 121. When relay 116 releases, relay 121 operates.

The second operation of relay 116 connects ground over the front contacts of relays 116 and 121, left back contact of relay 123 to the winding of relay 122 and battery. Relay 122 also locks to the back contact of relay 130 and prepares the circuit for relay 123 which is ineffective until relay 116 releases. In a similar manner relays 124 to 129 are operated successively.

Until relay 116 operates, a circuit is closed from battery through the winding of relay 131, back contact of relay 120, inner front contacts of relays 115 and 106, lower contacts of relays 105, 104 and 103 to the sleeve conductor of line link 132. If the link is idle, relay 131 does not operate, and when relay 116 operates, in turn operating relay 120, the circuit of relay 131 is transferred over the front contact of relay 120, back contact of relay 121, middle front contacts of relays 115, 106, 105, 104 and 103 to the sleeve of line link 133. If link 133 is busy, relay 131 operates connecting its winding to the winding of relay 114 which is in turn connected to the sleeve of line 100 and ground. Relay 114 receives sufficient current under this condition to operate.

With relay 122 operated, relay 131 is connected to the sleeve of the third link and the links are thus tested in succession. When relay 128 operates, relay 131 is connected over the front contacts of relays 120 to 128, right back contact of relay 129, outer front contacts of relays 115 and 116, inner front contacts of relays 105, 104 and 103 to the sleeve of link 109, to which, it was as-

sumed, the line 100 is connected. Ground on this link operates relay 131, which connects relay 114 to the same link over the sleeve contact of cross-point 110. Under this condition the winding of relay 114 is shunted by the line link itself and relay 114 does not operate. An indicating circuit is operated over the front contact of relay 131 and the back contact of relay 114 to indicate that the wanted line link has been found and to establish its identity.

As indicated above, three conditions exist on the line links, the link may be idle, the link may be busy with some other line or the link may be busy with the wanted line. In the first case neither relay 131 or relay 114 is operated, in the second case both relays are operated and in the third case relay 131 is operated but relay 114 is not, thus providing a simple method of identifying the link serving the wanted line.

If it were desired, a simple stepping switch might be substituted for the relay chain without departing from the spirit of the invention.

What is claimed is:

1. In a telephone system, a subscriber's line, a group of trunks, means for connecting said line with one of said group of trunks, switching means, common control equipment having access to said line as a called line, to said trunks and to said switching means, means in said control equipment for establishing a no-test connection with said line by causing said switching means to connect with said one trunk, and means to identify said one trunk by connecting a relay to said subscriber's line and successively connecting the trunks of said group to said relay.

2. In a telephone system, a subscriber's line, a group of trunks, means for connecting said line with one of said group of trunks, means for applying a busy potential to the test conductor of said line over the test conductor of said trunk, switching means, common control equipment having access to said line as a called line, to said trunks and to said switching means, means in said control equipment for establishing a no-test connection with said line by causing said switching means to connect with said one trunk, and means to identify said one trunk comprising means for connecting a relay to the test conductor of said line and means to successively connect the test conductors of busy trunks of said group to said relay.

3. In a telephone system, a subscriber's line, a group of trunks, means for connecting said line with one of said group of trunks, means for applying the busy potential to the test conductor of said line over the test conductor of said trunk, switching means, common control equipment having access to said line as a called line, to said trunks and to said switching means, means in said control equipment for establishing a no-test connection with said line by causing said switching means to connect with said one trunk and means to identify said one trunk comprising means to connect a relay to said subscriber's line, means responsive to said busy potential on the test conductor of said one trunk, means controlled by said responsive means to connect said relay to

the test conductor of said busy trunk and signaling means operated by said relay when connected to said trunk.

4. In a telephone system, a subscriber's line, a group of trunks, means for connecting said line with one of said group of trunks, switching means, common control equipment having access to said line as a called line, to said trunks and to said switching means, means in said control equipment for establishing a no-test connection with said line by causing said switching means to connect with said one trunk, means for applying a busy potential to the test conductor of said line over the test conductor of said trunk, and means to identify said one trunk comprising a relay, means for connecting one terminal of said relay to the test conductor of said line and means for successively connecting the test conductors of busy trunks to the other terminal of said relay.

5. In a telephone system, a subscriber's line, a group of trunks, means for connecting said line with one of said group of trunks, means for applying a busy potential to the test conductor of said line over the test conductor of said trunk, switching means, common control equipment having access to said line as a called line, to said trunks and to said switching means, means in said control equipment for establishing a no-test connection with said line by causing said switching means to connect with said one trunk and means to identify said one trunk, comprising a relay, means for connecting one terminal of said relay to the test conductor of said line, trunk testing means, means for successively connecting said testing means to the test conductors of the trunks of said group, means controlled by said testing means when connected with busy trunks to connect said relay in parallel with said testing means, said relay being responsive to connection with said one trunk to indicate its identity.

6. In a telephone system, a subscriber's line, a group of trunks, means for connecting said line with one of said group of trunks, means for applying a busy potential to the test conductor of said line over the test conductor of said trunk, switching means common control equipment having access to said line as a called line, to said trunks and to said switching means, means in said control equipment for establishing a no-test connection with said line by causing said switching means to connect with said one trunk, and means to identify said one trunk, comprising a relay, means to connect said relay with the test terminal of said line, a second relay, means to successively connect said second relay with the trunks of said group in turn, said second relay being responsive to connection with busy trunks, means controlled by said second relay to connect said first relay to said busy trunks, said first relay being operated when connected to a busy trunk other than said one trunk and shunted by connection with said one trunk and means responsive to the non-operation of said first relay and the operation of said second relay to indicate the identity of said one trunk.

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