

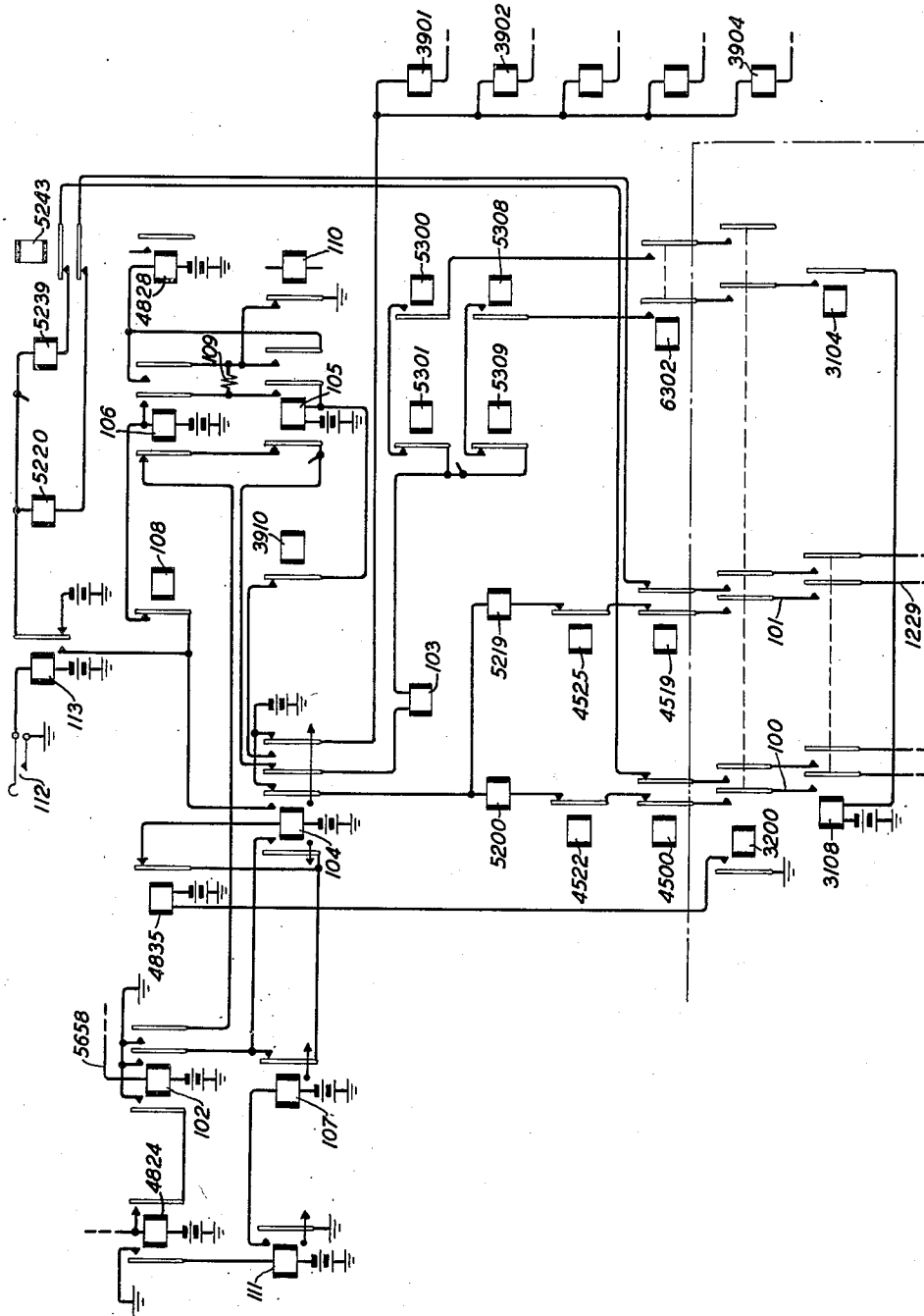
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TELEPHONE SYSTEM

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TELEPHONE SYSTEM

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9 Claims. (Cl. 179—18)

This invention relates to telephone systems and has for its object to increase the efficiency of operation of such systems.

In the cross-bar system, the operation of testing the wanted line is performed by common control apparatus known as a marker which is connected with the line through a link including a plurality of conductors, a set of relays for connecting any marker with the conductors and a set of relays for connecting the conductors with a group of lines, one relay of each set being operated for each call. In the marker these test conductors are connected to a set of test relays for determining whether the called line is busy or idle. If one of the conductors in the link becomes grounded falsely, each time that a connection is attempted the corresponding line will appear to be busy. In order to test these conductors for a false ground, it is necessary to delay the connection of the conductors with the line and therefore increase the holding time of the marker.

In accordance with the present invention, means is provided for testing the conductors of the link by associating conductor testing means with the normal line testing means and delaying the connection of the conductors with the lines during the test. In order to avoid delaying calls due to the increase in marker holding time, means is provided to prevent the test being performed when the marker is re seized within a predetermined length of time after release.

The invention will be more clearly understood from the consideration of the following description read in connection with the drawing, which shows a portion of a marker and within the rectangle at the bottom a portion of a link or line choice connector including the conductors to be tested. A large part of the disclosure has been selected from the drawing accompanying the application of W. W. Carpenter, Serial No. 68,262, filed March 11, 1936, and where possible the same reference numerals have been employed. Reference is hereby made to that application for a description of the system as a whole.

When a terminating call arrives at an office employing cross-bar type switches, a terminating sender is seized and the line number is transmitted from the originating office to this sender. The sender then connects with a terminating marker to which it transfers the recorded number. The marker translates the number into a set of three cross-connections individual to a group of twenty lines including the wanted line.

Over one of these cross-connections it seizes a line choice connector, operating marker connecting relay 3200. It then operates a hundred-block relay 3104 and thereafter a twenty-block relay 3108. Each twenty-block relay has two armatures for each of twenty lines, one closing the sleeve or test circuit and the other a class or position identifying circuit. These twenty pairs of circuits also extend over the contacts of the marker connecting relay 3200, and it is the conductors 100, 101, etc., to be included in the test circuits between the armatures of relay 3200 and the contacts of relay 3108 which are tested in the present arrangement.

During the progress of a normal call, relay 102 is operated over conductor 5658 as soon as the marker connector connects the marker and sender together. As soon as the registration and translation are completed, three circuits are prepared, one to a preference chain in the line choice connector, one for a marker twenty-block relay such as relay 5308, and one for a connector hundred-block relay such as relay 3104. Relay 5308 operates immediately, in turn operating relay 6302. As soon as the line choice connector is available, which may be immediately, the preference relay operates, in turn operating relay 3200. With relay 3200 operated, the circuit of relay 3104 is completed, followed, if no test is to be made, by relay 3108, whose circuit may be traced from battery through the winding of relay 3108, front contact of relay 3104, front contact of relay 3200, front contact of relay 6302, front contact of relay 5308, back contact of relay 5309, winding of relay 103, middle back contact of relay 104, back contacts of relays 105 and 106, outer front contact of relay 102 to ground. With relay 3108 operated, one line test circuit extends, for example, from conductor 1229 over a front contact of relay 3108, conductor 101, front contact of relay 3200, back contacts of relays 4519 and 4525, winding of test relay 5219, inner back contact of relay 104 to battery. Relay 5219 operates from ground on conductor 1229 to indicate that the line is busy. Relay 5200 makes a similar test of the line to which it is connected and similar relays test the remainder of the group of twenty lines identified by the operation of relays 3200, 3104 and 3108.

As above indicated, if one of the conductors 100, 101, etc. becomes grounded falsely, each time that a group of lines is tested the corresponding line will appear busy. Therefore, when possible, as will appear hereinafter, the operation of relay 3108 is delayed long enough to make a

test of these conductors. Relay 102 in operating closes a circuit over the back contacts of relays 107 and 4835 to the winding of relay 104 and battery. Relay 104 locks under the control of relay 4835, disconnects the windings of relays 5200, 5219, etc., from battery and connects them in multiple over the back contact of relay 100 to the winding of relay 106 and battery. A false ground on one of the conductors 100, 101, etc., operates relay 106, which locks through resistance 109 to ground at the back contact of relay 110. Relay 106 opens the circuit of relay 3108 and operates trouble release relay 4828 to cause a record of the trouble to be made. If no trouble appears, the operation of relay 3200 in turn operates relay 4835. Relay 4835 opens the locking circuit of relay 104, which closes its back contacts after an interval, completing the circuit of relay 3108 and permitting the call to proceed.

In order to obviate this delay when the traffic is heavy, a timing circuit controls the operation of relay 104. Relay 4824 is operated in the chain circuit closed for checking the registering leads connecting sender and marker, and locks under the control of relay 102. Relay 4824 in turn operates relays 111 and 107, these relays remaining operated until the release of the marker connector releases relay 102. Relays 111 and 107 release slowly to measure off a definite interval of time. As long as relay 107 holds its contact open, relay 104 cannot operate. If the calls are arriving so rapidly that the marker is resealed before relays 111 and 107 can release, relay 104 does not operate and no test is made of the sleeve link conductors 100 and 101 until the traffic slows.

Relays 3901, 3902, 3904, etc., are operated under special conditions, for example, when a call is to be routed to an intercept operator. When relay 104 applies the test above described to the sleeve linkage, a similar test is applied to these relays. They are connected over the outer front contact of relay 104, back contact of relay 3913 to the winding of relay 105, which performs the same functions as relay 106.

A similar test is applied at will under the control of key 112 to the linkage in the class indicating circuit. With key 112 operated, relay 113 is operated, opening the direct battery supply to relays 5220 to 5239 and closing their windings through to the winding of relay 106, which performs the same functions for these circuits that it does for the sleeve circuits. However, this test is only applied during general tests of the marker.

What is claimed is:

1. In a telephone system, a control device, means for seizing said device, testing means in said device, timing means started when said device is released and means for preventing the operation of said testing means if said device is resealed before said timing means completes its operation.

2. In a telephone system, a control device, means for successively seizing said control device, a plurality of groups of lines, means including a plurality of conductors for connecting said control device with one of said groups of lines when seized, means for testing said conductors and means depending upon the frequency of successive seizures for determining whether said test shall be performed.

3. In a telephone system, a control device, means for successively seizing said control device, a plurality of groups of lines, means includ-

ing a plurality of conductors for connecting said control device with one of said groups of lines when seized, means for testing said conductors, timing means started by the release of said control device and means for preventing said test if said device is resealed within a predetermined length of time.

4. In a telephone system, a control device, a plurality of groups of lines, a plurality of conductors, first connecting means for connecting said control device with said conductors, second connecting means for connecting said conductors with one of said groups of lines, means in said device for testing said lines over said conductors, means for testing said conductors, means for associating said conductor testing means with said line testing means and means for preventing the operation of said second connecting means during said association.

5. In a telephone system, a control device, a plurality of groups of lines, a plurality of conductors, first connecting means for connecting said control device with said conductors, second connecting means for connecting said conductors with one of said groups of lines, means for testing said conductors, and means for preventing the operation of said second connecting means during said test.

6. In a telephone system, a control device, a plurality of groups of lines, a plurality of conductors, first connecting means for connecting said control device with said conductors, second connecting means for connecting said conductors with one of said groups of lines, means for testing said conductors, means for delaying the operation of said second connecting means during said test, timing means started when said device is released, and means for canceling said delay if said device is resealed before said timing means completes its operation.

7. In a telephone system, a control device, means for successively seizing said control device, a plurality of groups of lines, a plurality of conductors, first connecting means for connecting said control device with said conductors, second connecting means for connecting said conductors with one of said groups of lines, means for testing said conductors, means for preventing the operation of said second connecting means during said test, and means depending upon the frequency of successive seizures for determining whether said conductor test shall be performed.

8. In a telephone system, a control device, means for seizing said device, a plurality of groups of lines, a plurality of conductors, first connecting means for connecting said control device with said conductors, second connecting means for connecting said conductors with one of said groups of lines, means in said device for testing said lines over said conductors, means for testing said conductors, means for associating said conductor testing means with said line testing means, means for preventing the operation of said second connecting means during said association, timing means started when said device is released, and means for preventing the operation of said conductor testing means if said device is resealed before said timing means completes its operation.

9. In a telephone system, a control device, means for successively seizing said control device, a plurality of groups of lines, a plurality of conductors, first connecting means for connecting said control device with said conductors, second connecting means for connecting said conductors

with one of said groups of lines, means in said device for testing said lines over said conductors, means for testing said conductors, means for associating said conductor testing means with
5 said line testing means, means for preventing the operation of said second connecting means dur-

ing said association, and means depending upon the frequency of successive seizures for determining whether said conductor test shall be performed.

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