

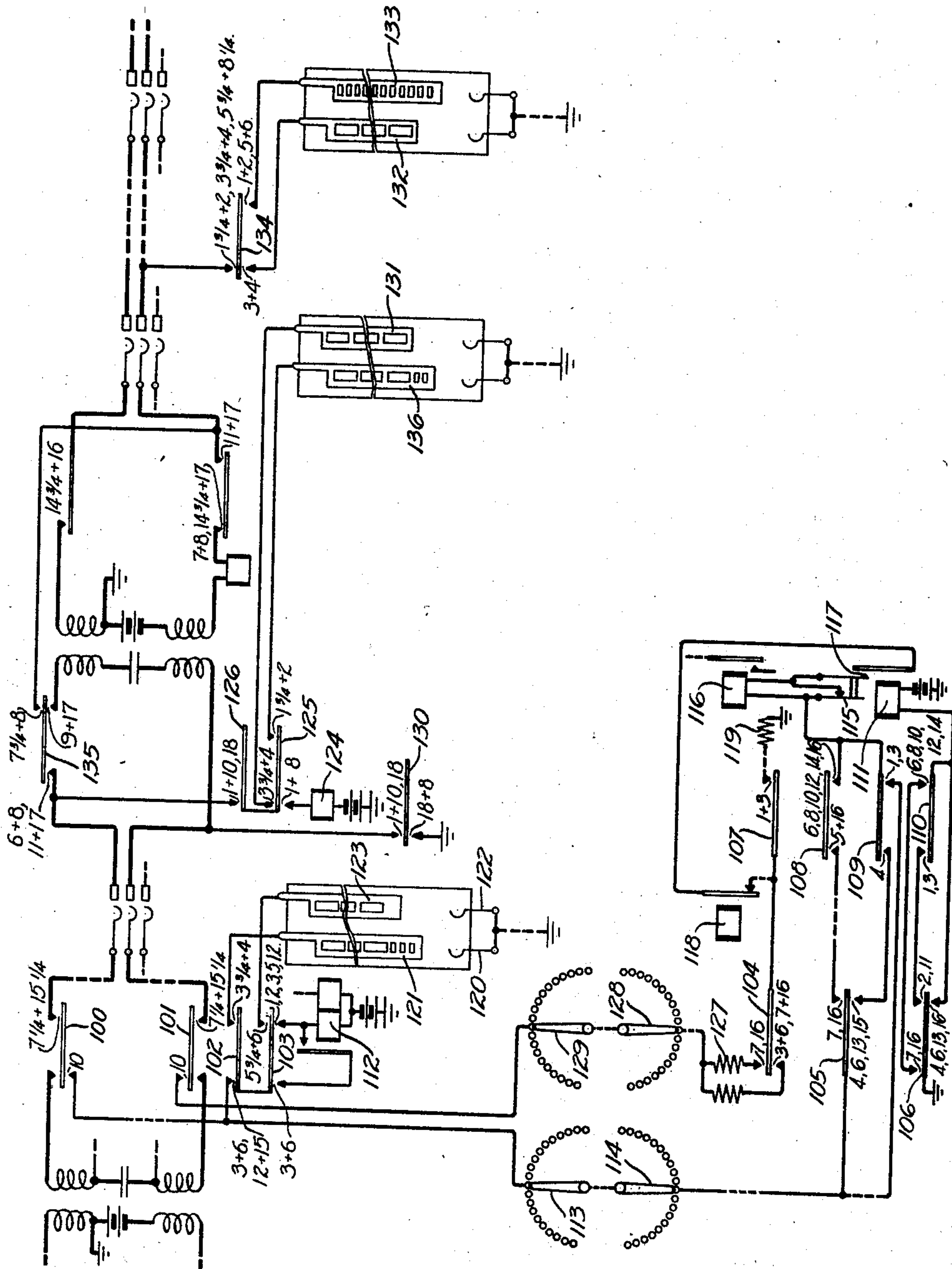
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TELEPHONE SYSTEM

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TELEPHONE SYSTEM

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This invention relates to telephone exchange systems and more particularly to systems employing revertive control of selections.

5 With the increase in the use of dial telephone systems, the length of the interoffice cables over which selections must be controlled has increased. In the case of long telephone cables the conductors have a considerable distributed capacity so that a charge may be built up on them during the time that the circuit is open at the sender. When the control circuit is closed this charge flows off very rapidly through the control relay of the sender operating that relay while the steady current flow may not build up fast enough to hold the relay operated. The control relay would therefore operate, release and reoperate indicating to the sender that one revertive pulse had been received when such was not the case, resulting in an inaccurate selection.

In accordance with the present invention, means has been provided for absorbing the initial discharge without operating the control relay of the sender, such means comprising a shunt normally closed around said control relay and momentarily included in the selection control circuit when the circuit is closed through the control relay. This is accomplished by the use of an auxiliary relay to close the control circuit for the purpose of making selections. The shunt around the control relay extends over a back contact of this auxiliary relay while the control circuit is closed over a front contact of this relay and the two contacts are so adjusted and related that the shunt is opened at the back contact long enough after the control circuit is closed at the front contact to discharge the control circuit through the shunt instead of through the relay.

For a clearer understanding of the invention reference is made to the drawing which shows portions of a telephone system to which the invention is applicable. The drawing includes portions of a sender and district selector such as are disclosed in Patent 1,589,402 granted June 22, 1926 to O. H. Kopp and portions of an incoming

selector and a final selector such as disclosed in Patent 1,658,829 granted February 14, 1928 to C. H. Berry. Reference may be made to these patents for complete descriptions of the operation of the system.

As set forth in the Kopp patent above referred to, the initiation of a call by a subscriber causes the extension of the calling line to an idle district selector and the association of an idle sender with the district selector and the line. The subscriber then operates his dial to set up a registration of the wanted line number. The code of the wanted office is translated and a control circuit known as the fundamental circuit is then established between the sender and the district selector for the purpose of controlling district brush selections. At the time this fundamental circuit is to be established the district selector sequence switch which controls cams 100 to 103 inclusive has been advanced to position 3, the sender control sequence switch which controls cams 104 to 106 inclusive has been advanced to position 2 and the sender sequence switch which controls cams 107 to 110 inclusive is still in position 1. As soon as the sender control sequence switch reaches position 2 a circuit is closed for relay 111 extending from battery, through the winding of the relay, upper left contact of cam 110, upper right contact of cam 106, to ground. Relay 111 operates to establish the fundamental circuit. This circuit may be traced from battery, through the left winding of relay 112, lower right contact of cam 103, upper left contact of cam 102, through the link circuit represented by brushes 113 and 114, lower contact of cam 109, to one side of contact 115 controlled by relay 111 and one side of the winding of relay 116. As relay 111 operates it first closes contact 117 completing the fundamental circuit over contacts 115 and 117 in shunt of the winding of relay 116, back contact of relay 118, upper contact of cam 107, resistance 119 to ground. It is obvious that under this condition substantially the entire current flows by way of contact 115. When relay 111 is fully operated it opens contact 115 and the funda-

mental circuit extends through the winding of relay 116 alone to contact 117 and thence to ground as traced. Relays 112 and 116 operate in the fundamental circuit, relay 112 locking over its left front contact and the left contact of cam 103 to the fundamental circuit and relay 116 closing a circuit through the counting relays and registers in the manner fully described in the patent to Kopp. Relay 112 advances the district sequence switch and initiates the operation of the district selector. As the selector moves upward the commutator brush 120 closes an intermittent circuit from ground, over the conducting segments of commutator strip 121, upper right contact of cam 102, lower left contact of cam 103, left front contact and winding of relay 112 to battery, holding relay 112 operated and releasing stepping relay 116. The release of relay 116 at each closure of this circuit operates a pair of counting relays in the well known manner. When the registration has been satisfied, relay 118 operates, opening the fundamental circuit, releasing relays 112 and 116 and causing the advance of the district selector sequence switch and the sender sequence switch. When the sender sequence switch leaves position 1 relay 111 releases, first reclosing the shunt around the winding of relay 116 and then disconnecting it from the fundamental circuit. The advance of the sequence switch also releases the counting relays including relay 118, preparing for the next selection.

The advance of the district selector sequence switch one position again connects relay 112 to the fundamental circuit. When the sender sequence switch has advanced two positions relay 111 is reoperated again connecting relay 116 and its shunt into the fundamental circuit and then removing the shunt from the relay to permit it to function. The intermittent circuit for releasing the stepping relay extends from brush 122, commutator strip 123 and the upper right contact of cam 103 during district group selection. Following group selection the district selector hunts for an idle outgoing trunk and the district selector advances to position 10 as described in the Kopp patent.

The circuit shown does not include an office selector and therefore assumes that the sender control sequence switch is advanced from position 2 to position 7 under the control of the class sequence switch, after which the sender sequence switch is advanced to position 5 and a test made of the outgoing trunk over the fundamental circuit which extends in position 5 through relays not shown. If the incoming selector is ready for service the trunk test causes the advance of the sender sequence switch to position 6. It will be noted that relay 111 is operated

in positions 4 and 6 of the sender control sequence switch, in which positions office selections take place, over the lower contact of cam 106.

With the sender control sequence switch in position 7 and the sender sequence switch in position 6, relay 111 is operated over the upper left contact of cam 106 and the upper right contact of cam 110. Relay 124 of the incoming selector is connected to the fundamental circuit at the time the trunk test is made and is therefore already connected to the circuit when relay 116 is connected into the circuit. As set forth above in the arrangement shown in the Kopp patent when the interoffice trunk is of considerable length a charge is built up on the trunk conductors during the time that the fundamental circuit is open between trunk test and the first incoming selection, and when the fundamental circuit is reclosed the dissipation of this charge may cause the stepping relay to operate and release before the steady current can build up sufficiently to hold the stepping relay operated, thus falsely registering a revertive pulse. In the arrangement of the present invention the connection of the shunt controlled by relay 111 into the circuit in parallel with relay 116 permits such a discharge to flow harmlessly over the shunt and prevents the operation of the stepping relay until the direct current from the incoming selector is sufficient to operate it.

The fundamental circuit for incoming brush selection may be traced from battery, through the winding of relay 124, lower left contact of cam 125, upper left contact of cam 126, tip brush of the district selector, upper right and lower left contacts of cam 100, link brushes 113 and 114, upper contact of cam 105, contacts of cam 108, winding of relay 116, contact 117, back contact of relay 118, upper contact of cam 104, resistance 127, link brushes 128 and 129, upper left and lower right contacts of cam 101, ring brush of the district selector, contacts of cam 130, to ground. This fundamental circuit remains the same for all of the subsequent selections, namely, incoming group selection, final brush, final tens and final units selections, since relay 124 controls the final selections as well as the incoming selections. These selections take place in positions 8, 10, 12 and 14 of the sender sequence switch. In passing from selection to selection relay 111 is released, and each time that the fundamental circuit is reclosed for another selection the shunt around relay 116 is connected into the circuit to prevent the false operation of relay 116. The intermittent circuits for incoming brush and incoming group selections extend over the incoming selector commutator strips 136 and 131 respectively and contacts of cam 125. Following incoming selections the incoming se-

lector sequence switch advances to position 8 and the operation of the final selector completes intermittent circuits over commutator strips 133 and 132, contacts of cam 134, ring brush of the incoming selector, upper right and lower left contacts of cam 135 to the winding of relay 124 to hold that relay operated and release the stepping relay 116. The operation of the incoming selector and the final selector are set forth in detail in the Berry patent above referred to.

What is claimed is:

1. In a telephone system, a selector switch, a sender, means for establishing a control circuit between said sender and said switch, a relay in said sender, a shunt normally closed around said relay, means for including said relay in said control circuit, and means for removing said shunt from said relay only after said relay has been included in said circuit.

2. In a telephone system, a plurality of selector switches, a sender, means for successively establishing control circuits between said sender and said switches, a relay in said sender, a shunt normally closed around said relay, means for including said relay in said control circuits, and means for removing said shunt from said relay only after said relay has been included in said circuits.

3. In a telephone system, a plurality of selector switches, a sender, means for successively establishing control circuits between said sender and said switches, a first relay in said sender, a shunt normally closed around said first relay, a second relay in said sender, and means controlled by said second relay for simultaneously including said first relay and said shunt in said control circuits and for immediately thereafter removing said shunt.

4. In a telephone system, a plurality of selector switches, a sender, means for successively establishing control circuits between said sender and said switches, a relay in said sender, a second relay in said sender, means controlled by said second relay for including said first relay in said control circuits, and means also controlled by said second relay for discharging said control circuits comprising a shunt around said first relay momentarily included in said control circuits.

5. In a telephone system, a plurality of selector switches, a sender, means for successively establishing control circuits between said sender and said switches, a relay in said sender, a second relay in said sender, means controlled by said second relay for including said first relay in said control circuits, and means also controlled by said second relay for discharging said control circuits comprising a shunt around said first relay, included in said control circuits between the closure of a front contact and the

opening of a back contact of said second relay.

6. In a telephone system, a plurality of selector switches, a sender, means for successively establishing control circuits between said sender and said switches, a relay in said sender, a shunt normally closed around said relay, means for including said relay in said control circuits, and means for removing said shunt from said relay only after said relay has been included in said circuits and for restoring said shunt before said relay is disconnected from said circuits.

In witness whereof, I hereunto subscribe my name this 21 day of June, 1928.

RAYMOND E. COLLIS.