

Nov. 11, 1924.

G. DEAKIN

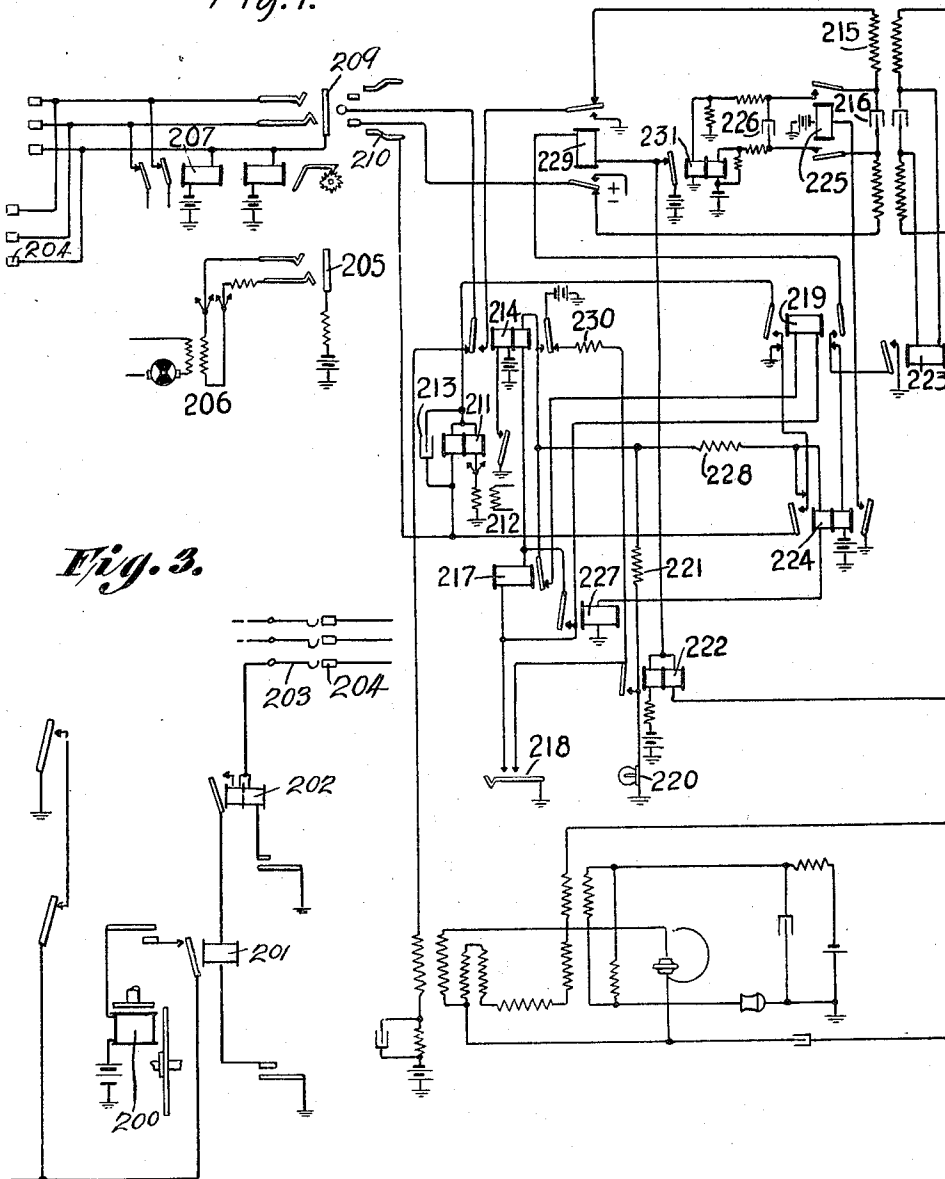
1,514,837

MACHINE SWITCHING TELEPHONE SYSTEM

Filed Nov. 23, 1918

2 Sheets-Sheet 1

Fig. 1.



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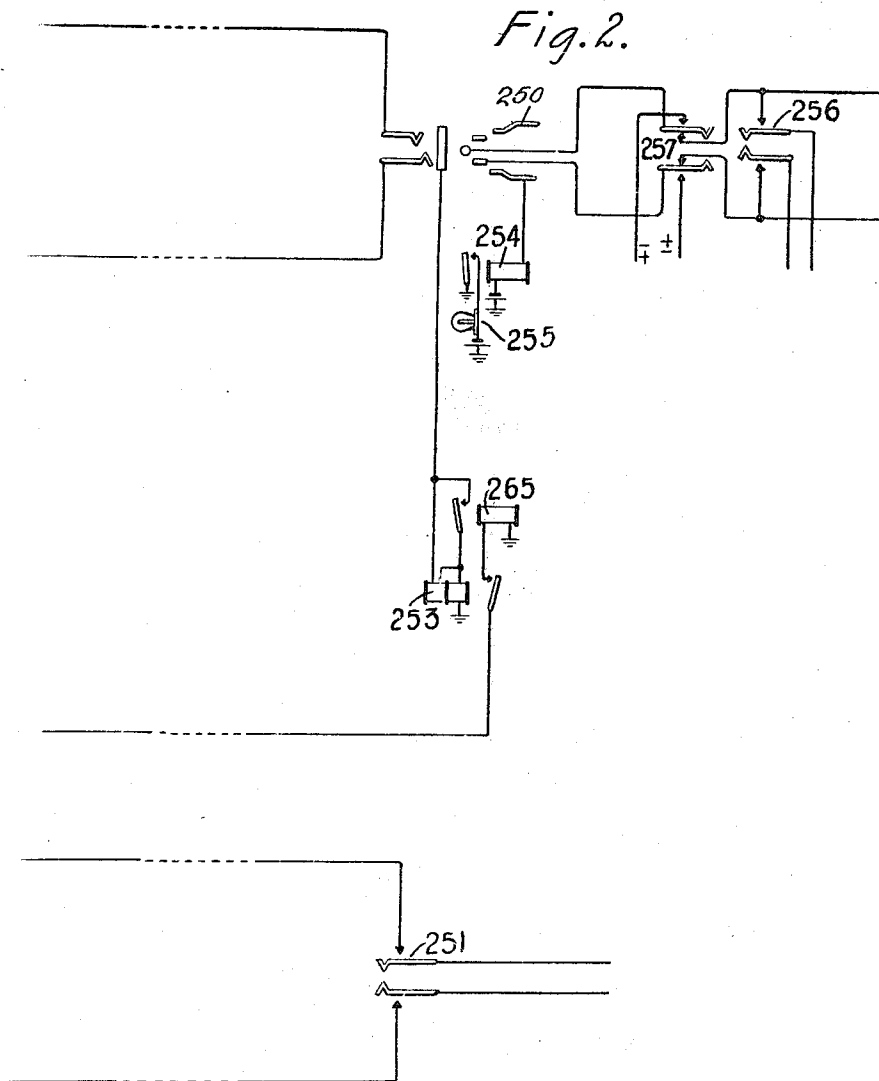
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MACHINE SWITCHING TELEPHONE SYSTEM

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE.

GERALD DEAKIN, OF LONDON, ENGLAND, ASSIGNOR TO WESTERN ELECTRIC COMPANY, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

MACHINE-SWITCHING TELEPHONE SYSTEM.

Application filed November 23, 1918. Serial No. 263,884.

To all whom it may concern:

Be it known that I, GERALD DEAKIN, a citizen of the United States of America, residing at London, England, have invented certain new and useful Improvements in Machine-Switching Telephone Systems, of which the following is a full, clear, concise, and exact description.

This invention relates to machine switching telephone systems and more particularly to systems wherein in addition to the usual or ordinary service provided for the inter-connection of the subscribers' stations of an exchange network the subscribers' lines of the machine switching telephone systems may be also connected over a manual switching section with the toll board.

A particular feature of the invention is the arrangement of circuits and apparatus associated with the incoming end of a trunk line extending from a toll board to a manual switching section which enables the establishment of a connection between a subscriber of the machine switching section and the toll operator without disturbing a local connection between two subscribers and so that the toll operator in depressing the usual listening key, may listen in on the local connection without disturbing it and, in depressing the usual ringing key on the toll board, creates a condition on the incoming end of the trunk line which causes the release of the connection.

Certain other inventive features herein disclosed are not claimed herein but form the subject matter of an application for patent of Lipa Polinkowsky, Serial Number 258,683, filed October 18, 1918, and are claimed therein.

In the accompanying drawings:

Figure 1 shows the arrangement of circuits and apparatus associated with the incoming end of a trunk line extending from a toll board to a manual switching section.

Figure 2 shows a toll operator's position.

Figure 3 illustrates part of a machine switching section engaged in a local connection.

The system will be best understood from a description of the operation thereof.

The switching section is connected in the well known manner over an order wire with the toll board, on which the toll cords are provided with supervisory relays operated over

the sleeves of the jacks of the trunk lines. When the order wire key 251 is depressed and the operator at the switching section receives instructions, she lifts the plug of a free cord from its seat, tests the line and inserts the plug into the jack of the wanted line. The subscriber line remains thereby free for local connections until made busy from the toll board.

In a large exchange in which multiple jacks are used at the switching section, the operator through testing ascertains whether or not the line is engaged in another toll connection. She can also ascertain this fact when testing one of several lines leading to a private branch exchange. After the plug 210 is brought into the jack a circuit is established for the energization of relay 211 over the cut-off relay 207 of the subscriber line, the sleeve 209 of the jack, the sleeve of the plug 210, both windings of relay 211 in series and the secondary winding of the busy tone coil 212 to ground. The condenser 213 around the lefthand high resistance winding of relay 211 enables the creation of a busy tone at the sleeve 209 of the jack so that the subscriber line now appears engaged in a toll connection. Relay 211 closes over its front contact a circuit for the energization of the lefthand winding of relay 214 which disconnects on its lefthand back contact the test circuit and provides over its lefthand front contact a bridge to the subscriber line containing the lefthand windings of the repeating coil 215 in series with a small condenser 216. Over the righthand front contact of relay 214 and the contact of the plug seat switch 218 a circuit is provided for the righthand winding of relay 214 and the winding of relay 217, which is thereby energized and in opening its back contact disconnects the winding of the slow operating relay 219. The guard lamp 220 lights in a circuit over resistance 221 and righthand front contact of relay 214. After the plug 250 is inserted into the jack of the assigned trunk line at the toll board, relay 253 is energized in a circuit over the sleeve of the jack and clearing out relay 254. A circuit is then provided over the third wire of the trunk line including relay 255 at the toll board, the righthand low resistance winding of relay 222 and the back contact and armature of the supervisory relay 231 at

the cord of the switching section. Both relays 222 and 255 are energized. Relay 255 provides a shunt around the high resistance winding of relay 253 so that relay 254 is energized and connects the clearing out lamp 252. Relay 222 provides over its front contact and a contact of the plug seat switch 218 a shunt around the lamp 220.

The toll operator in depressing the listening key 256 connects her telephone in bridge to the trunk line and ascertains whether or not the wanted subscriber's line is engaged in a local connection which beforehand remains undisturbed, the size of the condenser 216 being so selected that the bridge does not interfere with the local connection. The toll operator is also able to communicate with the subscribers and to invite them to restore the receivers on the hooks. When the toll operator is ready to establish the through connection she depresses the ringing key 257 and sends a ringing current over the trunk line. Relay 223 is thereby energized and provides a circuit for energization of the righthand winding of relay 224 over righthand back contact of relay 219 and front contact of relay 223. Over the righthand front contact of relay 224 a circuit is then established for the energization of relay 225 which brings the comparatively large condenser 226 and both windings of the supervisory relay 231 in bridge to condenser 216. The sleeve 209 of the jack of the subscriber's line is connected with ground over the sleeve of the plug 210 the lefthand front contact of relay 224 and the lefthand back contact of relay 219 whereas through the opening of the lefthand back contact of relay 224 a circuit is established for the lefthand winding of relay 224 and the winding of the slow operating relay 227, the circuit including the resistance 228 and the righthand front contact of relay 214. Relay 227 after closing its front contact provides a shunt around the winding of relay 217 so that this relay is slowly de-energized and in closing its back contact provides a circuit for the energization of the slow operating relay 219. In the opening of the lefthand back contact of relay 219 the direct connection with ground of the sleeve 209 of the jack is removed, whereas in closing the lefthand front contact of relay 219 a shunt around the high resistance windings of relay 211 is maintained over the lefthand front contact of relay 224. The sleeve 209 of the jack is now maintained busy over the righthand low resistance winding of relay 211. At the righthand back contact of relay 219 the operating winding of relay 224 is disconnected, while relay 229 is energized in a circuit including back contact of relay 231, righthand front contact of relay 219 and front contact of relay 223. Relay 229 connects on its back contacts the lefthand

windings of the repeating coil 215 and the relay 231 from the subscriber's line and connects the line to a source of ringing current.

The connection of the sleeve 209 of the jack direct to ground during the time relay 224 is energized, removes temporarily the potential at the test terminals 204 of the subscriber line in the automatic exchange so that if the line is engaged in a local connection this connection is released. This release takes place in a manner similar to that shown and described in the patent to Polinkowsky, No. 1,381,431, issued June 14, 1921, through the deenergization of the relays 201 and 202 by the direct connection to ground of the test terminals 204, resulting in the operation of sequence switch 200 and the release of the instrumentalities engaged in a local connection. The subscriber's line is automatically made busy at the switching section and a local connection is automatically released when the toll operator depresses the first time the ringing key 257 usually provided on her board; it follows that the toll operator has not to fulfil any special operation except to depress the ringing key. Though the ringing current serves as agent for the forced release of a local connection, the disconnection takes place locally over the sleeve of the jack. In order that the ringing current will not pass into the ear of the subscriber should he listen into his telephone at the moment the operator depresses the ringing key, the sending of the ringing current is delayed until the supervisory relay 231 has had ample time to become energized over the subscriber's line.

When the toll operator restores the ringing key 257 relay 223 is de-energized and in consequence also relay 229. The supervisory relay 231 is again connected over the back contacts of relay 229 with the subscriber line. When the subscriber removes the receiver from the hook, relay 231 is energized and the shunt around the high resistance winding of relay 222 is opened. Relay 255 is thereby de-energized and in opening the shunt around the winding of relay 253 causes the de-energization of relay 254 which disconnects lamp 252. When the subscriber restores his receiver on the hook, lamp 252 lights before the toll operator. To re-ring the subscriber the toll operator has to depress ringing key 257 so that relays 223 and 229 are energized. After the plug 250 is withdrawn at the toll board from the jack of the trunk line, relay 253 is de-energized and opens the circuit of relay 222 which is then de-energized and removes the shunt around lamp 220. The operator at the switching section then withdraws the plug 210 from the jack of the subscriber's line. After the plug seat switch 218 is opened the relays 214, 224, 219, 225 and 227 are de-energized and lamp 220 is extinguished.

If a plug is erroneously brought into the jack of a trunk line which has not been assigned and relay 222 is energized the guarding lamp 220 lights in a circuit over front contact of relay 222, resistance 230 and righthand back contact of relay 214.

When the operator at the switching section finds that the wanted line is engaged in another toll connection she inserts the plug of the assigned trunk line into a busy jack 205 whereby relays 211 and 214 are again energized and the operator at the toll board in depressing listening key 256 perceives a busy signal from the busy tone coil 206.

What is claimed is:—

1. In a telephone exchange system, a called subscriber's line, automatic switches for establishing a connection to said line, an operator's position, a second operator's position, a trunk interconnecting said positions, a calling line, means at the first operator's position for extending the calling line over said trunk to the second position, an operator's cord circuit at said second position for extending said trunk to the called subscriber's line, a source of alternating current, a ringing key at the first position for applying said source of current to said trunk, a relay responsive to said current for applying ringing current to the called line, and means operated in response to said relay for releasing said switches to disestablish said connection with the called line.

2. In a telephone exchange system, a called subscriber's line, automatic switches for establishing a connection to said line, an operator's position, a second operator's position, a trunk interconnecting said positions, a calling line, means at the first operator's position for extending the calling line over said trunk to the second position, an operator's cord circuit at said second position for extending said trunk to the called subscriber's line to establish a second connection therewith while said first connection is still maintained, a source of current, a ringing key at the first operator's position for applying said current to the trunk, a device responsive to said current for applying ringing current to the called line, and means operated in response to said device

for releasing said automatic switches to disestablish said first connection.

3. In a telephone exchange system, a called subscriber's line, automatic switches for establishing a connection to said line, an operator's position, a second operator's position, a trunk interconnecting said positions, a calling subscriber's line, means at the first operator's position for extending the calling line over said trunk to the second position, an operator's cord circuit at said second position for extending said trunk to the called subscriber's line to establish a second connection therewith, a source of alternating current, a key at the first operator's position for connecting said source of alternating current to said trunk, a device responsive to said current for applying ringing current to subscribers' lines, and means actuated by said device for releasing said automatic switches to disestablish said first connection.

4. In a telephone exchange system, an automatic switch, an operator's position, a manual switch at said position, a called subscriber's line appearing in terminals of said automatic switch and also in said manual switch, means for operating said automatic switch to establish a connection to said called subscriber's line, a second operator's position, a trunk interconnecting said positions, a calling subscriber's line, means at the second operator's position for extending a calling subscriber's line over said trunk to the first operator's position, means at said first operator's position including said manual switch for extending said trunk to the called subscriber's line to establish a second connection therewith, a source of current, a ringing key at the second operator's position for applying said source of current, a device responsive to said current for connecting ringing current to the called line, and means operated in response to said device for releasing said automatic switch to disestablish said first mentioned connection with the called line.

In witness whereof, I have hereunto subscribed my name this 2nd day of October, A. D. 1918.

GERALD DEAKIN.