

I. MOLNAR
TELEPHONE SYSTEM.

4 Sheets-Sheet 1



BY
Davis, Lindsey, Smith & Shonta
ATTORNEYS

Sept. 25, 1945.

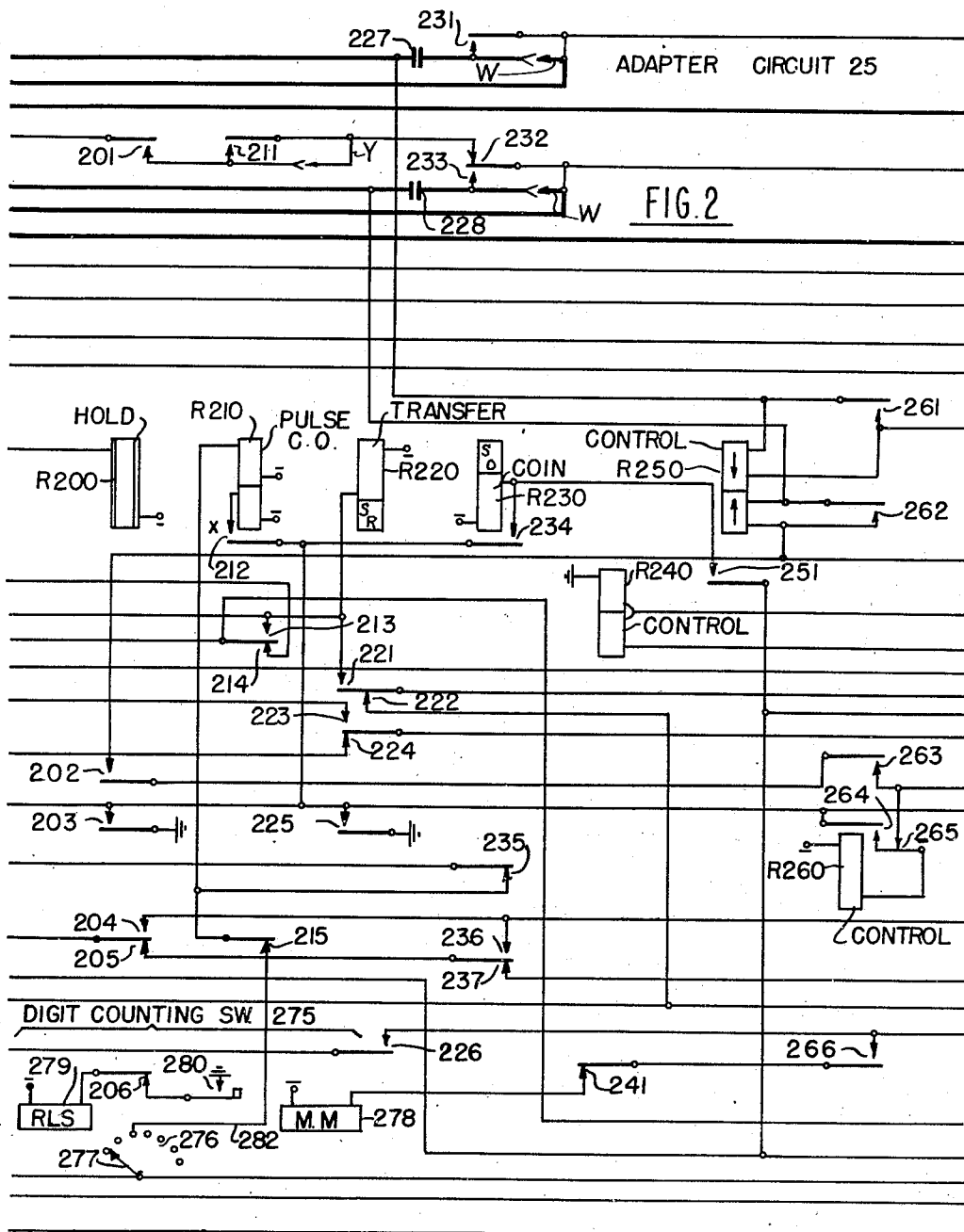
I. MOLNAR

2,385,720

TELEPHONE SYSTEM

Filed Feb. 9, 1942

4 Sheets-Sheet 2



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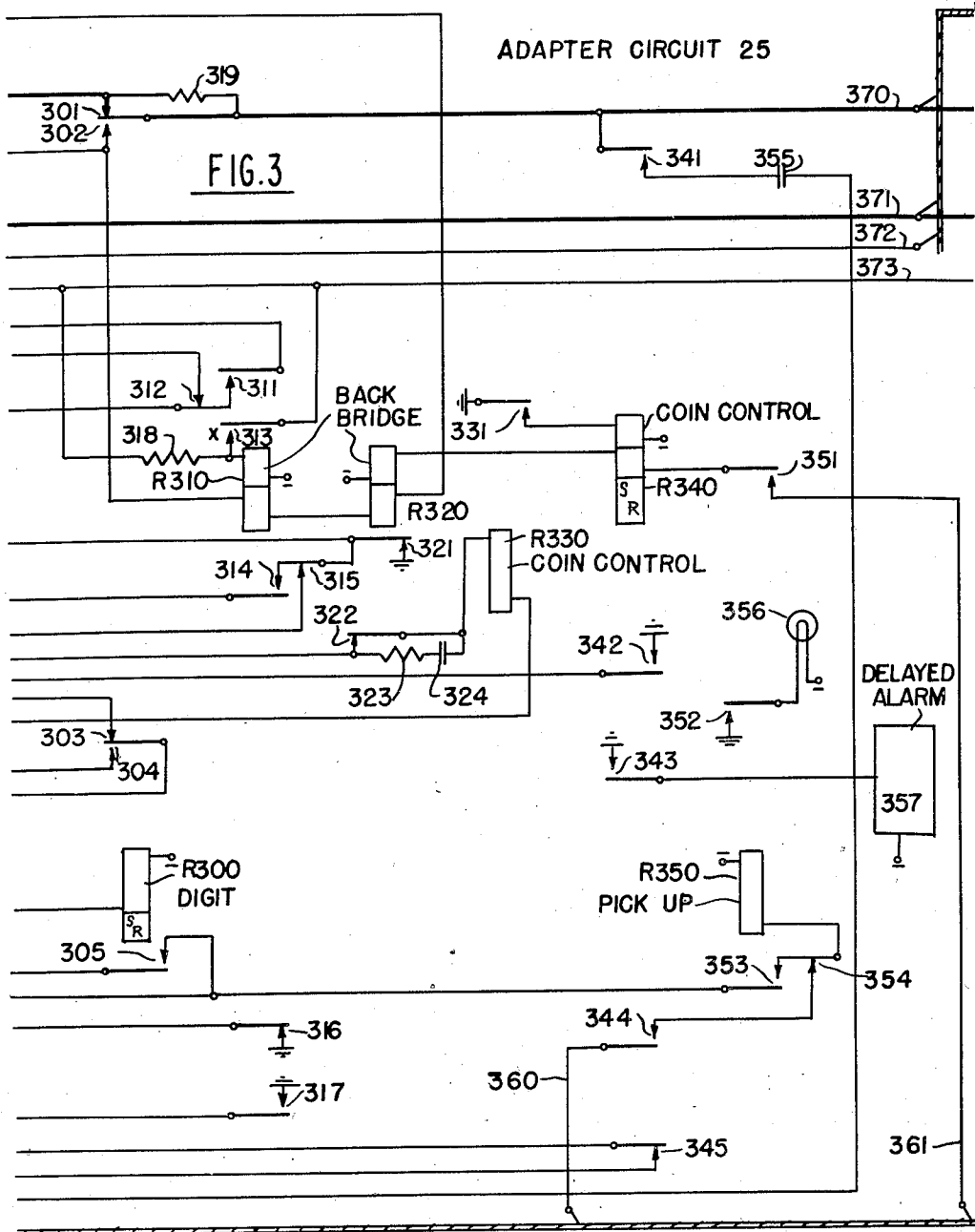
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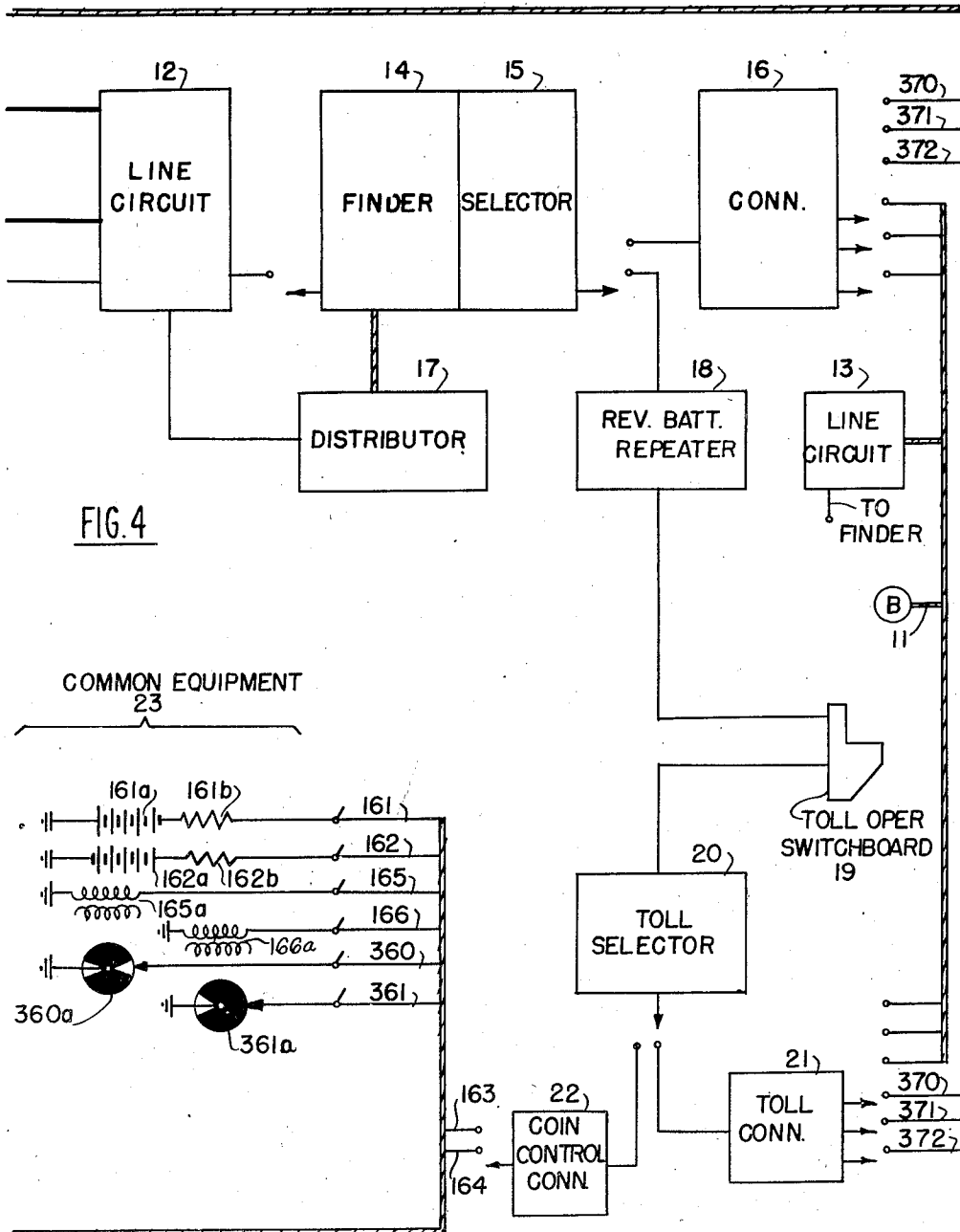
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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

2,385,720

TELEPHONE SYSTEM

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45 Claims. (Cl. 179—6.3)

The present invention relates to measured service telephone systems and, more particularly, to improved apparatus for controlling the collecting and refunding of coins deposited in the coin receiving means of paystations forming a part of an automatic telephone system.

It is an object of the present invention to provide, in an automatic telephone system, improved and exceedingly simple apparatus for controlling the coin collecting and refunding operations required incident to the use of connections involving the paystations embodied in the system.

It is another object of the invention to provide, in an automatic telephone system, improved and simplified apparatus for permitting an operator to control the collecting and refunding of coins deposited at a paystation of the system at any time after a connection is established between the paystation and the operator position.

According to another object of the invention, the selective control of the coin mechanism at the paystation is effected by the operator through auxiliary automatic switches which are entirely separate from those switches used in setting up the connection between the operator position and the paystation.

According to a further object of the invention, provisions are made in the apparatus for transmitting to the operator a signal which indicates that the coin control operation directed by the setting imparted to the auxiliary automatic switches is being effected.

In accordance with another object of the invention, the coin control apparatus is so arranged that the coin mechanism at the paystation is automatically operated to refund deposited coins incident to the extension of a connection from the paystation to the operator position.

According to another object of the invention, the coin control apparatus is arranged to switch the conductors of a calling paystation line through to the conductors of a trunk in extending a connection to the operator position in order to permit the operator directly to control the coin mechanism at the paystation, providing the operator position is equipped with the necessary facilities for such control.

It is another object of the invention to provide a paystation control circuit which includes improved facilities for permitting the paystation user to make certain free service calls without first making a coin deposit, and for preventing a local call connection from being set up unless the correct coin deposit is made at the paystation before the call is initiated.

According to still another object of the invention, the paystation control circuit is equipped with improved facilities for insuring the positive response of the coin mechanism of a connected paystation when circuits are set up therefrom for operating the mechanism.

In accordance with another object of the invention, improved facilities are provided in the coin control circuit for delaying the transmission of a dial tone signal to a calling paystation until a coin is deposited at the paystation.

It is still another object of the invention to provide improved apparatus of the character described, which is so arranged that the regular automatic switching apparatus of the system may be used in completing local connections and in extending connections to a toll operator position without sacrificing any of the required paystation control features.

It is a still further object of the invention to provide improved and exceedingly simple paystation circuit apparatus which is characterized by the operating features briefly referred to above, is adapted for use in conjunction with the individual paystation lines, and is so arranged that all required paystation control operations are effected with a minimum of equipment.

The invention, both as to its organization and method of operation, together with further objects and advantages thereof, will best be understood by reference to the specification taken in connection with the accompanying drawings in which Figs. 1, 2, 3 and 4, when placed side by side in the order named, illustrate a telephone system having incorporated therein a paystation line adapter circuit characterized by the features of the present invention.

In general, the system as illustrated in Figs. 1 to 4, inclusive, of the drawings, comprises an automatic exchange which is provided with facilities including a toll operator switchboard for handling toll traffic to a distant central office, not shown. In the particular arrangement illustrated, the automatic exchange is designed to serve 1,000 lines or less, two of these lines being shown as extending to the substations A and B, respectively. The subscriber lines of the system may be of the single party type or of the multiparty type as desired, the line being illustrated as serving only the substation B. This substation is of the conventional common battery type of which several well known commercial embodiments are available. The substation A, on the other hand, is of the paystation type. In brief, the equipment provided thereat comprises a transmit-

ter 30, a receiver 31, a dial-operated calling device 32, a hook switch 34, an induction coil 35, and a ringer 36. The enumerated circuit elements are interconnected in a well known manner to form a substation circuit of the well known anti-side-tone type. The equipment at the substation A also includes a coil mechanism which is schematically shown as including a coin chute 37, a coin gate 41, a polarized control magnet 38, and two sets of circuit control contacts 39 and 40.

For the purpose of setting up local call connections between the lines terminating in the exchange and of extending connections from these lines to the toll operator switchboard 19, automatic switching equipment is provided which comprises a plurality of finder-selector links and a plurality of connectors, together with line circuits individual to the various lines. Thus the lines 10 and 11 are illustrated as terminating at the exchange in line circuits 12 and 13, respectively. One of the finder-selector links is schematically shown as comprising a finder 14 and a selector 15. The selectors each have access to a plurality of groups of connectors, one of which includes the connector 16. The selectors also have access to a group of reverse battery repeaters through which connections are extended to the toll operator switchboard 19. A plurality of distributors 17, each associated with a different group of the finder-selector links and a different group of lines terminating at the exchange, are provided in order to assign idle ones of the associated links to the use of calling lines in the associated line groups. Thus the distributor 17 is provided for the purpose of assigning the links in the group including the link 14, 15, to the use of calling lines in the line group which includes the line 10.

For the purpose of handling toll calls routed to the toll operator switchboard 19, automatic toll switching equipment is provided which includes a plurality of toll selectors including the selector 20 and a plurality of toll connectors including the connector 21. These switches may only be seized from the toll switchboard 19 and may be used to extend connections to all lines terminating in the exchange.

In order to control the coin mechanisms respectively provided at the substations of the paystation type each paystation line is directly terminated in the exchange in a paystation line adapter circuit. Thus an adapter circuit 25 is shown as being connected between the conductors of the line 10 and the line circuit 12. This circuit and the similar circuits terminating the other paystation lines of the exchange have associated therewith common equipment 23 which includes two distinctive signal current sources 165a and 166a; an interrupter 361a for transmitting interrupted ground pulses over the lead 361; an interrupter 360a for periodically connecting the pickup lead 360 to ground; a source of refund potential 161a, the negative terminal of which is connected to the conductor 161; and a source of collect potential 162a, the positive terminal of which is connected to the conductor 162. In order to permit the operator or operators at the switchboard 19 selectively to control the application of refund and collect potentials to the conductors of a paystation line involved in a toll connection, coin control connectors 22 are provided which may be seized from the switchboard 19 through the toll selectors 20 and may be directed to engage either the coin collect ter-

terminal or the coin refund terminal individual to any one of the adapter circuits.

The various adapter circuits include identical parts and are identically wired. Briefly considered, the illustrated circuit 25 includes a line relay R150, a slow-acting hold relay R200, a pulse cut-off relay R210, a slow-to-release transfer relay R220, a slow-to-operate coin relay R230, a slow-to-release digit relay R300, a pair of back-bridge relays R310 and R320, a switching relay R130, an incoming call relay R140, a pickup relay R350, five coin control relays R100, R110, R120, R330 and R340, and three additional control relays R240, R250 and R260 which perform general circuit control operations. The relays R100 and R340 are of the slow-to-release type and the relay R310 is of the well known electropolarized type. The adapter circuit also includes a digit counting switch 275 which is of the well known minor type and is provided for controlling the pulse cut-off relay R210. More specifically, this switch includes a single set of contacts 276 of eleven points, a wiper 277, a magnet 278 for driving the wiper 277 over the contacts of the contact set 276, a release magnet 279, and a set of off-normal springs 280. The supervisory signaling facilities provided in association with the adapter circuit 25 include a signal lamp 356 and a delayed alarm signaling circuit schematically illustrated at 357.

Outgoing local paystation calls

In considering the operation of the system and, more particularly, the operation of the adapter circuit 25, it may be assumed that a call intended for the substation B is originated at the paystation A. When the receiver 31 provided at this paystation is removed from the supporting hook of the hookswitch 34 to initiate the call, a circuit is completed for energizing the windings of the line relay R150 in series with the windings of the control relay R250. This circuit extends from ground by way of the contacts 321, the lower winding of R250, the contacts 134 and 103, the pulsing contacts of the calling device 32, the transmitter 30, the upper and middle contacts of the hookswitch 34, the middle winding of the induction coil 35, the contacts of the busy key 144, the contacts 101 and 131, the upper winding of R250, the contacts 312, and the series-connected windings of R150 to battery. The two windings of the control relay R250 are differentially related and, accordingly, this relay does not operate when energized over the circuit just traced.

The line relay R150, upon operating, closes its contacts 152 to complete an obvious circuit for energizing the slow-acting hold relay R200. At its contacts 153, the relay R150 opens a point in the operating circuit for the digit relay R300. At its contacts 151, the relay R150 completes a local loop circuit which extends between the adapter circuit 25 and the line circuit 12. This loop circuit may partially be traced as extending from the positive talking conductor 371 by way of the contacts 151, the lower windings of R310 and R320, and the contacts 133 and 301 to the negative talking conductor 370.

The hold relay R200, upon operating, closes its contacts 201 to prepare or complete a path for short-circuiting the impulsing springs 151 of the line relay R150. At its contacts 202 and 203, the relay R200 prepares a path for short-circuiting the windings of the control relay R240. At its contacts 203, the relay R200 also prepares certain

operating and locking circuits described with particularity hereinafter. At its contacts 204, the relay R200 prepares the above-mentioned operating circuit for the relay R300. At its contacts 205, the relay R200 opens a point in another circuit for energizing the digit relay R300 and a point in one of the available operating circuits for the coin control relay R100. At its contacts 206, the relay R200 opens a point in the incomplete operating circuit for the release magnet 279 of the digit counting switch 275.

When the above-traced bridging path between the conductors 370 and 371 is completed, the line relay of the line circuit 12 operates in the usual manner to mark the vertical and rotary positions of the line 10 in the banks of the finders having access thereto, to mark the circuit 25 against seizure, and to impress ground potential upon the start lead extending to the distributor 17. In response to the latter operation the control equipment of the distributor 17 functions to initiate the operation of a previously selected finder to search for the calling line 10. Assuming that the illustrated finder-selector link 14, 15 has been previously set up for use by the distributor 17, the finder 14 thereof first elevates its wipers to a position opposite the level of contacts in which the conductors extending to the circuit 25 are terminated and then rotates these wipers until the particular set of contacts individual to the line 10 is found. Incident to the seizure of the adapter circuit 25 by the finder 14, this finder operates to extend the loop circuit from the adapter circuit to the selector 15, and to cause the operation of the cut-off relay embodied in the line circuit 12. When this cut-off relay operates the distributor 17 functions to select another idle link and the windings of the line relay embodied in the line circuit 12 are disconnected from the talking conductors 370 and 371. Also incident to the switch-through operation of the finder 14, this finder and its associated selector 15 are marked as busy in the banks of the link selecting switch embodied in the distributor 17; the selector 15 is conditioned to respond to impulses transmitted thereto from the adapter circuit 25; and the control conductor 373 is connected to ground. It will be noted that this conductor is connected through the upper winding of the incoming call relay R140 and the contacts 142b of the busy key 142 to the private conductor 372. Accordingly when the control conductor 373 is connected to ground, the adapter circuit 25 and the line 10 are marked as busy in the bank contacts of the connectors having access thereto. It will also be noted that when ground potential is applied to the control conductor 373, the lower winding of the relay R140 is energized in series with the resistor 143. The current traversing this winding is insufficient to cause the operation of the relay R140.

When the loop circuit is initially completed between the adapter circuit 25 and the line circuit 12, the respective lower windings of the two back-bridge relays R310 and R320 are both energized therein. The relay R310 does not operate when its lower winding is alone energized. When ground potential is thereafter applied to the control conductor 373, the upper winding of this relay is energized in an obvious circuit. At this time, the two windings of the relay R310 produce opposing magnetic fields and, accordingly, this relay does not operate. The relay R320 operates when energized in the above-traced loop circuit and opens its contacts 321 to include the series-

connected windings of the control relay R240 in the calling loop circuit extending to the paystation A. When thus energized the relay R240 opens its contacts 241 further to interrupt an incomplete operating circuit for the magnet 278.

The starting of the dialing operation at the paystation A depends upon the character of the wiring used at this paystation, and also upon the character of the wiring used in the adapter circuit 25. With the illustrated paystation circuit arrangement the impulsing springs of the calling device 32 are short-circuited through the contacts 40 of the coin control mechanism and the strap Y until such time as a coin is deposited in the coin chute 37. It will be understood, however, that the strap Y may be omitted from the paystation wiring, whereby the impulsing springs of the calling device 32 may be used to direct automatic switching operations before coin deposits are made. On this point it will be understood that immediately a loop circuit is established between the adapter circuit 25 and the selector 15, the control equipment of the selector functions in a well known manner to impress dial tone signal voltage upon the talking conductors 370 and 371. If the W straps shown in Fig. 2 of the drawings are provided in the adapter circuit, this dial tone signal voltage is impressed by way of these straps, the condensers 227 and 228, and the contacts 131, 134, 101 and 103 across the talking conductors of the line 10 to energize the receiver 31 provided at the substation A and thus inform the calling party that the dialing operation may be started. On the other hand, if the W straps shown in Fig. 2 of the drawings are omitted from the wiring of the adapter circuit 25, the dial tone signal current path is held open at the contacts 231 and 233 until such time as the coin relay R230 operates. On this point it is noted further that if a coin deposit is to be a prerequisite to the starting of the dialing operation at the paystation A, the strap Y is provided in the adapter circuit so that the contacts 211 are shunted when the relay R200 operates. So long as these contacts are short-circuited, the line relay R150 is rendered ineffective to repeat impulses transmitted thereto from the paystation A to the selector 15. Hence, if the Y strap is provided and the W straps are omitted, a coin deposit at the paystation A is a prerequisite to effective operation of the calling device 32 regardless of the character of the wiring used at this paystation. On the other hand, if the W straps are provided and the Y strap is omitted, the dialing operation may be started at the paystation A without a coin deposit, and a signal to that effect is transmitted to this paystation immediately after the receiver 31 is removed from the supporting hook of the hook switch 34.

Assuming now that the illustrated paystation circuit arrangement is used, and that a coin is deposited in one of the coin chutes immediately after the call is initiated, the coin mechanism functions to close the contacts 39 and open the contacts 41, whereby the windings of the magnet 38 are connected between the positive side of the line 10 and ground and the path short-circuiting the pulsing springs of the calling device 32 is opened. When ground potential is applied to the positive conductor of the line 10, the current flow through the lower winding of the relay R250 is decreased, and that through the upper winding of this relay is increased. When the energization of these two windings is thus unbalanced, the differential relay R250 closes its contacts 251 to

complete a circuit for energizing the coin relay R230. This circuit extends from ground by way of the contacts 203, 303 and 251 and the winding of R230 to battery. In operating, the relay R230 locks to ground over a path including the contacts 234 and 203. At its contacts 236, the relay R230 prepares the above-mentioned alternative circuit for energizing the digit relay R300. At its contacts 235, the relay R230 opens a point in one of the operating circuits for the pulse cut-off relay R210. At its contacts 231 and 233, the relay R230 completes the above-described dial tone signaling circuit, assuming that the illustrated W straps are not provided. At its contacts 232, the relay R230 opens the above-described path short-circuiting the impulsing contacts 151 of the line relay R150, thereby to render the line relay effective to transmit impulses to the selector 15, assuming that the Y strap is provided in the wiring of the adapter circuit 25.

It will be understood that during the dialing of each digit of the directory number designating the desired substation B, the impulsing springs of the calling device 32 are opened and closed one or more times to transmit a corresponding number of impulses to the line relay R150. This relay, in following the impulses of the first digit, opens and closes its contacts 151 to repeat the impulses to the selector 15. Upon restoring at the beginning of the open-circuit period of the first impulse, the relay R150 closes its contacts 153 to complete the prepared operating circuit for the digit relay R300, this circuit extending from ground by way of the contacts 153 and 204, and the winding of R300 to battery. Upon operating, the relay R300 closes its contacts 302 to exclude the lower windings of the back-bridge relays R310 and R320 from the loop connecting the adapter circuit 25 with the selector 15, thus causing the release of the relay R320. At its contacts 305, the relay R300 prepares one of the operating circuits for the coin control relay R100. At its contacts 303, the relay R300 opens the operating circuit for the coin relay R230. At its contacts 304, the relay R300 completes the prepared operating circuit for the control relay R260, this circuit extending from ground by way of the contacts 203, 304 and 265 and the winding of R260 to battery. Due to the slow-to-release characteristics thereof, the hold relay R200 and the digit relay R300 remain operated during each series of impulses transmitted to the adapter circuit 25.

The relay R320, upon releasing, closes its contacts 321 to exclude the series-connected windings of the control relay R240 from the calling loop circuit and thus improve the response of the line relay R150 to the impulses transmitted thereto over the line 10. The control relay R260, upon operating, closes its contacts 261 and 262 to short-circuit the windings of the control relay R250 and thus further lower the resistance of the calling loop circuit, whereby the response of the line relay R150 to the impulses transmitted thereto is further enhanced. At its contacts 264 and 265, the relay R260 completes an obvious locking circuit for itself and then opens its operating circuit as traced above. At its contacts 263, the relay R260 completes an alternative path for short-circuiting the series-connected windings of the control relay R240, this path extending from ground by way of the contacts 203, 304, 263, 202 and 315 to the lower winding terminal of the relay R240. At its contacts 266, the relay R260 fur-

ther prepares the operating circuit for the magnet 278.

The control relay R250, upon restoring, opens its contacts 251 further to interrupt the above-traced operating circuit for the coin relay R230. The relay R240, upon restoring, closes its contacts 241 to complete the prepared operating circuit for the magnet 278, this circuit extending from ground by way of the contacts 316, 266 and 241, and the winding of the magnet 278 to battery. When thus energized the magnet 278 attracts its operating pawl, thereby to condition this pawl to actuate the wiper 277 one step when the magnet 278 is subsequently deenergized.

The selector 15 responds to the impulses of the first digit by elevating its wipers to a position opposite the level of bank contacts through which access is gained to the connectors having access to the called line 11. Incident to the vertical movement of the selector wipers the previously described dial tone signaling circuit is broken in the selector to terminate the transmission of signal current to the paystation A.

During the inter-digit pause between the first and second digits, the line relay R150 remains in its operated position for a time interval sufficient to cause the release of the digit relay R300. The latter relay, upon restoring, opens its contacts 304 to interrupt one of the above-traced paths short-circuiting the windings of the control relay R240. At its contacts 302, the relay R300 opens the path short-circuiting the respective lower windings of the two back-bridge relays R310 and R320, whereby these windings are again included in the loop circuit extending from the adapter circuit 25 to the selector 15. When its lower winding is again energized, the relay R320 opens its contacts 321 to again include the windings of the control relay R240 in the calling loop circuit. The relay R240 now reoperates and opens its contacts 241 to deenergize the magnet 278, thus permitting the wiper 277 to be stepped one step from the illustrated normal position thereof.

Also during the inter-digit pause between the first and second digits, the selector 15 automatically rotates its wipers, in a well known manner, to seize the first idle connector of the group selected during the vertical movement of its wipers. Assuming that the connector 16 is the first available idle connector, the selector 15, upon rotating its wipers to engage the contacts terminating the conductors of the trunk incoming to this connector, stops the rotary movement of its wipers and extends the loop circuit from the adapted circuit 25 to the connector 16. When the connector 16 is thus seized the control equipment thereof is conditioned to respond to the impulses of the second and succeeding digits of the directory number designating the desired substation B, and ground potential is returned over the test or release conductor of the trunk incoming to this connector to provide circuits for preventing the release of the finder-selector link 14, 15 and the line circuit 12.

The four relays R150, R300, R320 and R240 respond to the impulses of each succeeding digit of the directory number designating the desired substation B in the exact manner explained above. From this explanation it will be understood that the relays R300, R320 and R240 cooperate to transmit a current pulse to the operating magnet 278 of the digit counting switch 275 in response to each digit dialed at the calling paystation A. Thus, the wiper 277 is stepped one step for each dialed digit. Incident to the

operation of this wiper to its first off-normal position, the off-normal springs 280 are closed to prepare a circuit for energizing the release magnet 279. The purpose of providing the digit counting switch and the pulse cut-off relay R210 controlled thereby, is to prevent, under certain circumstances, the line relay R150 from repeating the impulses of more than a predetermined number of digits to the automatic switching equipment seized through the adapter circuit 25. In this regard it will be noted that with the conductor 282 connected to the third contact of the contact set 276 in the manner illustrated, a circuit is completed for energizing the pulse cut-off relay R210 after two digits have been dialed into the adapter circuit 25. This circuit extends from ground by way of the contacts 203, 303 and 345, the wiper 277, the conductor 282, the contacts 215 and the upper winding of R210 to battery. It will be noted that this circuit is completed at the wiper 277 and the contact terminating the conductor 282 shortly following the end of the second digit dialed into the adapter circuit 25. When energized thereover, the relay R210 first locks up in a circuit which includes its preliminary make contacts 212 and the contacts 203. After this circuit is completed, the relay R210 opens its contacts 215 to interrupt its operating circuit as traced above. At its contacts 214, the relay R210 opens the prepared operating circuit for the switching relay R130. At its contacts 213, the relay R210 prepares the operating circuit for the transfer relay R220. At its contacts 211, the relay R210 prepares or completes the above-traced path for short-circuiting the impulsing contacts 151 of the line relay R150. In this regard it will be noted that if the coin relay R230 is operated, the short-circuiting path just mentioned is held open at the contacts 232 and, hence, the operation of the pulse cut-off relay R210 is ineffective to short-circuit the pulsing contacts 151 of the line relay R150. On the other hand, if no coin has been deposited at the paystation A to cause the operation of the coin relay R230, and the Y strap is omitted from the wiring of the adapter circuit 25, the pulse cut-off relay R210, in operating to close its contacts 211, short-circuits the pulsing contacts 151, thereby to render the line relay R150 ineffective to repeat impulses to the switch train succeeding the adapter circuit 25.

More specifically stated, the purpose of the arrangement just described, i. e., that comprising the digit counting switch 275 and the pulse cut-off relay R210, is to permit certain free service numbers to be dialed into the adapter circuit 25 without a coin deposit at the paystation. Thus in the arrangement illustrated, wherein the conductor 282 is connected to the third contact of the contact set 276, a single digit may be dialed into the adapter circuit 25 without a coin deposit. This digit may designate the group of trunks extending to the toll operator switchboard 19, for example. Alternatively, the digit may designate additional groups of trunks, such, for example, as information trunks, over which free service connections may be set up to other operator positions of the system.

In the specific case under consideration, wherein it is assumed that the coin relay R230 is operated, the operation of the transfer relay R220 at the end of the second digit is not effective to prevent the line relay R150 from repeating impulses to the switch train succeeding the adapter circuit 25. Accordingly, the impulses of the second,

third and, if required, additional digits, are repeated to the connector 16 by the line relay R150. This connector responds to the impulses of the second digit by selecting the group of ten lines in which the called line 11 is included. It responds to the impulses of the third digit by selecting the called line 11 from the selected group of ten lines. If this connector is arranged for selective code or selective harmonic ringing, an additional digit may be required in order to select the particular code or ringing frequency which designates the particular substation B desired by the calling party. At the end of the dialing operation the control equipment of the connector 16 functions in a conventional manner to test the idle or busy condition of the selected line; to return the usual busy signal over the calling end of the connection if the line is busy; and to transmit ringing current of the proper code or frequency to signal the substation B over the line 11 in the event this line is idle at the time it is selected.

When the call is answered at the substation B, the control equipment of the connector 16 operates to reverse the direction of current flow over the loop circuit including the respective lower windings of the two back-bridge relays R310 and R320. In response to this operation the relay R310 closes its contacts 313 to fully energize its upper winding. The relay R310 then closes its contacts 314 and opens its contacts 315, thereby to exclude the lower winding of the relay R240 from the loop circuit extending to the calling paystation A. At its contacts 311 and 312, the relay R310 excludes the lower winding of the line relay R150 from the loop circuit extending to the calling paystation. Thus the current flow over this loop circuit is increased to enhance the operation of the transmitter 30. At its contacts 316, the relay R310 opens a point in the prepared operating circuit for the coin control relay R100 and a point in the above-traced operating circuit for the magnet 278. At its contacts 317, the relay R310 completes the above-mentioned operating circuit for the transfer relay R220, this circuit extending from ground by way of the contacts 317 and 213, and the winding of R220 to battery.

The relay R220, upon operating, closes its contacts 221 to prepare a locking circuit for itself, and closes its contacts 225 to complete obvious multiple locking circuits for the relays R210, R230 and R260. At its contacts 222, the relay R220 opens a point in an incomplete holding circuit for the coin control relay R100. At its contacts 224, the relay R220 opens a point in one of the available paths for impressing negative coin refund potential upon the two sides of the line 10. At its contacts 223, the relay R220 prepares a path for impressing positive coin collect potential upon the two conductors of the line 10. At its contacts 226, the relay R220 further prepares the operating circuit for the coin control relay R100.

After the call is answered at the substation B to cause the operation of the back-bridge relay R310 in the manner explained above, this relay is rendered non-responsive to further reversals in the direction of current flow over the loop circuit extending between the adapter circuit 25 and the connector 16. Accordingly, the release of the connection at the called substation B is without effect. When, however, the party using the paystation A hangs up to interrupt the calling loop circuit, the relay R150 restores to de-

energize the hold relay R200, energize the digit relay R300, and open the loop circuit extending from the adapter circuit 25 to the connector 16. The reoperation of the digit relay R300 is without effect. Coincident with the release of the line relay R150, the control relay R240 closes its contacts 241 to reprepare the operating circuit for the magnet 278. When the loop circuit extending from the connector 16 to the adapter circuit 25 is opened, this connector, the finder-selector link 14, 15, and the line circuits 12 and 13 are all released in the usual manner. Incident to the release of the connector 16, the control conductor 373 is disconnected from ground to deenergize the upper winding of the back-bridge relay R310, to remove ground potential from the private conductor 372 and to deenergize the lower winding of the relay R140. The lower winding of the relay R310 and the lower winding of the relay R320 are deenergized when the loop circuit connecting the adapter circuit 25 and the connector 16 is initially opened. The relay R320, in restoring, closes its contacts 322 further to prepare the above-mentioned paths for impressing coin collect and refund potentials upon the two sides of the line 10. The relay R310, in restoring, opens its contacts 317 to interrupt the operating circuit for the transfer relay R220, and closes its contacts 316 to complete the prepared operating circuit for the coin control relay R100, this circuit extending from ground by way of the contacts 316, 326 and 139, and the winding of R100 to battery. At its contacts 316, the relay R310 also re completes the above-traced circuit for energizing the magnet 278.

When the relay R200 restores shortly following the release of the line relay R150, it opens its contacts 203 to interrupt the initially completed locking circuits for the relays R210, R230 and R260. At its contacts 204 and 205, the relay R200 opens the initially completed operating circuit, and then completes a locking circuit for the digit relay R300, the latter circuit extending from ground by way of the contacts 153, 205 and 236 and the winding of R300 to battery. At its contacts 206, the relay R200 completes an obvious circuit for energizing the release magnet 278, whereby the wiper 277 is restored to its normal position in the usual manner. Incident to the return movement of this wiper the off-normal springs 280 are disengaged to deenergize the release magnet 278.

As indicated above, the coin control relay R100 is energized in response to the release of the back-bridge relay R310. Upon operating, the relay R100 closes its contacts 105 to impress ground potential upon the control conductor 373, whereby the lower winding of the incoming call relay R140 is energized, the upper winding of the back-bridge relay R310 is energized through the resistor 318, and the private conductor 372 is marked with guarding ground potential through the upper winding of the incoming call relay R140. It will be understood that neither of the two relays R140 and R310 operate when their respective lower and upper windings are energized over the indicated circuits. At its contacts 106, the relay R100 completes obvious multiple locking circuits for the three relays R210, R230 and R260. At its contacts 102 and 104, the relay R100 completes the above-mentioned path for impressing positive coin collect potential upon the two sides of the line 10. This path extends from the positive terminal of the coin collect source 162a by way of the resistor 162b,

the conductor 162, the contacts 111 and 223, the winding of R330 and the contacts 322, 102 and 104 to the conductors of the line 10. This potential, which is of a value of approximately 110 volts, as applied to the positive side of the line 10 energizes the windings of the polarized magnet 38 in a direction such that the associated coin mechanism is operated to discharge the deposited coin into the collection box of the paystation. It will be noted that the relay R330 is energized in series with the windings of the coin control magnet 38. Accordingly this relay operates and closes its contacts 331 to complete an obvious circuit for energizing the coin control relay R340. The latter relay, upon operating, closes its contacts 342 to complete a holding circuit through the contacts 221 for the transfer relay R220. In this regard it is pointed out that the three relays R100, R330 and R340, upon sequentially operating in response to the release of the back-bridge relay R310, close the above-described circuit through the contacts 342 and 221 before the slow-to-release relay R220 can restore in response to the release of the relay R320. Accordingly the relay R220 is maintained in its operated position so long as the coin collect potential is applied to the two sides of the line 10.

Incident to the operation of the magnet 38 to collect the deposited coin, the coin mechanism of the paystation operates to open the contact springs 39 and to close the contact springs 40, whereby the series-connected windings of the magnet 38 and the relay R330 are deenergized. It will be understood, therefore, that if the coin collecting operation is effected with sufficient speed, the coin control relay R340 will not be operated. Accordingly, no holding circuit will be provided for the transfer relay R220 and this relay will restore to initiate the release of the adapter circuit 25 immediately after the coin collecting operation is completed. On the other hand, if the operation of the coin mechanism is somewhat sluggish, such that the collecting operation is delayed, the relay R330 operates to provide a holding circuit for the transfer relay R220 in the manner explained above. In operating, this relay also closes its contacts 343 to condition the delayed alarm circuit 357 for operation. At its contacts 341, the relay R340 prepares a path for impressing a signal voltage upon the negative talking conductor 370. At its contacts 345, the relay R340 opens a point in certain operating and locking circuits described below. At its contacts 344, the relay R340 prepares a circuit including the pickup lead 360 for energizing the pickup relay R350. This pickup lead is arranged to be periodically connected to ground through the contacts of a constantly operating timing device 360a provided in the common equipment 23. Accordingly, if the coin collecting operation is not carried out within a reasonable time interval to cause the release of the relays R330 and R340, the relay R350 is energized in a circuit which includes the contacts 354 and 344, the pickup lead 360 and the contacts of the timing device 360a. In operating, this relay first locks to ground over a path including the contacts 353, 139, 226 and 316, and then opens its contacts 354 to interrupt its operating circuit as traced above. At its contacts 352, the relay R350 completes an obvious circuit for energizing the alarm signal lamp 356. At its contacts 351, the relay R350 completes a circuit for transmitting ground pulses from the pulsing device 361a through the series-connected windings of the two

relay R320 and R340. Each time the relay R320 is energized over the lead 361 by the pulsing device 361a, it opens its contacts 322 to deenergize the coin control relay R330 and the windings of the magnet 38. Each time the relay R320 is deenergized at the end of a ground pulse applied to the lead 361, it restores and closes its contacts 322 to again energize the series-connected windings of the relay R330 and the magnet 38. The intermittent operation and release of the two relays R320 and R330 continues until the coin collecting operation is completed at the paystation A, at which time the contact springs 39 are disengaged to interrupt the circuit for energizing the series-connected windings of the magnet 38 and the coin control relay R330. The relay R330 now restores and opens its contacts 331 to deenergize the upper winding of the coin control relay R340. When the pulsing lead 361 is thereafter disconnected from ground by the pulsing device 361a, the lower winding of the relay R340 and the upper winding of the relay R320 are also deenergized. The relay R340 now restores and opens its contacts 342 to deenergize the transfer relay R220. At its contacts 343, the relay R340 opens the prepared delayed alarm circuit 357. At its contacts 344, the relay R340 opens another point in the operating circuit for the pickup relay R350. Before the next ground pulse is applied to the pulsing lead 361, the transfer relay R220 restores and opens its contacts 226 to deenergize the coin control relay R100 and the pickup relay R350. At its contacts 221, the relay R220 opens another point in its locking circuit as traced above. At its contacts 225, the relay R220 opens the multiple locking circuits for the relays R210, R230 and R260. At its contacts 224, the relay R220 completes a path through the contacts 121, 322, 102 and 104, and the winding of the coin control relay R330 for impressing negative coin refund potential upon the two sides of the line 10. This operation is without effect. At its contacts 223, the relay R220 opens a point in the above-traced path for impressing positive coin collect potential upon the two sides of the line 10. The relay R350, upon restoring, opens its contacts 351 to prevent further energization of the two relays R320 and R340. At its contacts 352, the relay R350 deenergizes the signal lamp 356. At its contacts 353, the relay R350 opens another point in its locking circuit as traced above. At its contacts 354, the relay R350 reprepares its operating circuit.

The relay R100, upon restoring, opens its contacts 105 to disconnect the private conductor 372 from ground and thus render the line 10 accessible to the various connectors having access thereto. At these contacts the relay R100 also deenergizes the lower winding of the relay R140 and the upper winding of the back-bridge relay R310. At its contacts 106, the relay R100 deenergizes the three relays R210, R230 and R260, causing all of these relays to restore. In releasing, the relay R260 opens its contacts 266 to deenergize the operating magnet 278 of the digit counting switch 275, whereby the wiper 277 is advanced one step from its illustrated normal position. In response to this operation the off-normal springs 280 are closed to again energize the release magnet 279. This magnet, in operating, attracts its associated holding pawl permitting the wiper 277 to again be restored to normal, at which time the off-normal springs 280 are opened to deenergize the release magnet. The coin relay R230, upon restoring, opens its

contacts 236 to deenergize the digit relay R300, and closes its contacts 237 to re-energize the coin control relay R100 in a circuit which includes the contacts 153, 205 and 305. The relay R100, upon reoperating, recloses its contacts 106 to again energize the control relay R260 in a circuit which also includes the contacts 304 and 265. The relay R260 now reoperates, and recloses the operating circuit for the magnet 278. Shortly following these operations the relay R300 restores and opens its contacts 305 to cause the sequential release of the relay R100 and the control relay R260. The latter relay, upon restoring, opens its contacts 266 to deenergize the magnet 278, whereby the wiper 277 is again advanced one step from its normal position. Incident to this operation, the off-normal springs 280 are reclosed to again energize the release magnet 279, whereby the wiper 277 is returned to its normal position. Incident to the release of this wiper, the off-normal springs 280 are opened to again deenergize the release magnet 279. Following the operations just described, all of the equipment included in the adapter circuit 25 is restored to normal and the line 10 is marked as idle in the bank contacts of the connectors to which it is accessible.

In the event the called line 11 is busy at the time it is selected by the connector 16, or the call as extended to the substation B is not answered, the control equipment of the connector does not function to reverse the direction of current flow over the loop circuit extending from this switch to the adapter circuit 25. Accordingly, the back-bridge relay R310 remains in its restored position. With this relay restored, no circuit is provided for energizing the transfer relay R220. Accordingly, when the calling party disconnects to cause the release of the line relay R150, the operation of the digit relay R300 and the release of the hold relay R200 in the order named, the locking circuits for the relays R210, R230 and R260 are opened at the contacts 203 of the hold relay R200. Upon restoring, the relay R200 closes its contacts 206 to cause the release of the digit counting switch 275 in the exact manner explained above. The release of the pulse cut-off relay R210 is without effect. The relay R260, upon restoring, opens its contacts 266 to interrupt the operating circuit for the magnet 278. The relay R230, upon restoring, opens its contacts 236 to deenergize the digit relay R300, and closes its contacts 237 to energize the coin control relay R100 in a circuit which includes the contacts 153, 205, 237 and 305. In operating, the relay R100 closes its contacts 106 to again energize the control relay R260 over a circuit which includes the contacts 304 and 265. In reoperating, the relay R260 again closes its contacts 266 to energize the magnet 278. In operating, the relay R260 also locks to ground over a path including its contacts 264 and the contacts 106. The remaining circuit switching operations performed by this relay are of no effect.

In operating, the coin control relay R100 also completes a path for impressing negative coin refund potential upon the two sides of the line 10, it being noted in this regard that the transfer relay R220 occupies its restored position. This path extends from the negative terminal of the source 161a by way of the resistor 161b, the lead 161, the contacts 121 and 224, the winding of R330, the contacts 322 and the contacts 102 and 104 to the two sides of the line 10. When this path is completed the magnet 38 operates

to actuate the coin control mechanism in a manner such that the deposited coin is dumped into the coin refund chute of the paystation equipment. Incident to the operation of this mechanism the contacts 39 are opened to deenergize the magnet 38 and the coin control relay R330.

During the time interval required for the coin refunding operation to be effected, the relay R330 is energized and closes its contacts 331 to energize the coin control relay R340. In the present case the relay R340, upon closing its contacts 342, completes a locking circuit for the coin control relay R100 rather than the previously traced locking circuit for the transfer relay R220. More specifically, the completed locking circuit extends from ground by way of the contacts 342 and 222, and the winding of R100 to battery. It is noted that this locking circuit is completed at the contacts 342 before the slow-to-release coin control relay R100 can restore in response to the release of the slow-to-release digit relay R300, which latter operation occurs shortly following the restoration of the coin relay R230. From this point on the manner in which the coin control relays R330, R340 and R350 and the back-bridge relay R320 operate in the event the coin refunding operation is not promptly completed, is exactly the same as set forth above with reference to the manner in which a coin collecting operation is effected. From this explanation it will be recalled that the coin control relay R340 is only released when the coin refunding operation is fully completed. Upon restoring, the relay R340 opens its contacts 342 to deenergize the relays R100 and R350. The relay R100, upon restoring, opens its contacts 106 to deenergize the relay R260. The latter relay, upon restoring, opens its contacts 266 to deenergize the magnet 278, whereby the wiper 277 is advanced one step from its illustrated normal position. Incident to this off-normal movement of the wiper 277, the off-normal springs 280 are closed to energize the release magnet 279. When this magnet is energized the wiper 277 is returned to normal and the off-normal springs 280 are opened to deenergize the magnet 279. Thus the adapter circuit 25 is fully restored to normal.

Free service calls

As indicated previously, if the paystation A is to be used in making free service calls without coin deposits, the Y strap normally shunting the pulsing springs of the calling device 32 is omitted from the wiring of the paystation equipment, the Y strap of the adapter circuit 25 is omitted, and the W straps are provided in this circuit. In such case, the digit counting switch 275 cooperating with the pulse cut-off relay R210 is utilized to prevent calls other than free service calls from being successfully completed without coin deposits. The only limitation on the use of the digit counting switch 275 for this purpose, is that the directory numbers assigned to the subscriber lines directly accessible to the paystation A shall have two more digits than the directory numbers assigned to the free service trunks. For example, if all subscriber lines terminating in the exchange are assigned four digit directory numbers, the free service information and toll trunks, for example, may be assigned either one digit or two digit directory numbers. If the free service trunks are assigned one digit directory numbers the lead 282 is connected to the third contact of the contact set 276. Accordingly, when the single digit

designating a group of free service trunks is dialed into the adapter circuit 25, the wiper 277 is only operated to engage its associated second contact during the dialing operation. As a result the pulse cut-off relay R210 is not operated during the operation of the adapter circuit 25 to handle the call and, hence, the call is not blocked in the manner explained below.

In making a free service call of the character under consideration it may be assumed that a toll call is originated at the paystation A and, hence, that the call must be routed to the toll operator switchboard 19. It may be assumed further that the finder-selector link 14, 15 and the reverse battery repeater 18 are utilized in extending the connection to this operator switchboard. Incident to the operation of the selector 15 to seize the repeater 18 at the end of the single digit designating the group of trunks extending to the switchboard 19, the loop circuit is extended from the adapter circuit 25 to this repeater and the control equipment of the repeater functions to transmit a call signal to the operator attending the switchboard 19. When the call is answered at this switchboard the control equipment of the repeater 18 functions to reverse the direction of current flow through the series-connected lower windings of the two relays R310 and R320. In response to this current reversal, the relay R310 closes its contacts 317 to complete the prepared operating circuit for the switching relay R130, this circuit extending from ground by way of the contacts 317 and 214, and the upper winding of R130 to battery. The other circuit switching operations performed by the relay R310 are exactly the same as described above.

In operating the relay R130 locks to ground over a path which includes the contacts 137 and 317. At its contacts 138, the relay R130 completes an alternative circuit for energizing the pulse cut-off relay R210, this circuit extending from ground by way of the contacts 203, 303, 345, 138 and 235, and the upper winding of R210 to battery. It will be noted that if a coin has been deposited at the paystation A such that the coin relay R230 is operated, the circuit just traced is held open at the contacts 235. At its contacts 139, the relay R130, upon operating, opens a point in one of the previously traced operating circuits for the coin control relay R100. At its contacts 131 and 134, the relay R130 opens two points in the calling loop circuit extending to the paystation A, thereby to deenergize the line relay R150 and the control relay R240. At its contacts 131 and 135, the relay R130 extends the calling loop circuit to the repeater 18 free of any attachments.

Assuming first that no coin is deposited at the paystation A prior to the origination of the free service call, the pulse cut-off relay R210 is energized and operates incident to the operation of the switching relay R130, in the manner explained above. Upon operating, the relay R210 locks to ground through the contacts 212 and 203, and closes its contacts 213 to complete the previously traced operating circuit for the transfer relay R220. In operating, the relay R220 closes its contacts 225 to complete multiple locking circuits for the relays R210 and R260. At its contacts 223, the relay R220 prepares the previously traced path for impressing positive coin collect potential upon the two sides of the line 10. At its contacts 221, the relay R220 prepares the previously traced locking circuit for itself. Coincident with the operation of the three relays

R130, R210 and R220, the line relay R150 restores and opens its contacts 152 to deenergize the hold relay R200. At its contacts 153, the relay R150 completes the operating circuit for the digit relay R300. When the hold relay R200 restores shortly thereafter, the coin control relay R100 is energized in the above-traced circuit including the contacts 153, 205, 237 and 305. In operating, the relay R100 completes the previously traced path for impressing coin collect potential upon the two sides of the line 10. In this case, however, since no coin has been deposited at the paystation A, the windings of the magnet 38 and the coin control relay R330 are not energized. Shortly following the operation of the relay R100 the digit relay R300 releases and opens its contacts 305 to deenergize the relay R100. The latter relay, upon restoring, recloses the loop circuit extending to the repeater 18 and disconnects the conductors of the line 10 from the coin collect lead 162. It will be noted that under the conditions assumed above, the relays R210 and R220 are operated in the adapter circuit 25 after the call is answered at the toll operator switchboard 19. With the relays R130, R210 and R220 operated, the adapter circuit 25 is conditioned to impress coin collect potential upon the conductors of the line 10 incident to the release of the connection.

In the event a coin is deposited at the paystation A prior to the extension of the connection to the toll operator switchboard 19 in the manner explained above, the coin relay R230 is operated in the adapter circuit 25. In such case the switching relay R130, upon operating in response to the operation of the backbridge relay R310, only prepares the operating circuit for the pulse cut-off relay R210, this circuit being held open at the contacts 235. When the line relay R150 and the hold relay R200 sequentially restore in response to operation of the switching relay R130, the operating circuit for the digit relay R300 is completed at the contacts 153 incident to the release of the line relay, and the locking circuits for the relays R230 and R260 are opened at the contacts 203 incident to the release of the hold relay R200. Upon restoring, the relay R200 also opens its contacts 204 to deenergize the digit relay R300, and closes its contacts 205 to prepare the above-traced operating circuit for the coin control relay R100. At its contacts 203, the relay R200 also opens the previously traced alternative operating circuit for the pulse cut-off relay R210. The circuit for energizing the digit relay R300 is opened at the contacts 236 and that for energizing the relay R100 is completed at the contacts 237 incident to the release of the coin relay R230. In operating, the relay R100 closes its contacts 106 to complete the operating circuit for the control relay R260, which latter relay, upon operating, locks to ground through its contacts 264 and closes its contacts 266 to reprepare the operating circuit for the magnet 278. At its contacts 105, the relay R100 completes a multiple holding circuit for the back-bridge relay R310 and a multiple path for impressing ground potential upon the private conductor 372. At its contacts 101 and 103, the relay R100 interrupts the loop circuit extending from the paystation A to the repeater 18. At its contacts 102 and 104, the relay R100 completes the above-described path for impressing negative refund potential upon the two sides of the line 10, whereby the windings of the magnet 38 and the coin control re-

lay R330 are energized. When thus energized the magnet 38 causes the coin control mechanism to refund the deposited coin in the manner previously explained. The relay R330, upon operating, closes its contacts 331 to energize the relay R340. The latter relay, in operating, closes its contacts 342 to complete the previously traced locking circuit for the coin control relay R100. At its contacts 345, the relay R340 opens the previously traced alternative operating circuit for the pulse cut-off relay R210. Shortly following the operation of the coin control relay R340, the digit relay R300 restores and closes its contacts 303 to reprepare the above-traced alternative operating circuit for the pulse cut-off relay R210. From this point on the manner in which the relays R320, R330, R340 and R350 operate in the event the refunding of the deposited coin is not immediately completed, is exactly the same as described above. From this explanation it will be recalled that after the coin refunding operation is completed the relays R330 and R340 are sequentially deenergized. In releasing, the relay R340 opens its contacts 342 to deenergize the coin control relay R100 and the relay R350, if operated, and closes its contacts 345 to complete the above-traced alternative operating circuit for the pulse cut-off relay R210. The latter relay, in operating, closes a circuit through the contacts 213 and 317 for energizing the transfer relay R220. Upon operating, the relay R220 closes its contacts 225 to complete multiple locking circuits for the two relays R210 and R260. Shortly following the operation of the two relays R210 and R220 the coin control relay R100 restores. In releasing, this relay opens its contacts 106 to interrupt the multiple locking circuits for the two relays R210 and R260. At its contacts 105, the relay R100 opens the multiple locking circuit for the back-bridge relay R310 and one of the paths over which ground potential is impressed upon the private conductor 372. At its contacts 102 and 104, the relay R100 disconnects the two conductors of the line 10 from the negative potential refund lead 161. At its contacts 101 and 103, the relay R100 recompletes the loop circuit extending between the paystation A and the repeater 18. It will be noted that, following the release of the coin control relay R100 to perform the functions just described, only the relays R130, R210, R220, R260 and R310 are operated in the adapter circuit 25. With the two relays R210 and R220 operated, the adapter circuit is conditioned to impress positive coin collect potential upon the two conductors of the line 10 incident to the release of the connection.

After the connection has been answered at the toll operator switchboard 19, it may be extended to the desired substation at a distant exchange in a manner well understood in the art, and the operator handling the call may instruct the calling party either before the desired connection is completed or at some time prior to the release thereof, as to the amount of the charge for the call. In this regard it will be understood that when coin deposits totaling the amount of the charge of the call are deposited at the paystation A, the usual audible signals are transmitted over the established talking circuit to the cord circuit of the operator handling the call at the switchboard 19, whereby the operator is informed of the value of the deposited coins.

In the event the cord circuit in use at the toll operator switchboard 19 and the repeaters as-

sociated with the trunks extending to this switchboard are equipped with the usual coin collecting and refunding facilities found in large toll offices, or the call is extended over a CLR trunk which is provided with facilities for repeating coin control potentials the operator handling the call may, after the call is answered, collect or refund the deposited coins at will as the circumstances may demand.

In small offices, however, provisions are seldom made in the repeaters associated with the trunks extending to the available operator switchboard facilities and in the cord circuits provided at these positions, for directly controlling the paystation coin mechanism at any time while a connection thereto is set up. Accordingly, provisions including the coin control connector 22 and a number of other similar connectors are provided in the illustrated system for indirectly controlling the coin mechanisms provided at the paystation. In the case under consideration if the operator handling the call at the toll operator switchboard 19 desires to refund the deposited coins, she may do so by seizing the toll selector 20 and dialing the digits of the directory number designating the coin refund conductor 164. When the digits of this number are dialed a control connection may be routed through the toll selector 20 and the coin connector 22, for example, to the conductor 164. If this conductor tests idle in the connector 22, the control equipment of the connector functions to impress ground potential thereon, thereby to energize the coin refund relay R110. In operating, the relay R110 short-circuits its lower winding over a path including the contacts 113 and 345. At its contacts 113, the relay R110 also completes an alternative circuit for energizing the upper winding of the pulse cut-off relay R210, this circuit extending from ground by way of the contacts 225 and 303, the lower winding of R110, the contacts 113, 138 and 235 and the upper winding of R210 to battery. At its contacts 111, the relay R110 opens the previously traced path for impressing positive coin collect potential upon the conductors of the line 10. At its contacts 112, the relay R110 prepares a path for impressing negative coin refund potential upon the conductors of the line 10. At its contacts 115, the relay R110 prepares a circuit for transmitting a refund tone signal current over the connection to the cord circuit of the operator handling the call at the switchboard 19.

At its contacts 114, the relay R110 completes an obvious circuit for energizing the coin control relay R100. The latter relay, upon operating, closes its contacts 106 to complete multiple locking circuits for the two relays R210 and R260, and closes its contacts 105 to complete a multiple locking circuit for the back-bridge relay R310 and a multiple path for impressing guarding ground potential upon the private conductor 372. At its contacts 101 and 103, the relay R100 opens the loop circuit extending between the paystation A and the repeater 18. At its contacts 102 and 104, the relay R100 connects the conductors of the line 10 to the negative potential refund lead 161 over a path which now includes the contacts 322, the winding of R330, the contacts 223 and 112. When this path is completed the magnet 38 actuates the associated coin mechanism to refund the coin or coins deposited at the paystation A in the manner previously explained. Also when this path is completed the relays R330 and R340 are caused sequentially to operate in

the manner pointed out above. At its contacts 341, the relay R340 completes the above-mentioned signaling circuit. This circuit may partially be traced as extending from the tone transformer 166a by way of the conductor 166, the contacts 115, the condenser 355 and the contacts 341 to the negative talking conductor 370. In this regard it will be understood that the two tone transformers 165a and 166a are connected to sources of alternating current having different frequencies. Accordingly, when the above-traced signaling circuit is completed, a distinctive tone is produced by the receiver of the operator cord circuit in use at the switchboard 19 to inform the operator handling the call that a coin refunding operation is in progress. At its contacts 342, the relay R340 completes the previously traced locking circuit for the transfer relay R220. At its contacts 345, the relay R340 opens the above-traced path short-circuiting the lower winding of the coin refund relay R110, permitting this winding to be energized in series with the upper winding of the pulse cut-off relay R210 in a circuit which includes the contacts 235, 138, 113, 303 and 225. Following the operation of the two relays R330 and R340, the coin refunding operation proceeds under the control of these two relays, the back-bridge relay R320, and the relay R350 in the exact manner previously explained. In this regard it will be understood that when the coin refunding operation is completed, the relays R330 and R340 are sequentially deenergized and restore. In releasing, the relay R340 opens its contacts 342 to interrupt the multiple holding circuit for the transfer relay R220, and recloses its contacts 345 to again short-circuit the lower winding of the coin refund relay R110. In the event the control connection as routed through the toll selector 20 and the coin control connector 22 is released at the toll operator switchboard 19 prior to the completion of the coin refunding operation, such that the coin refund lead 164 is disconnected from ground, the relay R110 is deenergized and restores incident to the release of the relay R340. In restoring, this relay opens its contacts 114 to deenergize the coin control relay R100. The latter relay, upon restoring, opens the path for impressing negative coin control potential upon the two conductors of the line 10, recloses the loop circuit to the repeater 18, and opens the multiple locking circuits for the relays R210, R260 and R310. Incident to the release of the two relays R110 and R340, the above-traced circuit for transmitting a refund tone signal to the operator handling the call at the switchboard 19 is interrupted at the contacts 115 and 341.

From the preceding explanation it will be understood that immediately the coin control relay R340 operates to transmit the coin refund signal to the operator handling the call at the switchboard 19, indicating that the control connection through the selector 20 and the connector 22 may be released, a locking circuit is established for the coin refund relay R110. The provision of this circuit is of importance since it prevents the coin refunding operation from being interrupted before it is completed due to the premature release of the control connection as set up through the toll selector 20 and the coin control connector 22.

In the event the operator handling the call at the switchboard 19 desires to effect a coin collecting operation while the call is in progress, she may do so by extending a connection through the

toll selector 20 and the coin control connector 22 to the coin collect conductor 163. In this regard it will be understood that separate directory numbers are assigned to the conductors 163 and 164 so that an operator at the switchboard 19 may seize either of these two leads by dialing the appropriate directory number. Assuming that the toll selector 20 and the connector 22 are used to select the conductor 163, the control equipment of the connector 22, in operating to connect this conductor to ground, completes an obvious circuit for energizing the upper winding of the coin collect relay R120. In operating, this relay short-circuits its lower winding through the contacts 123 and 345, closes its contacts 125 to prepare a path for transmitting a coin collect signal to the operator handling the call, and closes its contacts 124 to complete an obvious operating circuit for the coin control relay R100. The relay R100, upon operating, performs the functions described above, but in this case completes a path through the contacts 102, 104, 111, 322 and 223, and the winding of the coin control relay R330 for impressing positive coin collect potential upon the two conductors of the line 10, whereby a coin collecting operation is initiated. The relay R340, upon operating in response to the operation of the relay R330, opens its contacts 345 to interrupt the path short-circuiting the lower winding of the relay R120, permitting this winding to be energized in series with the upper winding of the pulse cut-off relay R210. At its contacts 341, the relay R340 completes a circuit through the condenser 355 and the contacts 125 for transmitting collect tone signal current from the transformer 165 through the receiver of the operator cord circuit in use by the operator handling the call at the switchboard 19. From this point on the manner in which the coin collecting operation is completed and the relays R330, R340, R120 and R100 are deenergized, is exactly the same as explained above.

When the connection as extended to the toll operator switchboard 19 is released at the paystation A, disconnect supervision is given to the operator handling the call at this switchboard, but no circuit switching operations are performed in the adapter circuit 25. Since the conductors of the line 10 are switched through to the reverse battery repeater 18, the operator handling the call may re-ring the paystation without disturbing the setting of the relays in the adapter circuit 25, providing re-ring facilities are incorporated in her cord circuit and in the reverse battery repeater 18.

When the operator handling the call at the switchboard 19 takes down the connection, the reverse battery repeater 18 is released. During the release of this repeater, the link 14, 15 is released and the control conductor 373 is disconnected from ground to cause the sequential release of the relays R310 and R130. The relay R130, upon restoring, closes its contacts 139 to complete one of the previously traced operating circuits for the coin control relay R100. Assuming that uncollected coins remain in the coin chutes of the paystation equipment, a coin collecting operation is started in response to the operation of the coin control relay R100, which operation proceeds in the exact manner explained above. It is noted in this regard, that the two relays R330 and R340 are operated at the beginning of the coin collecting operation and remain operated until it is completed. When these two relays restore, the other operated relays of the

adapter circuit 25 are released in the exact manner explained above with reference to the release of the adapter circuit upon the termination of a local call. On the other hand, if no coins are to be collected at the paystation A when the connection is released, no circuit is available for energizing the coin control relay R330 when the coin control relay operates. Accordingly, no locking circuit is provided for the transfer relay R220 and this relay restores shortly following the release of the switching relay R130. In releasing, the relay R220 opens its contacts 226 to deenergize the coin control relay R100. The latter relay, upon restoring, initiates the release of the adapter circuit 25 in a manner clearly apparent from the preceding explanation.

Incoming local calls

Incoming local calls to the paystation A are handled by the regular connectors of the automatic switching equipment. Thus a call originating at the substation B, for example, and intended for the substation A, may be routed to this station through the finder-selector 14, 15 and the connector 16 under the directive control of the calling party at the substation B. At the end of the dialing operation and when the wipers of the connector 16 are positioned on the contacts individual to the line 10, the usual busy test is made by the control equipment of the connector for the purpose of determining the idle or busy condition of the selected line. In this regard it will be understood from the preceding explanation that when the adapter circuit 25 is occupied with an outgoing call, guarding ground potential is impressed upon the private conductor 372 through the upper winding of the relay R140 and the contacts 142b of the busy key 142. If the private conductor 372 is connected to ground over this path at the time the line 10 is selected by the connector 16, the busy test relay of this connector operates in the usual manner to return a busy signal to the calling subscriber at the substation B. In this connection it will be noted that the busy test relay of the connector is energized in a circuit which extends from the grounded control lead 373 through the upper winding of the relay R140 and the contacts 142b to the private conductor 372. The current flow in this winding is in opposition to the sustained current flow through the lower winding of the relay R140 and, accordingly, this relay does not operate. On the other hand, if the line 10 is idle at the time it is selected, the private conductor 372 is marked with negative battery potential over a path which includes the contacts 142b, the two windings of the relay R140 and the resistor 143. When this potential is found by the test wiper of the connector 16, the connector automatically switches into its ringing position in the usual manner. Incident to this operation the private conductor 372 is connected to ground in the connector 16 to provide a circuit for energizing the two windings of the relay R140 in series. This ground path is also connected through the upper winding of the relay R140 to the control conductor 373, thereby to provide a circuit for energizing the cut-off relay of the line circuit 12. This cut-off relay, upon operating, disconnects the windings of its associated line relay from the talking conductors 370 and 371. When its two windings are energized in series, the relay R140 closes its contacts 141 to complete an obvious circuit for energizing the lower winding of the switching relay R130 in series with the winding of the transfer relay

R220. The relay R130 now closes its contacts 137 to prepare a locking circuit for itself, and closes its contacts 138 to prepare the common portion of the previously traced locking circuits for the coin refund and collect relays R110 and R120. At its contacts 138, the relay R130 also prepares the previously traced operating circuit for the pulse cut-off relay R210. At its contacts 139, the relay R130 opens a point in one of the previously traced operating circuits for the coin control relay R100. At its contacts 132 and 135, the relay R130 connects the conductors of the line 10 to the talking conductors 370 and 371 free of all attachments, thereby to provide a circuit over which ringing current may be transmitted through the ringer 36 provided at the paystation A.

The relay R220, upon operating, closes its contacts 221 to prepare a locking circuit for itself, and opens its contacts 224 to interrupt one of the previously traced paths for impressing coin control potentials upon the conductors of the line 10. At its contacts 223, the relay R220 prepares the other path over which coin control potentials may be applied to the conductors of the line 10. At its contacts 225, the relay R220 prepares the previously traced locking circuits for the two relays R210 and R230, as well as the operating and locking circuits for the relay R260. At its contacts 225, the relay R220 also completes the prepared operating circuit for the pulse cut-off relay R210. The relay R210 now operates and locks to ground through the contacts 212 and 225. The remaining switching operations performed by this relay are of no effect at this time.

Following the operation of the four relays R130, R140, R210 and R220, no further switching operations occur in the adapter circuit 25 until the connection as set up between the substation B and the paystation A is released. In this regard it will be understood that when the calling and called parties disconnect, the automatic switch train including the connector 16, the selector 15 and the finder 14 are released in an entirely conventional manner. Incident to the release of the connector 16 the private conductor 372 is disconnected from ground therein, thereby to deenergize the relay R140 and the cut-off relay of the line circuit 12. In releasing, the relay R140 opens its contacts 141 to deenergize the switching relay R130. The latter relay, in restoring, closes its contacts 139 to complete a circuit through the contacts 226 and 316 for energizing the coin control relay R100. In the present case the operation of the relay R100 is without effect since no coins are on deposit at the paystation A. Shortly following the release of the switching relay R130, the transfer relay R220 restores and opens its contacts 226 to deenergize the coin control relay R100. The relay R100, upon restoring, opens its contacts 106 to deenergize the relay R210. Following the release of the latter relay the adapter circuit 25 is fully restored to normal.

Incoming toll calls

In extending toll calls to the paystation A, the operator attending the switchboard 19 may use the toll selector 20 and the toll connector 21, for example. Assuming that these two switches are utilized in extending a connection to the paystation A, the relay operations which occur in the adapter circuit 25 incident to the seizure of this circuit by the toll connector 21 are exactly the same as occur when this circuit is seized through a local connector. It will be understood, therefore, that after a connection is set up to the

paystation A from the toll operator switchboard 19, the relays R130, R140, R210 and R220 are operated in the adapter circuit 25. With these relays operated, the operator handling the call at the switchboard 19 may selectively control the coin refund and coin collect relays R110 and R120 through a second toll selector and an available coin control connector, either to effect coin refunding or coin collecting operations at the paystation A. This type of control has particular utility in the handling of delayed toll call connections, since it permits an operator at the switchboard 19 to locate a subscriber desired by a calling party at the paystation A, and then recall the calling party at this paystation without losing control of the coin mechanism thereat. In this regard it will be understood that if the coin refund relay R110, for example, is seized through the coin control connector 22, for example, from the toll operator switchboard 19 after the connection to the paystation A is established, this relay will operate the cause the sequential operation of the relays R100, R330 and R340, assuming that coins are on deposit at the paystation A, which are to be refunded. It will also be understood that the relay R330 is energized in series with the windings of the magnet 38 over the previously traced coin refund control circuit. The manner in which the coin refunding operation is carried out under the control of the relays R320, R330, R340 and R350 will be clearly apparent from the preceding explanation, it being understood from this explanation that after the refunding operation is completed only the relays R130, R140, R210 and R220 remain operated in the adapter circuit 25.

In the event the coin collect relay R120 is seized through the coin control connector 22, for example, from the toll operator switchboard 19, a coin collecting operation occurs in the exact manner previously explained, it being understood in this regard that the only difference in the operation of the adapter circuit 25, as between the operation of the coin refund relay R110 and the coin collect relay R120, resides in the fact that in one case the conductors of the line 10 are connected through the winding of the relay R330 to the negative refund conductor 161, and in the other case to the positive collect conductor 162. In either case, the four relays R130, R140, R210 and R220 are the only relays which remain operated in the adapter circuit 25 after the coin control operation is completed.

With the four indicated relays operated in the adapter circuit 25 at the time the toll connection as set up between the switchboard 19 and the paystation A is released, a coin collecting operation is automatically performed, providing coins are on deposit at the paystation A. Thus when the two relays R140 and R130 sequentially restore incident to the release of the connection, the above-described circuit including the contacts 139, 226 and 316 is completed for energizing the coin control relay R100. This relay, in operating, connects the conductors of the line 10 through the winding of the coin control relay R330 to the collect conductor 162. Hence, if coins are on deposit at the paystation A a coin collection operation is carried out in the exact manner explained above. After this operation is completed, the adapter circuit is released. On the other hand, if no coins are on deposit at this paystation the relay R330 remains in its restored position to permit the release of the coin control relay R100 shortly following the restoration of

the switching relay R130. Upon restoring, the coin control relay R100 opens its contacts 106 to deenergize the pulse cut-off relay R210. Following the release of the latter relay the adapter circuit 25 is fully restored to normal.

If for any reason it is desired to cut the paystation A out of service the busy key 142 is operated to its off-normal position wherein the contact springs 142b thereof are opened and the contact springs 142a thereof are closed, and the key 144 is operated to its open-circuit position to interrupt one side of the line 10 extending to the paystation A. With the contacts of the key 144 disengaged, obviously no control may be exercised over the adapter circuit 25 from the paystation A. With the busy key 142 occupying its off-normal position the private conductor 372 is connected directly to ground to prevent seizure of the adapter circuit 25 through any of the connectors having access thereto. Thus this circuit cannot be seized either on incoming or outgoing calls.

As indicated previously, the coin control relay R340 is arranged to control, through its contacts 343, a delayed alarm circuit 357. This circuit is preferably so arranged that an alarm indication is not produced thereby until the relay R340 has been operated for a period exceeding a predetermined time interval. In this regard it will be understood that when an alarm indication is produced by the circuit 357 it indicates that an abnormal condition exists in the equipment associated with one of the paystation lines. This alarm indication is supplemented by the signal lamp 356 which is individual to the adapter circuit 25, and when energized indicates the source of the alarm indication, i. e., the particular equipment in which the abnormal condition exists.

While one embodiment of the invention has been disclosed, it will be understood that various modifications may be made therein which are within the true spirit and scope of the invention.

What is claimed is:

1. In a telephone system, a paystation including a mechanism for controlling the collection and refunding of coins or the like, an operator position, means for setting up a connection between said paystation and said operator position, and means comprising an automatic switch separate from said connection and controllable from said operator position for controlling said mechanism so long as said connection is not released.

2. In a telephone system, a paystation including means for collecting coins or the like, an operator position, means for setting up a connection between said paystation and said operator position, and means comprising an automatic switch separate from said connection and controllable from said operator position for operating said collecting means so long as said connection is not released.

3. In a telephone system, a paystation including a mechanism for controlling the collection and refunding of coins or the like, an operator position, means for setting up a connection between said paystation and said operator position, and means comprising an automatic switch separate from said connection and controllable from said operator position for selectively controlling said mechanism to collect or refund coins at any time after said connection is extended to said operator position and prior to its release.

4. In a telephone system, a paystation including means for refunding coins or the like, an operator position, means for setting up a connection between said paystation and said operator position, and means comprising an automatic switch separate from said connection and controllable from said operator position for operating said coin collecting means so long as said connection is not released.

5. In a telephone system, a plurality of paystations each including a mechanism for controlling the collection and refunding of coins or the like, an operator position, means for setting up connections between said operator position and said stations, an automatic switch separate from the means utilized in establishing any one of said connections and controllable from said operator position and operative to different settings individually designating the collection and refunding of coins deposited at different ones of said paystations, and means selectively controlled in accordance with the settings imparted to said switch for selectively controlling said mechanisms to collect and refund coins.

6. In a telephone system, a plurality of paystations each including a mechanism for controlling the collection of coins or the like, an operator position, means for setting up connections between said operator position and said stations, an automatic switch separate from the means utilized in establishing any one of said connections and controllable from said operator position and operative to different settings individually designating the collection of coins deposited at different ones of said stations, and means selectively controlled in accordance with the settings imparted to said switch for selectively operating said mechanisms.

7. In a telephone system, a plurality of paystations each including a mechanism for controlling the refunding of coins or the like, an operator position, means for setting up connections between said operator position and said stations, an automatic switch separate from the means utilized in establishing any one of said connections and controllable from said operator position and operative to different settings individually designating the refunding of coins deposited at different ones of said stations, and means selectively controlled in accordance with the settings imparted to said switch for selectively operating said mechanisms.

8. In a telephone system, a paystation line, an adapter circuit terminating said line and including means for selectively impressing coin collect and coin refund potentials upon at least one of the conductors of said line, an operator position, means including said circuit for setting up a connection between said line and said operator position, and means including an automatic switch separate from said connection and controllable from said operator position for controlling said first-named means.

9. In a telephone system, a plurality of paystation lines, adapter circuits individually terminating said lines and each including means for selectively impressing coin collect and coin refund potentials upon at least one of the conductors of the respective associated line, an operator position, means including said circuits for setting up connections between said lines and said operator position, and means including an automatic switch separate from said connecting means and controllable from said operator position.

tion for selectively controlling said first-named means.

10. In a telephone system, a plurality of paystation lines, adapter circuits individually terminating said lines, an operator position, means including said circuits for setting up connections between said lines and said operator position, and an automatic switch separate from the means utilized in establishing any one of said connections and directly controllable from said operator position and having settings individually corresponding to said circuits, each of said circuits including means responsive to the operation of said switch to the setting corresponding thereto for impressing a coin control potential upon at least one of the conductors of the associated line.

11. In a telephone system, a plurality of paystation lines, adapter circuits individually terminating said lines, an operator position, means including said circuits for setting up connections between said lines and said operator position, and an automatic switch separate from the means utilized in establishing any one of said connections and directly controllable from said operator position and having two different settings for each of said circuits, each of said circuits including means responsive to the operation of said switch to one of the settings corresponding thereto for impressing a coin refund potential upon at least one of the conductors of the associated line and means responsive to the operation of said switch to the other setting corresponding thereto for impressing a coin collect potential upon at least one conductor of the associated line.

12. In a paystation control circuit which is adapted to be included in a connection established between a paystation line and another line, a path for impressing coin control potential upon at least one conductor of said line, a relay adapted to be controlled over a connection which is entirely separate from said first-named connection, and means responsive to the operation of said relay for completing said path.

13. In a paystation control circuit which is adapted to be included in a connection established between a paystation line and another line, paths for impressing coin refund and coin collect potentials upon at least one conductor of said line, a pair of relays which are adapted to be selectively controlled over a connection which is entirely separate from said first-named connection, and means responsive to the operation of one of said relays for completing one of said paths and responsive to the operation of the other of said relays for completing the other of said paths.

14. In a paystation control circuit which is adapted to be included in a connection established between a paystation line and another line, a path for impressing coin control potential upon at least one conductor of said line, a relay adapted to be controlled over a connection which is entirely separate from said first-named connection, means responsive to the operation of said relay for completing said path and for locking said relay operated, and means controlled over said line for releasing said relay.

15. In a paystation control circuit which is adapted to be included in a connection established between a paystation line and another line, paths for impressing coin refund and coin collect potentials upon at least one conductor of said line, a pair of relays which are adapted to be selectively controlled over a connection which is entirely separate from said first-named connection,

means responsive to the operation of one of said relays for completing one of said paths and for locking said one relay operated and responsive to the operation of the other of said relays for completing the other of said paths and for locking said other relay operated, and means reversibly controlled over said line by the coin control mechanism of said paystation for releasing the operated one of said relays.

16. In a telephone system, a paystation including a mechanism for controlling the disposal of coins or the like, a line extending to said station, an operator position, means including a paystation control circuit for setting up a connection between said line and said operator position, a coin control circuit for controlling said mechanism, said coin control circuit extending between said paystation and said paystation control circuit and including at least one conductor of said line, means for setting up a second connection between said operator position and said paystation control circuit before said first-named connection is released, and means controlled over said second connection for completing said coin control circuit.

17. In a telephone system, a paystation including a mechanism for controlling the disposal of coins or the like, a line extending to said station, an operator position, means including a paystation control circuit for setting up a connection between said line and said operator position, a coin control circuit for controlling said mechanism, said coin control circuit extending between said paystation and said paystation control circuit and including at least one conductor of said line, means for setting up a second connection between said operator position and said paystation control circuit, a relay operated in response to the completion of said second connection, means responsive to the operation of said relay for completing said coin control circuit and for locking said relay operated independently of said second connection, and means responsive to the operation of said mechanism for releasing said relay and for opening said coin control circuit in said paystation control circuit.

18. In a telephone system, a paystation including a mechanism for controlling the collection of coins or the like, a line extending to said paystation, an operator position, means including a paystation control circuit for setting up a connection between said line and said operator position, said circuit including paths over which coin refund and collect potentials may be impressed upon at least one conductor of said line to effect the operation of said mechanism and a pair of relays respectively operative to effect the completion of said paths, and means including a second connection set up between said circuit and said operator position for selectively operating said relays.

19. In a telephone system, a paystation including a mechanism for controlling the collection of coins or the like, a line extending to said station, an operator position, means including a paystation control circuit for setting up a connection between said line and said operator position, said circuit including paths over which coin refund and collect potentials may be impressed upon at least one conductor of said line to effect the operation of said mechanism, means for setting up either of two different control connections between said circuit and said operator position, a pair of relays included in said circuit and respectively operated when said control connections are set up, means responsive to the operation of one of said

relays for completing one of said paths and for locking said one relay operated and responsive to the operation of the other of said relays for completing the other of said paths and for locking said other relay operated, and means responsive to the operation of said mechanism for releasing the operated one of said relays.

20. In a telephone system, a paystation including a mechanism for controlling the disposal of coins or the like, a line extending to said station, an operator position, means including a paystation control circuit for setting up a connection between said line and said operator position, a coin control circuit for controlling said mechanism, said coin control circuit extending between said paystation and said paystation control circuit and including at least one conductor of said line, means for setting up a second connection between said operator position and said paystation control circuit before said first-named connection is released, and means controlled over said second connection for completing said coin control circuit and for transmitting a signal over said first-named connection to said operator position.

21. In a telephone system, a paystation including a mechanism for controlling the collection of coins or the like, a line extending to said paystation, an operator position, means including a paystation control circuit for setting up a connection between said line and said operator position, said circuit including paths over which coin refund and collect potentials may be impressed upon at least one conductor of said line to effect the operation of said mechanism, means for setting up a second connection between said operator position and said paystation control circuit, and means controlled over said second connection for selectively completing said paths and for transmitting a signal over said first-named connection to said operator position which indicates the path that is completed.

22. In a telephone system, a paystation line, an adapter circuit terminating said line and including paths for impressing coin collect and coin refund potentials upon at least one of the conductors of said line, an operator position, means including said adapter circuit for extending a connection from said line to said operator position, and means included in said circuit and operative in response to the answering of the call at said operator position for completing one of said paths in said circuit.

23. In a telephone system, a paystation line, an adapter circuit terminating said line and including paths for impressing coin collect and coin refund potentials upon at least one of the conductors of said line, an operator position, means including said adapter circuit for extending a connection from said line to said operator position, means included in said circuit and operative in response to the answering of the call at said operator position for completing said coin refund path, and means included in said circuit and operative in response to the release of the connection at said operator position for completing said coin collect path.

24. In a telephone system, a paystation line, an adapter circuit terminating said line and including paths for impressing coin collect and coin refund potentials upon at least one of the conductors of said line, an operator position, means including said adapter circuit for extending a connection from said line to said operator position, means included in said circuit and operative in response to the answering of the call of said operator position

for completing said coin refund path, and means including an automatic switch separate from said connection and controllable from said operator position for selectively completing said paths.

25. In a telephone system, a paystation line, an adapter circuit terminating said line and including paths for impressing coin collect and coin refund potentials upon at least one of the conductors of said line, an operator position, means including said adapter circuit for extending a connection from said line to said operator position, means included in said circuit and operative in response to the answering of the call at said operator position for completing said coin refund path, means including an automatic switch separate from said connection and controllable from said operator position for selectively completing said paths, and means included in said circuit and operative in response to the release of the connection at said operator position for completing said coin collect path.

26. In a telephone system, a paystation line, an adapter circuit including a bridge provided with reactive elements for transmitting signal currents between said line and a called line, an operator position, means including said circuit and a succeeding automatic switch train for extending a connection from said paystation to said operator position, and means included in said circuit for excluding said bridge from a connection set up between said paystation and a succeeding switch train incident to the operation of the switch train to extend the connection to said operator position.

27. In a telephone system, a paystation line, an adapter circuit including a bridge provided with reactive elements for transmitting signal currents between said line and a called subscriber line, an operator position, means including said circuit and a succeeding automatic switch train for extending a connection from said paystation to a called subscriber line or to said operator position, means included in said circuit for excluding said bridge from a connection set up between said paystation and a succeeding switch train incident to the operation of the switch train to extend a connection to said operator position, and means included in said circuit for preventing the operation of said last-named means in setting up connections between said paystation line and subscriber lines.

28. In a telephone system, a paystation line, an adapter circuit including a path for impressing a coin control potential upon at least one of the conductors of said line and a bridge provided with reactive elements for transmitting signal currents between said line and a called subscriber line, an operator position, means including said circuit and a succeeding automatic switch train for extending a connection from said paystation to said operator position, means included in said circuit for excluding said bridge from the connection incident to the operation of the switch train to extend the connection to said operator position, and means operative in response to the answering of the call at said operator position for completing said path.

29. In a telephone system, a paystation line, an adapter circuit including a path for impressing a coin control potential upon at least one of the conductors of said line and a bridge provided with reactive elements for transmitting signal currents between said line and a called subscriber line, an operator position, means including said circuit

cuit and a succeeding automatic switch train for extending a connection from said paystation to said operator position or to a subscriber line, means included in said circuit for automatically excluding said bridge from a connection extended to said operator position from said line, means included in said circuit for preventing the operation of said last-named means in setting up connections between said paystation line and subscriber lines, and means operative in response to the answering of a call routed from said paystation line to said operator position for completing said path.

30. In a paystation line adapter circuit which is adapted for use in setting up connections between a paystation line and subscriber lines or trunks, a bridge provided with reactive elements coupling the two ends of said circuit to provide a signal transmission channel therebetween, and means responsive to the extension of a connection through said circuit to a trunk for excluding said bridge from the connection.

31. In a paystation line adapter circuit which is adapted for use in setting up connections between a paystation line and subscriber lines or trunks, a bridge provided with reactive elements coupling the two ends of said circuit to provide a signal transmission channel therebetween, means responsive to the extension of a connection through said circuit to a trunk for excluding said bridge from the connection, and means for preventing the operation of said last-named means in the extension of a connection through said circuit to a subscriber line.

32. In a telephone system, a paystation, an adapter circuit including a bridge provided with reactive elements for transmitting signal currents between said paystation and a called line, an impulsing relay for directing automatic switch operations and a digit counting device controlled by said relay, an operator position, means including said circuit and a succeeding automatic switch train controlled by said relay for extending a connection from said paystation to a subscriber line or to said operator position, means controlled by said digit counting device for preventing a connection from being extended through said automatic switch train to a subscriber line unless a coin has been deposited at said paystation, means included in said circuit for automatically excluding said bridge from a connection set up between said paystation and said operator position, and means controlled by said digit counting device for preventing the operation of said last-named means in setting up a connection between said paystation and a subscriber line.

33. In a telephone system, a paystation, an adapter circuit including an impulsing relay for directing automatic switch operations and a digit counting device controlled by said relay, an operator position, means including said circuit and a succeeding automatic switch train controlled by said relay for extending a connection from said paystation to said operator position or to a subscriber line, and means controlled by said digit counting device for preventing said connection from being extended to said subscriber line unless a coin is deposited at said paystation.

34. In a telephone system, a paystation, a line extending to said paystation, an adapter circuit terminating said line and including an impulsing relay for directing automatic switch operations, a digit counting device controlled by said relay and a coin relay operative to register the deposit of a coin at said paystation, an operator posi-

tion, means including said circuit and a succeeding automatic switch train for extending a connection from said paystation to said operator position or to a subscriber line, and means controlled by said digit counting device for preventing said connection from being extended to said subscriber line unless said coin relay is operated.

35. In a telephone system, a paystation, a line extending to said paystation, an adapter circuit terminating said line and including an impulsing relay for directing automatic switch operations, a digit counting device controlled by said relay and a coin relay operative to register the deposit of a coin at said paystation, an operator position, means including said circuit and a succeeding automatic switch train for extending a connection from said paystation to said operator position or to a subscriber line, means controlled by said digit counting device for preventing said impulsing relay from directing the operation of said switch train beyond a predetermined switching stage, and means controlled by said coin relay for rendering said last-named means ineffective.

36. In a circuit which is adapted for use in setting up connections between a paystation and subscriber lines or trunks, an impulsing relay for directing the operation of succeeding automatic switches, and means including a digit counting device controlled by said relay for rendering said relay ineffective to control succeeding automatic switches beyond a predetermined switching stage in the event a coin is not deposited at said paystation.

37. In a circuit which is adapted for use in setting up connections between a paystation and subscriber lines or trunks, an impulsing relay for directing the operation of succeeding automatic switches, a coin relay operative to register the deposit of a coin at said paystation, a digit counting device controlled by said impulsing relay, means controlled by said digit counting device for rendering said impulsing relay ineffective to control succeeding automatic switches beyond a predetermined switching stage, and means controlled by said coin relay for rendering said last-named means ineffective.

38. In a circuit which is adapted for use in setting up connections involving a paystation line, a path for impressing a coin control potential upon at least one conductor of said line, a pickup lead, a pickup relay, means responsive to the completion of said path for connecting said pickup relay to be energized over said pickup lead, and means responsive to the operation of said pickup relay for intermittently opening said path.

39. In a circuit which is adapted for use in setting up connections involving a paystation line, a path for impressing a coin control potential upon at least one conductor of said line, a pickup lead, a pickup relay, means responsive to the completion of said path for connecting said pickup relay to be energized over said pickup lead, a source of current pulses, a relay operative to open said path, and means responsive to the operation of said pickup relay for connecting said last-named relay to be controlled from said source of current pulses.

40. In a telephone system which includes a paystation and a line extending to said paystation, a circuit including at least one conductor of said line for controlling the disposition of coins deposited at said paystation, a pickup lead, a pickup relay, means for completing said circuit, means responsive to the completion of said circuit

for connecting said pickup relay to be energized over said pickup lead, and means responsive to the operation of said pickup relay for intermittently opening said circuit until it is interrupted at said paystation.

41. In a telephone system which includes a paystation and a line extending to said paystation, a circuit including at least one conductor of said line for controlling the disposition of coins deposited at said paystation, a pickup lead, a pickup relay, means for completing said circuit, means responsive to the completion of said circuit for connecting said pickup relay to be energized over said pickup lead, means responsive to the operation of said pickup relay for intermittently opening said circuit until it is interrupted at said paystation, and means responsive to the interruption of said circuit at said paystation for releasing said pickup relay and said three last-named means.

42. In a telephone system which includes a paystation and a line extending to said paystation, an adapter circuit terminating said line and including means controllable over said line for directing the operation of an automatic switch train, a coin control circuit including at least one conductor of said line and extending between said paystation and said adapter circuit, means included in said adapter circuit for momentarily completing said coin control circuit, and means responsive to the momentary completion of said coin control circuit for thereafter intermittently opening said coin control circuit until it is opened at said paystation.

43. In a telephone system which includes a paystation and a line extending to said paystation, an adapter circuit terminating said line and including means controllable over said line for directing the operation of an automatic switch train, a

coin control circuit including at least one conductor of said line and extending between said paystation and said adapter circuit, means included in said adapter circuit for momentarily completing said coin control circuit, a pickup lead extending to said adapter circuit, a pickup relay included in said adapter circuit, means responsive to the momentary completion of said coin control circuit for connecting said pickup relay to be energized over said pickup lead, and means responsive to the operation of said pickup relay for intermittently opening said coin control circuit until it is opened at said paystation.

44. In a telephone system, a paystation including means for receiving coins or the like, a line extending to said station, an adapter circuit terminating said line, a dial tone signaling circuit extending through said adapter circuit, and means responsive to the depositing of a coin in said coin receiving means and the initiation of a call at said paystation for completing said signaling circuit.

45. In a telephone system, a paystation including means for receiving coins or the like, a line extending to said station, an adapter circuit terminating said line and including a relay operative to direct the operation of succeeding automatic switches, a dial tone signaling circuit extending through said adapter circuit, means responsive to the initiation of a call at said paystation for rendering said relay inoperative to control succeeding automatic switches, and means responsive to the deposit of a coin in said coin receiving means for completing said signaling circuit and for rendering said relay operative to direct the control of succeeding automatic switches.

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