July 2, 1935. W. B. STRICKLER 2,006,489

TELEPHONE SYSTEM

Filed Oct. 12, 1933 3 Sheets-Sheet 1

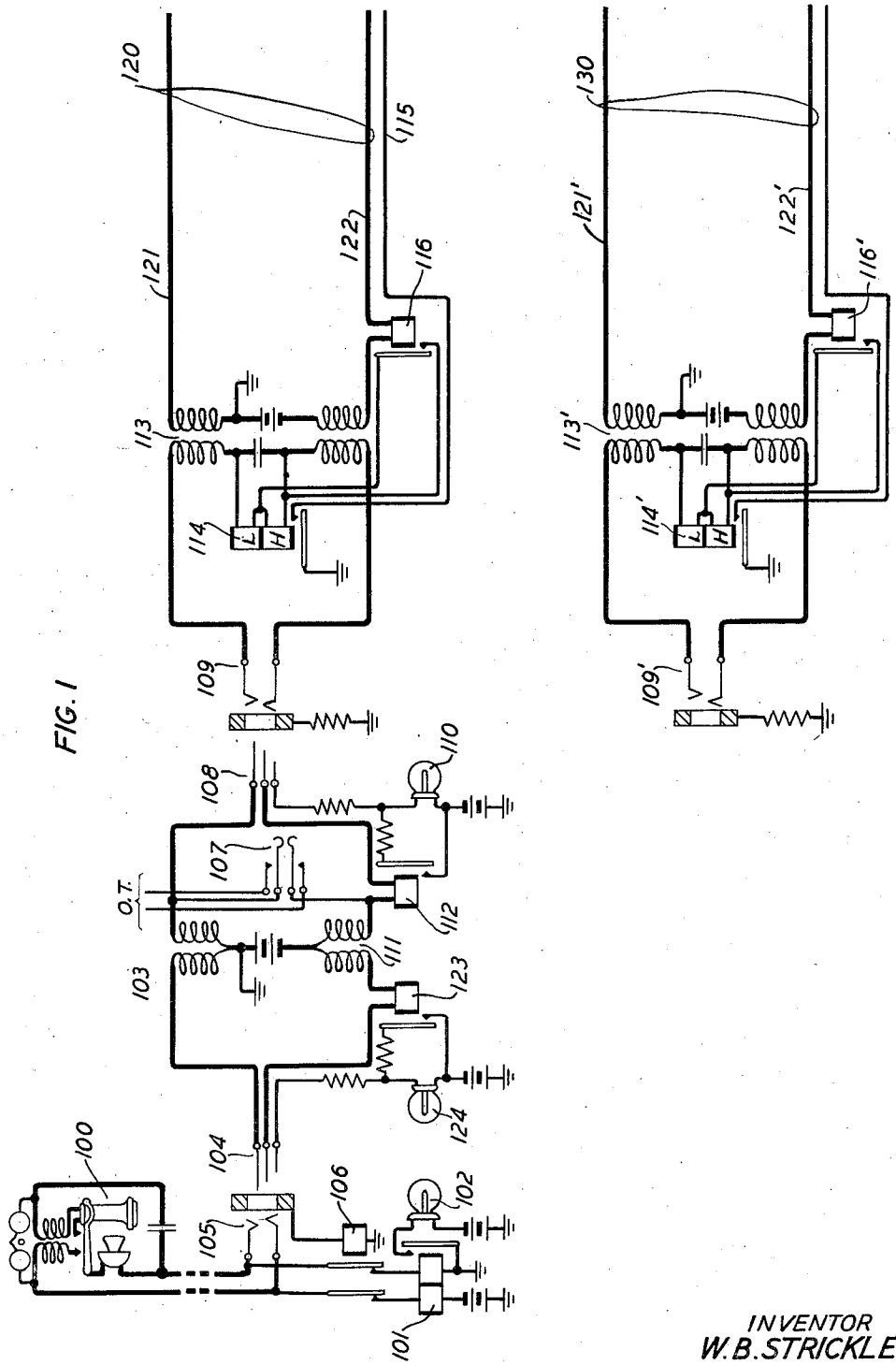

FIG. 1

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TELEPHONE SYSTEM

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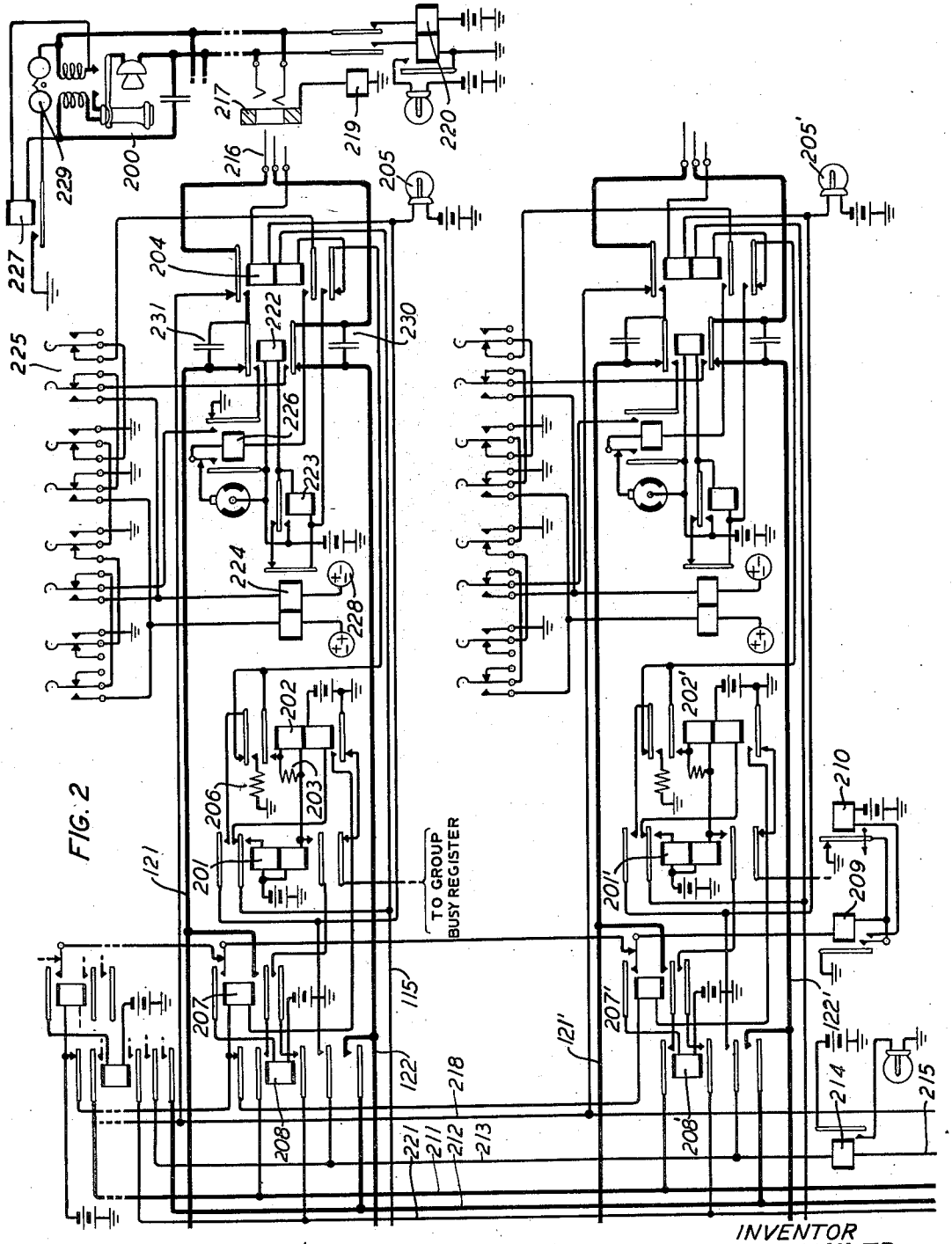

FIG. 2

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TELEPHONE SYSTEM

Filed Oct. 12, 1933 3 Sheets-Sheet 3

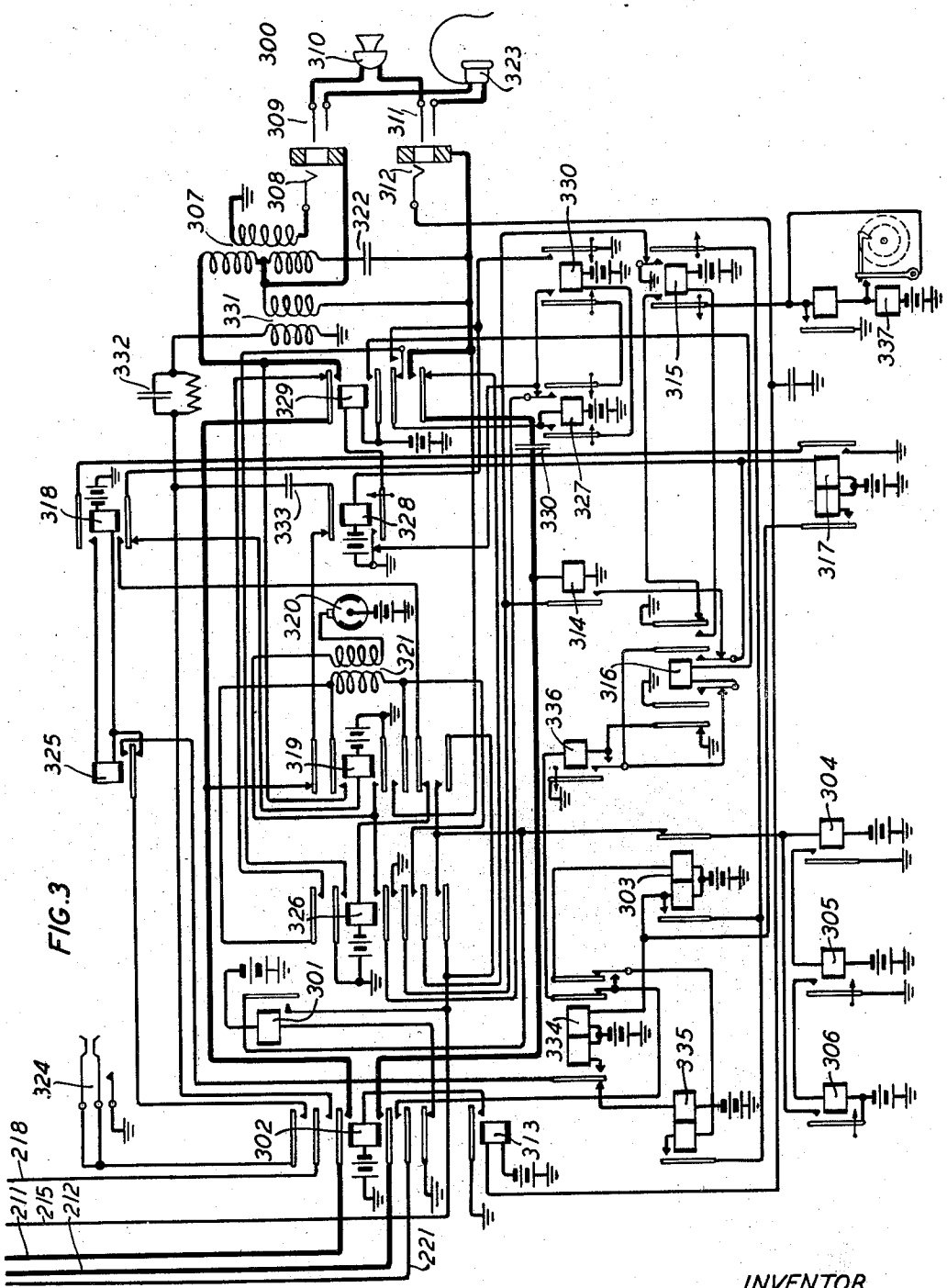

FIG. 3

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Patented July 2, 1935 2,006,489

UNITED STATES PATENT OFFICE

2,006,489

TELEPHONE SYSTEM

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Application October 12, 1933, Serial No. 693,277

11 Claims. (Cl. 179—41)

This invention relates to telephone exchange systems and more particularly to trunking systems where "A" and "B" operators are employed in trunking calls between offices of the exchange system. In such systems it is customary for the "A" operators in originating offices to receive the calls from calling subscribers' lines terminating therein and to extend them over trunks to the positions of "B" operators in the proper terminating offices which "B" operators then proceed to complete the calls to desired called subscribers' lines which terminate in the terminating offices.

The object of the present invention is to improve the facilities whereby the position equipment of a "B" operator may be associated and disassociated with an interoffice trunk to enable the "B" operator to receive instructions from an "A" operator for properly terminating a call.

In accordance with the present invention when an "A" operator selects an idle trunk in a group of trunks terminating at the "B" operator's position of a terminating office the trunk is automatically associated with the "B" operator's position equipment if the "B" operator's position is occupied and free, and the "B" operator is apprised of the waiting call by a tone signal applied to her position telephone set and by a flashing lamp signal associated with the particular calling trunk which has been associated with the position equipment. No talking connection is, however, established between the originating "A" operator's telephone set and the "B" operator's telephone set until after the "B" operator in response to the tone signal depresses her position listening key. When the listening key has been operated the tone signal is first discontinued, order tones are then transmitted in the well-known manner to apprise the "A" operator that she may pass to the "B" operator the information for completing the desired call and then following the termination of the order tones the "B" operator's telephone set is connected in to a talking connection with the "A" operator's telephone set.

To disconnect the trunk from the "B" operator's position equipment the "B" operator may either plug the trunk up into the jack of the called line, the number of which has been passed to the "B" operator, or by again depressing the position listening key. If calls are simultaneously waiting on more than one trunk incoming to the "B" operator's position the first depression of the position listening key will listen the "B" operator in on a first calling trunk and a subsequent depression of the listening key will cause the disassociation of the "B" operator's position equipment from the first trunk and the listening in of the "B" operator on another calling trunk.

While the invention has been disclosed as applied to the trunking of calls from an "A" operator's position to a "B" operator's position, it is to be understood that it is equally applicable to all trunking systems in which it is necessary to trunk calls from one operator's position to another operator's position.

For a clearer understanding of the invention reference may be had to the following detailed description taken in connection with the accompanying drawings in which:

Fig. 1 shows a calling line terminating in an originating office of an exchange system, the outgoing ends of two of the trunks extending to a terminating office of the exchange and an A operator's cord circuit by means of which the calling line may be connected to any of said trunks.

Fig. 2 shows the incoming ends of the trunks terminating in plugs at a B operator's position in a terminating office and a called subscriber's line.

Fig. 3 shows the position equipment at the B operator's position common to all trunks incoming to the position.

To completely illustrate the invention Fig. 2 should be placed at the right of Fig. 1 and Fig. 3 should be placed beneath Fig. 2 with the conductors extending to the margins of the respective figures in alignment.

It will be assumed that the calling subscriber at substation 100 initiates a call by removing his receiver from the switchhook thereby operating line relay 101 and lighting the line lamp 102. The A operator, one of whose cord circuits is shown at 103, seeing the lighted lamp 102 inserts the answering plug 104 of the cord circuit in the line jack 105 thereby operating the cut-off relay 106 to extinguish the lamp 102, and throws the listening key 107 to connect her telephone set (not shown) with the cord circuit. The operator is now enabled to converse with the calling subscriber and to obtain from him the number of the desired line.

It will further be assumed that the calling subscriber desires a connection with the line whose substation is shown at 200 and which terminates in another office of the exchange. The A operator will therefore test for an idle trunk of the group of trunks extending to the office in which the desired line terminates and, for example, finding the trunk 120 of the group idle will insert the calling plug 108 of cord circuit 103 into the jack 109 of this trunk. The called super-

visory lamp 110 will therefore become lighted in an obvious circuit over the sleeves of plug 108 and jack 109 and a circuit will also be established from battery through the lower right winding of repeating coil 111, winding of supervisory relay 112, rings of plug 108 and jack 109, the lower left winding of repeating coil 113, both high and low resistance windings of trunk relay 114, upper left winding of repeating coil 113, tips of jack 109 and plug 108, upper right winding of repeating coil 111 to ground. Relay 114 operates in this circuit but since the lower high resistance winding of relay 114 is included in the circuit of supervisory relay 112, relay 112 does not operate at this time and consequently supervisory lamp 110 remains lighted.

With relay 114 operated a circuit is established from ground at its contact over conductor 115, the upper back contact of relay 201 to battery through the lower winding of relay 202. Relay 202 operates and at its inner upper front contact establishes a circuit extending from battery through the lower winding of relay 201 thence in parallel through resistance 203 and the upper winding of relay 202, inner upper front contact of relay 202, lower back contact and lower winding of sleeve relay 204, to ground on conductor 115. Relay 201 operates and relay 202 is held operated over this circuit, but relay 204 does not operate. Relay 201 upon operating now locks over its upper winding and inner front contact directly to ground on conductor 115, and at its inner upper back contact opens the initial operating circuit of relay 202. With relays 201 and 202 both operated, the trunk guard lamp 205 is lighted in a circuit extending from battery through lamp 205, upper front contact of relay 201, upper front contact of relay 202, to ground through resistance 206.

At its lower front contact, relay 202 establishes a circuit extending from ground through the winding of start relay 207, thence if no call exists on succeeding trunks of the group over back contacts in series of relays of such succeeding trunks corresponding to relay 208 to battery. Relay 207 upon operating establishes a circuit for relay 208 extending from battery through the winding of relay 208, upper alternate contacts of start relay 207, normal contacts of relay 207' of the next preceding trunk, if such trunk is not in a calling condition, winding of relay 209 to ground at the back contact of relay 210. In the case illustrated trunk 130 to which relay 207' is individual is the first trunk in the group and trunk 120 to which the A operator has connected is the second trunk in the group. Relay 209 operates supplying locking ground for itself and for the operated relay 208 and operating ground for relay 210 which operates removing the initial operating ground for relays 208 and 209.

With relays 207 and 208 both operated, the tip talking conductor 121 of trunk 120 is extended over the inner lower front contact of relay 207 and the inner upper front contact of relay 208 to conductor 211 extending to the B operator's position circuit and the ring talking conductor 122 is extended over the lower front contact of relay 208 to conductor 212, extending the B operator's position circuit. Since relay 207 upon operating opens its upper normal contacts the chain circuit extending from ground at the contacts of relays 209 and 210 is opened and it is not possible for the relay corresponding to relay 208 of a succeeding trunk to become operated at this time. Also since relay 208 upon operating has opened its upper back contact, it is not possible for the relays corresponding to relay 207 of the preceding trunk, in this case relay 207' of the first trunk 130, to become operated. Thus the talking conductors of no other trunks can be connected to conductors 211 and 212 while relays 207 and 208 remain operated and therefore only one talking connection can be established from the A operator's position to the B operator's position at one time.

If the B operator's headset 300 is not at this time plugged up, relay 301 is operated over the lower back contact of relay 302 and a circuit is established from ground, resistance 206, upper contacts of relays 202 and 201, middle lower front contact of relay 208, conductor 213, winding of pilot relay 214, conductor 215, contact of relay 301, back contact of relay 303, winding of relay 304 to battery. Relay 304 operates in this circuit operating slow to operate relay 305 which in turn operates slow to operate relay 306. Relay 306 upon operating connects direct battery to the operating circuit of relay 304 thereby shunting the guard lamp 205 to cause it to become extinguished and shunting relay 304 which releases in turn releasing relays 305 and 306. Relay 306 upon releasing removes shunting battery from the guard lamp 205 and from relay 304. The lamp now relights and relay 304 reoperates. This cycle of operations is repeated whereby lamp 205 intermittently flashes as a signal that there is a call awaiting the attention of the operator.

If the B operator's headset 300 was plugged up at the time a call was incoming on one of the trunks of her position, or the operator plugs up her headset upon seeing the flashing of the guard lamp of the calling trunk, a circuit is established from ground through the right winding of repeating coil 307, tips of jack 308 and plug 309, headset transmitter 310, tips of plug 311 and jack 312 to battery through the winding of relay 313. With relay 313 operated an obvious circuit is established for relay 302 which opens the operating circuit of relay 301 to stop the flashing of the guard lamp of the calling trunk. A circuit is now established from battery through the lower winding and lower front contact of relay 201, lower front contact of relay 207, inner lower front contact of relay 208, conductor 221, lower front contact of relay 302, inner right back contact of relay 334, winding of relay 335 to ground at the outer left back contact of relay 316. Relay 335 operates in this circuit closing at its contacts a locking circuit for itself independent of relay 316.

A circuit is also established for relay 314 extending from ground through the winding of this relay, inner lower front contact of relay 302, conductor 212, thence as traced to conductor 122, winding of trunk supervisory relay 116, lower right winding of repeating coil 113 to battery and ground. Relay 314 operates in this circuit, but due to the high resistance of its winding, the trunk supervisory relay 116 does not operate. Relay 314 upon operating establishes a circuit extending from ground at the right normal contacts of relay 315, contacts of relay 314, inner right normal contacts of relay 316 to battery through the right winding of relay 317 and in parallel therewith over the back contact of relay 318 to battery through the winding of relay 319. Relays 317 and 319 both operate, relay 319 upon operating establishes a circuit from battery, interrupter 320 through the primary winding of tone coil 321 to ground at the inner lower front contact of relay 319 and connects the secondary

winding of tone coil 321 in a circuit extending from the lower terminal of the secondary winding, next to inner lower front contact of relay 319, condenser 322, left windings of repeating coil 307, upper front contact of relay 319 to the upper terminal of the secondary winding of tone coil 321. Tone current set up in this circuit by the interruptions of current in the primary winding of the tone coil 321, now reach the operator's headset receiver 323, over the sleeves of jack 312 and plug 311, and sleeves of jack 308 and plug 309 and the operator is given a steady warning tone that a call is awaiting her attention.

Hearing the steady tone, the operator depresses the non-locking positional listening key 324, thereby establishing a circuit from ground at the key over the upper front contact of relay 302, back contact of relay 325, to battery through the winding of relay 318. Relay 318 operates locking itself through the winding of relay 325 and its own upper front contact to ground at the right front contact of relay 317 and opening the circuit of relay 319 which now releases. Relay 319 upon releasing opens the primary and secondary circuits of tone coil 321 to discontinue the application of steady tone to the operator's headset receiver and closes a circuit from battery, winding of relay 326, lower back contact of relay 319, lower front contact of relay 313, thence as traced to ground at the right normal contacts of relay 315. At its inner lower front contact relay 326 reestablishes a circuit through the primary winding of tone coil 321 thence over the right normal contacts of relay 327 to ground at the lower normal contacts of relay 328 and establishes a circuit from the lower terminal of the secondary winding of tone coil 321, next to the lower front contact of relay 326, lower back contact of relay 329, condenser 330, inner lower front contact of relay 302, thence as traced to trunk conductor 122 through the right windings of repeating coil 113, returning over trunk conductor 121, thence as traced over conductor 211, inner upper front contact of relay 302, upper back contact of relay 329, upper front contact of relay 326 to the upper terminal of the secondary winding of tone coil 321. Tone current induced into this circuit from the primary winding of tone coil 321 is induced into the left windings of repeating coil 113 and reaches the A operator's telephone set. Relay 326 also closes a circuit for slow to operate relay 327 extending from ground, inner upper front contact of relay 326, middle lower normal contacts of relay 329 to battery through the winding of slow to operate relay 327. Relay 327 operates after an interval opening at its right normal contacts the previously traced circuit through the primary winding of tone coil 321 to discontinue the generation and transmission of tone current to the A operator's telephone set and at its left front contact extends the circuit over which it was operated to the winding of slow to operate relay 330. After an interval relay 330 operates and the primary winding of tone coil 321 is then reestablished as previously traced over the inner lower front contact of relay 326 thence over the right alternate contacts of relay 327 and the left contacts of relay 330 to ground at the lower normal contacts of relay 328. A second impulse of tone current is now transmitted over the previously traced circuit to the A operator's telephone set. Relay 330 upon operating also closes over its right contact an obvious circuit for slow to operate relay 328 which after an interval opens at its lower normal contacts the previously traced circuit through the primary winding of tone coil 321 to discontinue the generation and transmission of tone current. Two impulses of tone current have now been transmitted to the A operator's telephone set as a signal that she may proceed to transfer information for the completion of the desired connection to the B operator. During the transmission of these tone signals, the B operator also may hear the tone signals over a branch circuit extending from ground through the left winding of repeating coil 331, condensers 332 and 333, the upper back contact of relay 328, and the upper back contact of relay 319, and the inductive connection to the B operator's headset receiver 310 over the right winding of repeating coil 331.

Relay 328 upon operating also opens this branch tone circuit and closes an obvious circuit for relay 329 which at its middle lower transfer contacts opens the operating circuit of relays 327 and 330 and establishes a holding circuit for relay 328 for maintaining this relay operated under the control of relay 326 after relay 330 releases. Relay 329 at its outer back contacts also disconnects the secondary winding of tone coil 321 from the talking circuit extending to the A operator's position and connects this talking circuit over its outer front contacts to the B operator's headset receiver. The B operator is now listened in on the calling trunk and may receive instructions from the A operator for extending the connection. Relay 329 upon operating also closes an operating circuit for relay 316 extending from battery, inner lower front contact of relay 329, winding and left normal contacts of relay 316 to ground at the contacts of relay 336. Relay 316 upon operating locks to ground at its inner left front contact, opening at its outer left back contact the initial operating circuit of relay 336, transferring at its inner right contacts the operating circuits of relays 317 and 326 from ground at the normal contacts of relay 315 over the front contact of relay 314, to ground at the contacts of relay 336, and at its outer right front contact closing an obvious circuit for relay 315. Relay 315 now operates to prepare the circuit of pegcount meter 337 and to prepare locking circuits for relays 303 and 335.

When the operator releases the listening key 324, relay 325 operates in the locking circuit of relay 318, transferring the circuit from the contacts of key 324 over the front contact of relay 325, the left back contact of relay 334 to the right winding of relay 335 preparatory to the release of the operated position equipment.

The B operator having received the necessary information from the A operator proceeds to complete the desired connection. She first tests the desired line to determine its idle or busy condition by touching the tip of the trunk plug 216 to the sleeve of the line jack 217. If the line is busy, she will receive a click in her headset receiver through the windings of repeating coil 331 over a circuit extending from battery on the sleeve of jack 217, tip of plug 216, upper back contact of relay 204, conductor 218, middle upper front contact of relay 302, condenser 332, to ground through the left winding of coil 331. She will then pass back over the established connection to the originating office the information that the desired line is busy.

If she receives no busy click she will depress the proper ringing key of the trunk and then insert the plug 216 into the jack of the line thereby establishing a circuit from ground

through the cut-off relay 219, sleeves of jack 217 and plug 216, upper winding of sleeve relay 204 to battery through the lamp 205. Relays 219 and 204 operate in this circuit, relay 219 disconnecting the line relay 220 in the usual manner. Relay 204 upon operating opens at its upper back contact the connection between the tip of plug 216 and the test conductor 218 and at its upper front contact closes one point in the tip trunk conductor. At its lower contacts relay 204 opens the circuit previously traced from ground on conductor 115 through the lower winding of relay 204, inner upper front contact and upper winding of relay 202 to battery through the lower winding of relay 201 whereupon relay 202 releases in turn releasing relays 207 and 208. Relays 207 and 208 upon releasing in turn release relay 336. The release of relay 336 in turn releases relays 326, 328, 329, 315, 316 and 317. Relay 315 being slow to release closes a circuit from ground at the right back contact of relay 316, over the left contact of relay 315, to the pegcount meter 337 for a sufficient time to operate the meter.

When relay 204 operated as previously described, a circuit was established from battery, winding of ringing relay 222, back contact of relay 223, back contact of ringing trip relay 224, lower front contact of relay 204, upper back contact of relay 202, upper front contact of relay 201, upper winding of relay 204, sleeves of plug 216 and jack 217 to ground through the winding of cut-off relay 219. Relay 222 operates in this circuit opening at its back contact the connection between the talking conductors of the trunk and the tip and ring contacts of plug 216 and, assuming that the operator has depressed ringing key 225, closing a circuit extending from ground at the right back contact of pick-up relay 226, upper front contact of relay 222, upper front contact of relay 204, tips of plug 216 and jack 217, through the substation ringer relay 227, rings of jack 217 and plug 216, lower front contact of relay 222, left alternate contacts of key 225, right winding of trip relay 224, to the source of ringing current 228. Relay 227 operates in this circuit closing a circuit for the substation ringer 229, extending from ground through the ringer over the rings of jack 217 and plug 216, thence as traced to the ringing source 228. The ringer now operates as long as the key 225 remains depressed. When the called subscriber answers by removing his receiver from the switchhook, the trip relay 228 operates in the usual manner opening at its contact the shunt around the winding of relay 223 which now operates in the circuit previously traced through the winding of relay 222. Relay 223 upon operating shunts the winding of ringing relay 222 which now releases to open the previously traced ringing circuit and to close the tip and ring conductors of the trunk through to the called line. During the application of ringing current to the called line, ringing induction tone was transmitted back over condensers 230 and 231 and trunk conductors 121 and 122 to the calling subscriber's line so that the calling subscriber is apprised of the fact that the desired subscriber is being rung.

Upon the release of ringing relay 222, a supervisory circuit is established from the substation of the called line over the back contacts of relay 222, trunk conductors 121 and 122, right windings of repeating coil 113, and winding of supervisory relay 116 thereby operating relay 116. Relay 116 upon operating shunts the lower high resistance winding of relay 114 thereby decreasing the resistance of the circuit previously traced through the winding of cord supervisory relay 112 to such an extent that relay 112 operates to shunt the supervisory lamp 110 which becomes dark as a signal to the A operator that the called subscriber has answered.

Upon the termination of the conversation both the calling and called subscribers will return their receivers to their respective switchhooks. The return of the calling subscriber's receiver to its switchhook opens the circuit of the answering supervisory relay 123 which releases to cause the answering supervisory lamp 124 to become lighted. The return of the called subscriber's receiver to its switchhook releases the trunk supervisory relay 116 which in turn removes the shunt from the lower winding of relay 114 thereby causing the release of cord supervisory relay 112 and the lighting of lamp 110. The A operator noting the lighting of both lamps 110 and 124 now takes down the cord circuit 103 thereby restoring the calling line to its normal non-calling condition and releasing trunk relay 114. Relay 114 upon releasing in turn releases relay 201 which causes the lamp 205 to light as a disconnect signal. When the B operator removes plug 216 from jack 217 in response to the lighting of lamp 205, relays 204 and 223 release, and the called line is restored to its normal condition.

If the B operator desires to release her position equipment from the trunk, before she plugs the trunk into the jack of the desired line she may do so by reoperating the key 324. It will be recalled that after first operating and releasing key 324 to listen in on the trunk, relays 318, 325, 326, 328, 329, 315, 316, 317 and 336 are operated. The reoperation of key 324 at this time establishes a circuit from ground at key 324, front contact of relay 325, left back contact of relay 334, right winding of relay 335 to battery. Relay 335 upon operating locks in a circuit extending from battery, right winding of relay 303, outer right back contact of relay 334, left winding and contact of relay 335 to ground at the right contacts of relay 315. Relay 303 operates in this circuit and locks in a circuit from battery through its left winding and left contact to ground at the right contacts of relay 315. Relay 303 also opens the previously traced circuit over which the guard lamp 205 was flashed and extends its locking ground through the right winding of relay 334 to battery and through the left contact and left winding of relay 317 to battery thus operating relay 334 and holding relay 317 operated. Relay 334 upon operating locks under the control of key 324, opens the initial operating circuit of relay 335, opens the initial operating circuit of relay 303 and opens the circuit of relay 336. Relays 334, 303 and 317 now remain operated under the control of relay 315. With relay 334 operated a circuit is closed from ground at the right contacts of relay 315, over the contact and low resistance left winding of relay 335, outer right alternate contacts of relay 334, lower front contact of relay 302, conductor 221, inner lower front contact of relay 208, lower front contact of relay 207 to the lower front contact of relay 201, thus causing relay 202 to release in turn releasing relays 207 and 208. The release of relay 207 opens the circuit just traced through the left winding of relay 335 whereupon relay 335 releases. With relays 207 and 208 both released, the trunk is disconnected from the B position circuit. When the operator again releases key 324, relay 334 releases and if no other call is awaiting

attention on any other trunk incoming to the operator's position, relays 318, 325, 326, 328, 329, 315, 316, 317 and 303 now release.

The operation of the circuit with more than one call awaiting the attention of the B operator will now be described.

It will be assumed that following the seizure of trunk 120 by the A operator and before the B operator has completed the extension of the call incoming over the trunk 120, the A operator or another A operator plugs a cord circuit into the jack 109' of trunk 130 thereby causing the operation of relays 114', 201' and 202' in the manner previously described in connection with trunk 120. Since however relay 208 of trunk 120 is operated, the operation of relay 202' is ineffective at this time to operate relay 207' and consequently relays 207' and 208' do not operate to connect the B operator's position circuit with trunk 130. Lamp 205' is however steadily lighted through the operation of relays 201' and 202' as a trunk guard signal.

The B operator's position circuit being connected to trunk 120, the B operator receives a call waiting tone and proceeds to operate key 324 to transmit the order tones to the A operator's position and to listen her in on the trunk as previously described. After receiving the necessary information from the A operator, the B operator may release her position circuit from the trunk 120 by again operating the key 324. It will be recalled that after first operating and releasing key 324 to listen in on the trunk 120, relays 318, 325, 326, 328, 329, 315, 316, 317 and 336 are operated. The reoperation of key 324 at this time establishes a circuit from ground at key 324, front contact of relay 325, left back contact of relay 334, right winding of relay 335, to battery. Relay 335 upon operating locks in a circuit extending from battery, right winding of relay 303, outer right back contact of relay 334, left winding and contact of relay 335, to ground at the right contacts of relay 315. Relay 303 operates in this circuit, locking in a circuit from battery through its left winding and left contact to ground at the right contacts of relay 315. Relay 303 also opens the previously traced circuit over which the guard lamp 205 was flashed and extends its locking ground through the right winding of relay 334 to battery and through the left contact and left winding of relay 317 to battery, thus operating relay 334 and holding relay 317 operated. Relay 334 upon operating locks under control of key 324, opens the initial operating circuit of relay 335, opens the initial operating circuit of relay 303 and opens the circuit of relay 336. Relays 334, 303 and 317 now remain operated under the control of relay 315. With relay 334 operated a circuit is closed from ground at the right contacts of relay 315 over the contact and low resistance left winding of relay 335, outer right alternate contacts of relay 334, lower front contact of relay 302, conductor 221, inner lower front contact of relay 208, lower front contact of relay 207, through the lower front contact of relay 201, thus causing relay 202 to release, in turn releasing relays 207 and 208. The release of relay 207 opens the circuit just traced through the left winding of relay 335 whereupon relay 335 releases. With relays 207 and 208 both released, the trunk 120 is disconnected from the B position circuit and relays 207' and 208' may now operate to connect the trunk 130 to the position circuit.

With trunk 130 connected to the position circuit relay 314 which released upon the release of relay 208 now reoperates in a circuit over the inner lower front contact of relay 302, conductor 212, the lower front contact of relay 208', conductor 122', winding of trunk supervisory relay 116' to battery and ground through the lower right winding of repeating coil 113'. In the meantime the operation of relay 334 has released relay 336 which in turn has released relays 326, 328, 329 and 316. Relay 316 in turn opens the circuit of relay 315. However, since relay 315 is slow to release, it will not have released to open at its right alternate contacts the holding circuit of relays 303 and 317 before relay 314 reoperates. Consequently, relay 317 does not release before a circuit is established therefor from battery through its right winding, inner right normal contacts of relay 316, contacts of relay 314 to ground at the right normal contacts of relay 315 and since relay 317 does not release, it holds relays 318 and 325 operated. As soon, however, as relay 315 releases, the holding circuit of relay 303 is opened and relay 303 releases in turn opening the operating circuit of relay 334 which will not release if the operator has not released key 324. As soon as key 324 is released, relay 303 also releases.

With relays 318 and 325 operated, relay 319 can not now operate and the steady tone is not applied to the B operator's headset as a call waiting signal. Since relay 316 is now released the circuit of relay 326 is again established from battery, through its winding, the lower back contact of relay 319, the lower front contact of relay 318, the inner right normal contacts of relay 316, contacts of relay 314 to ground at the normal contacts of relay 315. Relays 326, 327, 328, 329 and 330 then operate in the manner previously described to transmit order tones over the connected trunk 130 to the A operator's telephone set and to connect the B operator's headset to enable the B operator to receive information from the A operator. This second call is then completed and the trunk 130 disconnected from the B position circuit in the manner just described for the first call, these operations continuing as long as calls are waiting the attention of the B operator.

What is claimed is:

1. In a telephone exchange system, first offices, a second office, trunks for trunking calls from a first office to said second office, an operator's position equipment at said second office having a telephone set and a key, means operable upon the seizure of a trunk at a first office for associating said operator's position equipment with said trunk, means operable by a first operation of said key for connecting said telephone set into a talking connection with said first office over said trunk, and means operable by the second operation of said key for entirely disconnecting said position equipment from said trunk.

2. In a telephone exchange system, first offices, a second office, trunks for trunking calls from a first office to said second office, an operator's position equipment at said second office, having a telephone set, a key, and means for transmitting order tones to said first office, means operable upon the seizure of a trunk at a first office for associating said operator's position equipment with said trunk, means operable by a first operation of said key for first causing the transmission of order tones to said first office and for then connecting said telephone set into a talking connection with said first office over said trunk, and means operable by a second operation of said key

for disconnecting said position equipment from said trunk.

3. In a telephone exchange system, first offices, a second office, trunks for trunking calls from a first office to said second office, an operator's position equipment at said second office having a telephone set and a key, means operable upon the seizure of a trunk at a first office for associating said operator's position equipment with said trunk, means operative upon the association of said trunk with said position equipment for transmitting a tone to said operator's telephone set as a call waiting signal, means operable by the first operation of said key for disconnecting said tone, for causing the transmission of order tones to said first office and the subsequent connection of said telephone set into a talking connection with said first office over said trunk, and means operable by a second operation of said key for disconnecting said position equipment from said trunk.

4. In a telephone exchange system, first offices, a second office, trunks for trunking calls from a first office to said second office, an operator's position equipment at said second office having a telephone set and a key, means operable upon the seizure of a trunk at a first office for associating said operator's position equipment with said trunk, means operative upon the association of said trunk with said position equipment for transmitting a tone to said operator's telephone set as a call waiting signal, a relay operable upon the first operation of said key for discontinuing said tone, means controlled by said relay for sequentially causing the transmission of order tones to said first office and connecting said telephone set into a talking connection with said first office over said trunk circuit, a second relay operable upon the release of said key, and means controlled by said second relay and operable by a second operation of said key for disconnecting said position equipment from said trunk.

5. In a telephone exchange system, first offices, a second office, trunks for trunking calls from a first office to said second office, an operator's position equipment at said second office having a telephone set and a key, means operable upon the seizure of a trunk at a first office for associating said operator's equipment with said trunk, a source of tone current, a relay operative upon the association of said trunk with said position equipment for connecting said source of tone current to said telephone set as a call waiting signal, a second relay operable upon the first operation of said key for releasing said first relay to disconnect said source of tone current from said telephone set and to operate means for first causing the transmission of order tones from said source to said first office and for then connecting said telephone set into a talking connection with said first office over said trunk, a third relay operable upon the release of said key and means controlled by said latter relay and operable by a second operation of said key for disconnecting said position equipment from said trunk.

6. In a telephone exchange system, first offices, a second office, trunks for trunking calls from a first office to said second office, an operator's position equipment at said second office associable with said trunks, said equipment including a telephone set and a key, means operable upon the seizure of more than one of said trunks at a first office for associating said operator's position equipment with a first one of said trunks, means operable by a first operation of said key for connecting said telephone set into a talking connection with said first office over said first trunk, and means operable by a second operation of said key for entirely disassociating said position equipment from said first one of said trunks and for connecting said telephone set into a talking connection with another of said seized trunks.

7. In a telephone exchange system, first offices, a second office, trunks for trunking calls from a first office to said second office, an operator's position equipment at said second office associable with said trunks, said equipment including a telephone set and a key, means operable upon the seizure of more than one of said trunks at a first office for associating said operator's equipment with a first one of said trunks, means operative upon the association of said first trunk with said position equipment for transmitting a tone signal to said operator's telephone set, means operable by a first operation of said key for discontinuing said tone signal and for connecting said telephone set into a talking connection with said first office over said first trunk, and means operable by a second operation of said key for disassociating said position equipment from said first trunk and for connecting said telephone set into a talking connection with another of said seized trunks without transmitting a tone signal to said operator's telephone set.

8. In a telephone exchange system, first offices, a second office, trunks for trunking calls from a first office to said second office, an operator's position equipment at said second office associable with said trunks, said equipment including a telephone set and a key, means operable upon the seizure of more than one of said trunks at a first office for associating said operator's equipment with a first one of said trunks, means operative upon the association of said first trunk with said position equipment for transmitting a tone signal to said operator's telephone set, means operable by a first operation of said key for discontinuing said tone signal, for causing the transmission of order tones to said first office and the subsequent connection of said telephone set into a talking connection with said first office over said first trunk, and means operable by a second operation of said key for disassociating said position equipment from said first trunk and for causing the transmission of order tones to said first office over another of said seized trunks and for subsequently connecting said telephone set into a talking connection with said first office over said other trunk.

9. In a telephone exchange system, first offices, a second office, trunks for trunking calls from a first office to said second office, an operator's position equipment at said second office associable with said trunks, said equipment including a telephone set and a key, means operable upon the seizure of more than one of said trunks at a first office for associating said operator's equipment with a first one of said trunks, means operable by a first operation of said key for connecting said telephone set into a talking connection with said first office over said first trunk, and means operable by each following operation of said key for entirely disassociating said position equipment from the trunk with which it is associated and for connecting said telephone set into a talking connection with another of said seized trunks.

10. In a telephone exchange system, first offices, a second office, trunks for trunking calls from a first office to said second office, an operator's position equipment at said second office as-

sociable with said trunks, said equipment including a telephone set, a key and a source of tone current, means operable upon the seizure of more than one of said trunks at a first office for associating said operator's equipment with a first one of said trunks, means operable by a first operation of said key for first transmitting order tones from said source to said first office over said first trunk and for then connecting said telephone set into a talking connection therewith, and means operable by each following operation of said key for disassociating said position equipment from the trunk with which it is associated and for then sequentially causing the transmission of order tones from said source over another of said seized trunks and connecting said telephone set into a talking connection therewith.

11. In a telephone exchange system, first offices, a second office, trunks for trunking calls from a first office to said second office, an operator's position equipment at said second office associable with said trunks, said equipment including a telephone set, a key and a source of tone current, means operable upon the seizure of more than one of said trunks at a first office for associating said operator's equipment with a first one of said trunks, a relay operable upon the association of said first trunk with said position equipment for connecting said source of tone current to said telephone set, a second relay operable upon the first operation of said key for releasing said first relay to disconnect said source of tone current from said telephone set and to operate means for first causing the transmission of order tones from said source to said first office over said first trunk and for then connecting said telephone set into a talking connection therewith, a third relay operable upon the release of said key, and means controlled by said latter relay and operable by each following operation of said key for disassociating said position equipment from the trunk with which it is associated and for then sequentially causing the transmission of order tones from said source over another of said seized trunks and connecting said telephone set into a talking connection therewith.

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