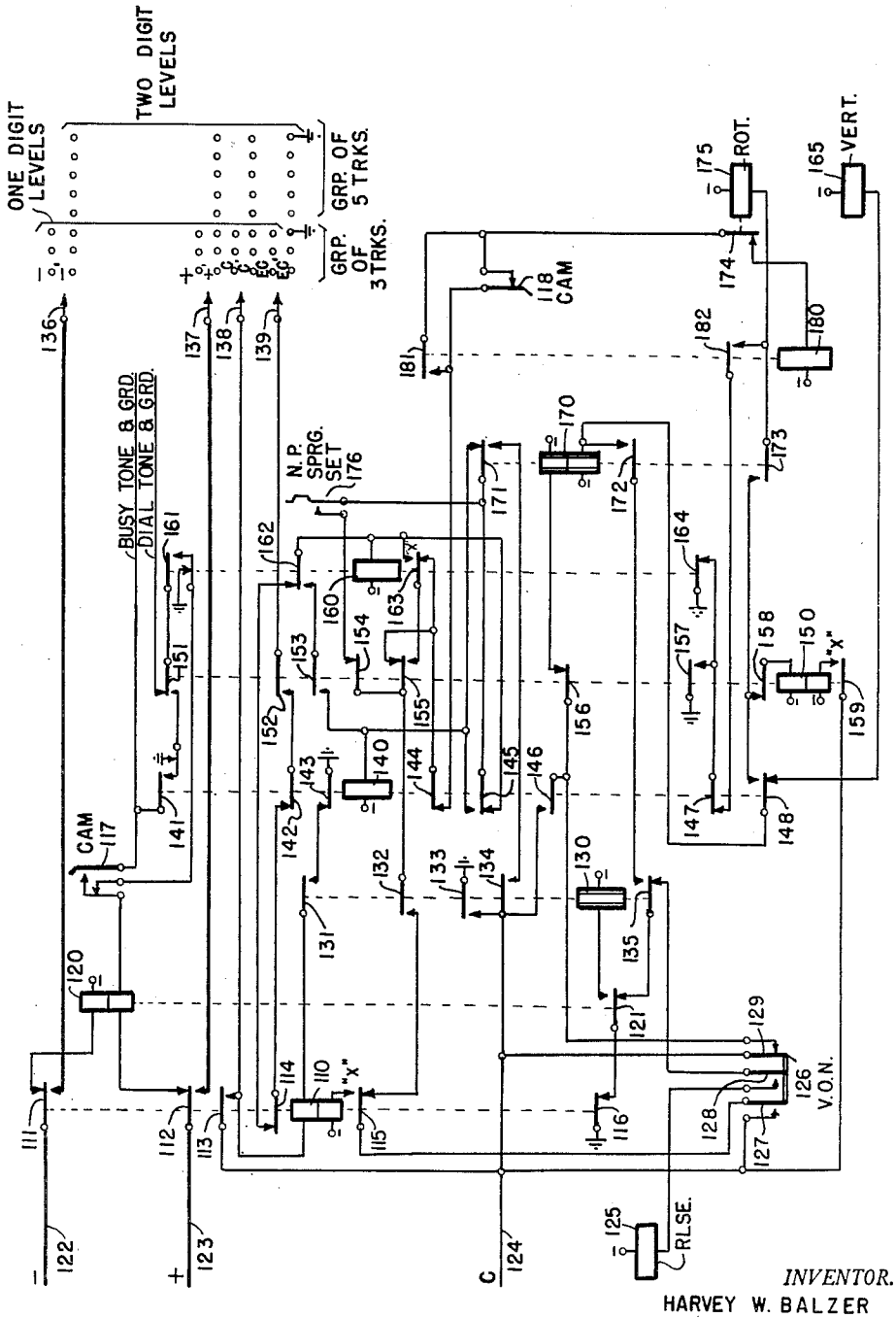
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COMBINATION ONE AND TWO DIGIT SELECTOR SWITCHES

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COMBINATION ONE- AND TWO-DIGIT SELECTOR SWITCHES

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This invention relates in general to automatic telephone systems, and more particularly to selector switches employed in such systems for selecting trunk paths to other switches or circuits in the train.

It is an object of the invention to provide an improved selector switch operable either by means of a single digit for selecting a free trunk of one group of trunks or by means of two digits for selecting a free trunk in another group of trunks.

Another object of the invention is to provide new and novel means for causing a selector switch to stop on the last trunk of a group of trunks, for returning busy tone to the calling station when said last trunk is in prior use, and for causing the selector switch to seize said last trunk when the last trunk is in the idle position.

A feature of the invention resides in the novel arrangement wherein a relay is caused to partially operate when the last trunk of a group is reached for the purpose of stopping the selector switch on the last trunk regardless of whether the last trunk is found in a busy position or an idle position, the said relay operating fully should the last trunk be found in the busy position for the purpose of causing busy tone to be connected to the selector switch, and a second relay operating simultaneously with said first relay should the last trunk be found in the idle position for the purpose of disabling said first relay before said first relay has had time to operate fully and cause busy tone to be connected to the selector switch.

There are other objects and features of the invention having to do for the most part with the details in carrying out the foregoing. The various objects and features of the invention will be understood best upon a further perusal of the specification, reference being had to the accompanying drawing which shows by means of a conventional circuit diagram a sufficient amount of apparatus to enable the invention to be described and understood.

The selector switch shown in the drawing comprises the well-known Strowger switch mechanism of the 400-point type having vertical and rotary movement. Associated with this Strowger mechanism is a switch spring set **176**, known as a normal post spring set. This spring set operates when the switch shaft is raised to a predetermined bank level, or levels, responsive to the dialing of the first digit for the purpose of changing the rotary movement of the switch from automatic rotation to dial controlled rotation. The Strowger mechanism further includes a set of switching springs **126** which are actuated by the movement of the switch shaft in the vertical direction away from its normal position, and a set of switching springs **117** and **118** which are actuated by the movement of the switch shaft into its eleventh rotary position. The selector switch also includes a line relay **120**, a hold relay **130**, a stepping relay **180**, a trunk group stopping relay **160**, a switching through relay **110** and other control relays.

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The selector switch has access, by way of its wipers, to ten bank levels any one of which is selected by the dialing of the related digit. Bank levels not associated with the operation of normal post spring set **176** have automatic rotation, i. e., an idle trunk in such a bank level is automatically selected following the pulsing of the switch shaft to the bank level. Bank levels directly associated with the operation of normal post spring set **176** do not have automatic rotation for selecting a particular group of trunks, as the operation of normal post spring set **176** changes the control of the rotary movement from automatic stepping to dial controlled stepping for the selection of a trunk group.

The "EC" bank contacts of one digit levels have no function. The "C" bank contacts of one digit levels are normally connected to battery potential when the related trunks are in idle positions, and to ground potential when the related trunks are in busy positions. The "EC'" bank contacts of two digit levels are divided into one or more trunk groups, the last "EC'" contact of each such trunk group being permanently connected to ground potential. In the accompanying drawing, the first three "EC'" contacts constitute one trunk group, the next five "EC'" contacts constitute another trunk group, the last two "EC'" contacts of the level not being shown. The "C'" bank contacts of two digit levels are normally connected to battery potential when the related trunks are in idle positions, and to ground potential when the related trunks are in busy positions.

It should be undertsood at this time that while the embodiment of the present invention disclosed and described in this specification includes the well-known Strowger selector switch of definite bank capacity, the invention is not limited to the particular form shown but may utilize other bank capacities or type of switch. It should be further understood that while a plurality of battery connections are shown in the drawing, they are preferably the same battery. Also, in

order to simplify the drawing further, such well-known facilities as busy key, test jack, spark quenching apparatus, ringing and tone equipment, and the like, have been omitted.

Having described the equipment and apparatus, a detailed description of the operation will now be given.

One digit operation

Whenever the selector shown in the drawing is in the idle, or free, position, battery through the upper winding of relay 170 will be found on the "C" conductor 124. A preceding switch or circuit seizing this selector connects ground to conductor 124 thereby causing relay 170 to operate. At the same time a metallic loop is completed across conductors 122 and 123 thus causing relay 120 to operate. The operation of relay 170 prepares a number of circuits, and the operation of relay 120 causes relay 130 to operate from ground, armature 116, armature 121 and working contact, winding of relay 130 to battery.

At armature 133, relay 130 connects ground potential to conductor 124 for the purpose of guarding the connection against intrusion; and, at armature 134, causes relay 160 to operate from ground, armatures 133, 134, armature 171 and working contact, armature 145 and resting contact, winding of relay 160 to battery. At armature 161, relay 160 transfers the lower winding of relay 120 from direct ground to dial tone and ground to inform the calling person that dialing of this selector may now commence.

The calling person then dials the wanted level of the selector, and the loop circuit to relay 120 is accordingly interrupted the number of times corresponding to the digit dialed. With each restoration of relay 120, the circuit to relay 130 is opened at the working contact of armature 121 but relay 130 is of the slow-to-release type and, therefore, remains operated during the pulsing; and a circuit is completed in multiple to the lower winding of relay 170 and vertical magnet 165 at armature 121 and resting contact. Vertical magnet 165 accordingly raises the switch shaft and wipers 136, 137, 138 and 139 to the dialed level in the well-known Strowger manner, the vertical off-normal spring set 126 operating with the first vertical step. At armature spring 129, V. O. N. spring set 126 opens the circuit of the upper winding of relay 170; and, at armature spring 127, V. O. N. spring set 126 causes relay 180 to operate from ground, armature 133, armature spring 127, armature 115 and resting contact, armature 132, armature 155 and resting contact, armature 144, cam spring set 118, interrupter armature 174, winding of relay 180 to battery. At armature 181, relay 180 shunts out cam spring set 118.

Upon the completion of the pulsing, relay 120 comes to rest in the operated position thereby maintaining the circuit to relay 130 at armature 121 and working contact. Relay 130, therefore, cannot restore at this time. Relay 170, however, restores shortly thereafter because the circuit to its upper winding is open at spring 129 of V. O. N. spring set 126, and the circuit to its lower winding is now open at the resting contact of armature 121. At the working contact of armature 171, relay 170 opens the circuit to relay 160, causing relay 160 to restore; and, at armature 172, further opens the multiple circuit to its lower winding and vertical magnet 165. At armature 164, relay 160 causes rotary magnet 175 to operate from ground, armatures 164, 147, 182, winding of rotary magnet 175 to battery; and, at armature 161 replaces the dial tone and ground on the lower winding of relay 120 with direct ground. Rotary magnet 175 accordingly rotates the shaft and wipers one step in the bank level selected by the vertical pulsing. The operation of rotary magnet 175 also opens the circuit to relay 180 at interrupter armature 174, causing relay 180 to restore and open the circuit to rotary magnet 175 at armature 182. The operation of the selector at this moment is dependent upon whether the trunk connected to the first bank contact set selected by the vertical pulsing is in prior use or is free.

Should the trunk connected to the first bank contact set be free, then wiper 138 of the selector encounters battery supplied from the selected trunk to the "C" contact of the first bank contact set, and a circuit for the upper winding of relay 110 is completed from ground, armature 143, 131, upper winding of relay 110, wiper 138 to battery on the "C" contact connected to wiper 138, causing relay 110 to operate before rotary magnet 175 can restore and complete the circuit to relay 180 at interrupter armature 174. Relay 110 closes its "X" contacts 115 first thereby completing the circuit to its lower winding which causes relay 110 to operate fully. At the resting contact of armature 115, relay 110 opens a further point in the circuit to relay 180 to prevent any further possible rotation across the selected bank level: at armature 113, extends ground potential to "C" wiper 138 thereby shunting its upper winding: at armatures 111 and 112, opens the loop circuit of relay 120, causing relay 120 to restore: at armatures 111 and 112 and respective working contacts, extends conductors 122 and 123 through to wipers 136 and 137; and, at armature 116, opens the circuit of relay 130, relay 130 restoring after a short interval. Rotary magnet 175 restores and partly prepares a circuit to relay 180 but the circuit is still open at the resting contact of armature 115.

The restoration of relay 120 opens a point in the circuit to relay 130, and also partly prepares the circuit to release magnet 125. At armature 133, relay 130 removes ground potential from "C" conductor 124 thereby opening the circuit of the lower winding of relay 110 and removing the ground shunt from the upper winding of relay 110. Relay 110 is now held operated over the circuit from ground on the "C" bank contact connected to wiper 138 (ground potential being connected to the "C" bank contact as one result of the switching through of conductors 122 and 123 to the selected trunk ahead), wiper 138, armature 113, spring 127 of V. O. N. spring set 126, armature 115 and working contact, lower winding of relay 110 to battery. The ground from wiper 138 through armature 113 is also thereby extended to "C" conductor 124 to retain the circuit preceding this selector and also to guard the connection from intrusion.

Should the trunk connected to the first bank contact set be in prior use, then wiper 138 of the selector encounters ground potential on the "C" contact of the first bank contact set and, consequently, relay 110 cannot operate at this time. The circuit to relay 180 is, therefore, completed at interrupter armature 174 when rotary magnet 175 restores, causing relay 180 to re-operate and again complete the circuit to rotary magnet 175 at armature 182. Rotary magnet 175 re-operates, advances the selector switch shaft and wipers a second rotary step, and again opens the circuit to relay 180. This interaction between rotary magnet 175 and relay 180 continues until wiper

138 encounters battery potential on the "C" contact of a bank contact set connected to a free trunk or until wipers 136, 137, 138 and 139 are advanced to the eleventh position of the banks. In the latter event cam spring sets 117 and 118 are operated, busy tone and ground is connected to the lower winding of relay 120 in place of direct ground, and a further point in the circuit of relay 180 is opened at cam spring set 118. Rotary magnet 175 restores but relay 180 cannot again re-operate.

Assuming now that the selector has selected a free trunk, then relay 110 is operated in the manner previously explained, and the calling person's transmission circuit is extended through to the selected trunk. From this point on, the connection may be extended to other switches or circuits in any well-known manner according to need or desire, but since such arrangements are not part of the present invention, it is deemed unnecessary to include further details in this specification. Upon the completion of the conversation the caling person disconnects, whereupon ground potential is removed from the "C" contact connected to wiper 138 in any well-known manner, causing relay 110 of the selector to restore. At armatures 111 and 112, relay 110 switches conductors 122 and 123 from wipers 136 and 137 to relay 120: at armature 113, disconnects "C" conductor 124 from wiper 138; and, at armature 116, completes the circuit to release magnet 125. The operation of release magnet 125 causes the selector to be restored to normal in the well-known Strowger manner, and the circuit of release magnet 125 is opened at spring 128 of V. O. N. spring set 126 as the selector switch shaft reaches its normal position.

Should the calling person fail to obtain a free trunk, then busy tone and ground is connected to the lower winding of relay 120, as previously explained. Upon hearing the busy tone, the calling person disconnects thereby opening the loop circuit to relay 120. Relay 120 restores and, at armature 121, opens the circuit to relay 130 and partly prepares the circuit to release magnet 125. Relay 130 restores after a short interval and, at armature 135 and resting contact completes the circuit to release magnet 125. At armature 133, relay 130 removes ground potential from "C" conductor 124 thereby to free the circuit preceding this selector. The operation of release magnet 125 causes the selector to be restored to normal in the well-known Strowger manner, and the circuit of release magnet 125 is opened at spring 128 of V. O. N. spring set 126 as the selector switch shaft reaches its normal position.

Two digit operation

The seizure and vertical stepping operations of the selector for two digit service are essentially the same as described in the preceding section for one digit service plus the added operation that, as the selector switch shaft and wipers are raised to a two digit bank level, normal post spring set 176 is operated.

The operation on N. P. spring set 176 completes a multiple circuit for operated relay 160 from ground, armature 133, spring 127 of V. O. N. spring set 126, armature 115 and resting contact, armatures 132, 154, N. P. spring set 176, armature 145 and resting contact, winding of relay 160 to battery. The operation of N. P. spring set 176 also partly prepares a circuit for relay 140.

Shortly after the completion of the vertical stepping, relay 170 restores to normal for the reasons given in the preceding section concerning one digit operation. At armature 171, relay 170 opens one of the multiple circuits to relay 160: at armature 172, further opens the multiple circuit to its lower winding and vertical magnet 165; and, at armature 171 and resting contact, causes relay 140 to operate from ground, armature 133, spring 127 of V. O. N. spring set 126, armature 115 and resting contact, armatures 132, 154, N. P. spring set 176, armature 171 and resting contact, winding of relay 140 to battery. Relay 140 locks to the circuit from ground, armature 133, spring 127 of V. O. N. spring set 126, armature 115 and resting contact, armatures 132, 154, N. P. spring set 176, armature 145 and working contact, winding of relay 140 to battery.

At armature 145, relay 140 opens the second multiple circuit to relay 160, causing relay 160 to restore: at armature 144, opens the circuit to relay 180, causing relay 180 to restore; and, at armature 146, causes relay 170 to re-operate from ground, armatures 133, 146, 156, upper winding of relay 170 to battery. At armature 181, relay 180 removes the shunt from cam spring set 118; and, at armature 182, opens a further point in the circuit of rotary magnet 175. At the resting contact of armature 161, relay 160 replaces dial tone and ground on the lower winding of relay 120 with direct ground; and, at armature 164, partly prepares a circuit to rotary magnet 175. At armature 171 and working contact, relay 170 connects a multiple ground to the winding of relay 140 by way of armature 133, 134, and armature 145 and working contact.

The calling person then dials the second, or rotary stepping, digit of the selector, and the loop circuit to relay 120 is accordingly interrupted the number of times corresponding to the digit just dialed. With each restoration of relay 120, the circuit to relay 130 is opened at the working contact of armature 121 but relay 130 is of the slow-to-release type and, therefore, remains operated during the pulsing; and a circuit is completed in multiple to the lower winding of relay 170 and rotary magnet 175 at armature 121 and resting contact. This multiple circuit may be traced from ground, armature 116, armature 121 and resting contact, armature 135 and working contact, armature 172, lower winding of relay 170 to battery and through armature 172, armature 148 and working contact, armature 173, winding of rotary magnet 175 to battery. Rotary magnet 175 accordingly operates and restores for each dialed pulse and rotates the selector shaft and wipers 136, 137, 138 and 139 across the bank level selected by the vertical pulsing to the dialed bank contact set in the well-known Strowger manner.

With the first restoration of relay 120 responsive to the dialing of the second digit, a circuit is completed for relay 150 from ground, armature 116, armature 121 and resting contact, armature 135 and working contact, armature 172, armature 148 and working contact, armature 158, upper winding of relay 150 to battery, causing relay 150 to operate its "X" contact (at armature 159) thereby to fully operate and lock relay 150 to the circuit from ground, armatures 133, 159, lower winding of relay 150 to battery. At armature 158, relay 150 opens the circuit to its upper winding: at armature 157 partly prepares a multiple circuit to rotary magnet 175: at armature 156, opens the circuit to the upper winding of relay 170, and at armature 154, opens one of the multiple circuits to relay 140.

Upon the completion of the pulsing of the second digit, relay 120 comes to rest in the operated position thereby maintaining the circuit to relay 130 at armature 121 and working contact. Relay 130, therefore, cannot restore at this time. Relay 170, however, restores shortly thereafter because the circuits to its upper winding are open at spring 129 of V. O. N. spring set 126 and at armature 156, and the circuit to its lower winding is now open at the resting contact of armature 121. At armature 171, relay 170 disconnects the remaining ground from the winding of relay 140, causing relay 140 to restore. At armature 142, relay 140 connects the winding of relay 160 to the E. C. wiper 139: at armature 143, connects ground potential to the upper winding of relay 110: at armature 147, partly prepares a circuit to rotary magnet 175; and, at armature 144, causes relay 180 to operate from ground, armature 133, spring 127 of V. O. N. spring set 126, armature 115 and resting contact, armature 132, armature 155 and working contact, armature 163 and resting contact, armature 144, cam spring set 118, interrupter armature 174, winding of relay 180 to battery. At armature 181, relay 180 shunts out cam spring set 118; and, at armature 182, causes rotary magnet to operate from multiple ground on armature 147, armature 182, winding of rotary magnet 175 to battery. Rotary magnet 175 accordingly steps the wipers 136, 137, 138 and 139 to the dialed bank contact set of the wanted group of trunks in the well-known Strowger manner. The operation of the selector at this moment is dependent upon whether the dialed trunk is in prior use or is free.

Should the dialed trunk be free, then "C" wiper 138 encounters battery supplied from the dialed trunk to the C' contact connected to wiper 138, and a circuit for the upper winding of relay 110 is completed from ground, armature 143, 131, upper winding of relay 110, wiper 138 to battery on the C' contact connected to wiper 138, causing relay 110 to operate before rotary magnet 175 can again restore and again complete the circuit to relay 180 at interrupter armature 174. Relay 110 closes its "X" contact 115 first thereby completing the circuit to its lower winding which causes relay 110 to operate fully. At the resting contact of armature 115, relay 110 opens a further point in the circuit to relay 180 to prevent any further possible rotation in the selected trunk group: at armature 113, extends ground potential to "C" wiper 138 thereby shunting its upper winding: at armatures 111 and 112, opens the loop circuit of relay 120, causing relay 120 to restore: at armatures 111 and 112 and respective working contacts, extends conductors 122 and 123 to wipers 136 and 137; and at armature 116, opens the circuit to relay 130, relay 130 restoring after a short interval. Rotary magnet 175 restores and partly prepares a circuit to relay 180 but the circuit is still open at the resting contact of armature 115.

The restoration of relay 120 opens a point in the circuit to relay 130 and also partly prepares the circuit to release magnet 125. At armature 133, relay 130 removes ground from "C" conductor 124 thereby opening the circuit of the lower winding of relay 110 and removing the ground shunt from the upper winding of relay 110. Relay 110 and 150 are now held operated over the circuit from ground on the C' bank contact connected to wiper 138 (ground potential being connected to the C' bank contact as one result of the switching through of conductors 122 and 123 to the selected trunk ahead), wiper 138, armature 113, spring 127 of V. O. N. spring set 126, armature 115 and working contact, lower winding of relay 110 to battery, and through armature 113, armature 159, lower winding of relay 150 to battery. The ground from wiper 138 through armature 113 is also thereby extended to "C" conductor 124 to retain the circuit preceding this selector and also to guard the connection against intrusion.

Should the dialed trunk be in prior use and it is not the last trunk of the group, then wiper 138 of the selector encounters ground potential on the C' contact of the dialed trunk and, consequently, relay 110 cannot operate at this time. The circuit to relay 180 is, therefore, completed at interrupter armature 174 when rotary magnet 175 restores the last time as a result of the dialing of the second digit, causing relay 180 to again operate and again complete the circuit to rotary magnet 175 at armature 182. Rotary magnet 175 again operates, advances wipers 136, 137, 138 and 139 to the bank contact set of the next trunk in the group, and again opens the circuit to relay 180. This interaction between rotary magnet 175 and relay 180 continues until wiper 138 encounters battery potential on the C' contact of a free trunk of the group or until the last trunk of the group is reached.

Assuming further that the last trunk of the group has been reached in the manner just described, and that the last trunk of the group is in prior use, then wiper 138 of the selector encounters ground potential on the C' bank contact of the last trunk, and relay 110, therefore, cannot operate. At the same time, "E. C." wiper 139 encounters ground potential on the "E. C'" bank contact of the last trunk, and relay 160 of the selector operates from this ground potential by way of armatures 152, 142, 114, 162, winding of relay 160 to battery. Relay 160 operates its "X" contact (armature 163) first thereby completing a locking circuit from ground, armature 133, spring 127 of V. O. N. spring set 126, armature 115 and resting contact, armature 132, armature 155 and working contact, armature 163 and working contact, winding of relay 160 to battery. At the resting contact of armature 163, relay 160 opens a point in the circuit to relay 180 before rotary magnet 175 can again restore and again complete the circuit to relay 180 at interrupter armature 174 thereby eliminating any possibility of the selector wipers being rotated from the bank contacts of the last trunk of the group. At armature 162, relay 160 disconnects "E. C." wiper 139 from the winding of relay 160; and, at armature 162 and working contact, causes relay 140 to operate from ground, armature 133, spring 127 of V. O. N. spring set 126, armature 115 and resting contact, armature 132, armature 155 and working contact, armature 163 and working contact, armature 162 and working contact, armature 153, winding of relay 140 to battery. Rotary magnet 175 restores for the last time and partly prepares a circuit to relay 180 but the circuit is still open at the resting contact of armature 163. At armature 141, relay 140 replaces direct ground on the lower winding of relay 120 with busy tone and ground to indicate to the calling person that all of the trunks of the group are in prior use. At armature 143, relay 140 disconnects ground potential from the upper winding of relay 110 to prevent relay 110 from later operating and switching

through should the occupied trunk become free before the calling person disconnects.

Should the last trunk of the group be free when the selector switch wipers reach the last trunk, then wiper 138 encounters battery on the "C'" bank contact and relay 110 immediately operates and locks in the manner previously described. At the same time, wiper 139 encounters ground potential on the "E. C.'" bank contact and relay 160 operates its "X" contact (armature 163). Relay 160, however, cannot operate fully or lock because the simultaneous operation of relay 110 opens the locking circuit of relay 160 at armature 115 and the starting circuit of relay 160 at armature 114. Relay 110, therefore, at this time performs the function of disabling relay 160 in addition to performing the operations detailed in the previous paragraph reading "Should the dialed trunk be free . . ."

Assuming now that the selector has selected a free trunk in the wanted group, then relay 110 is operated in the manner previously explained and the calling person's transmission circuit is extended through to the selected trunk. From this point on, the connection may be extended to other switches or circuits in any well-known manner according to need or desire, but since such arrangements are not part of the present invention it is deemed unnecessary to include further details in this specification. Upon the completion of the conversation the calling person disconnects, whereupon ground potential is removed from the "C'" contact connected to wiper 138 in any well-known manner, causing relays 110 and 150 to restore. At armatures 111 and 112, relay 110 switches conductors 122 and 123 from wipers 136 and 137 to relay 120: at armature 113, disconnects "C" conductor 124 from wiper 138; and, at armature 116, completes the circuit to release magnet 125. The operation of release magnet 125 causes the selector to be restored to normal in the well-known Strowger manner, and the circuit of release magnet 125 is opened at spring 128 of V. O. N. spring set 126 as the selector switch shaft reaches its normal position.

Should the calling person fail to obtain a free trunk in the desired group, then busy tone and ground is connected to the lower winding of relay 120, as previously explained. Upon hearing the busy tone, the calling person disconnects thereby opening the loop circuit to relay 120. Relay 120 restores and, at armature 121, opens the circuit to relay 130 and partly prepares the circuit to release magnet 125. Relay 130 restores after a short interval and, at armature 135 and resting contact, completes the circuit to release magnet 125. At armature 132, relay 130 opens the locking circuits of relays 140 and 160, causing relays 140 and 160 to restore: at armature 133, opens the locking circuit of relay 150, causing relay 150 to restore; and, at armature 133, relay 130 also removes ground potential from "C" conductor 124 thereby to free the circuit preceding this selector. The operation of release magnet 125 causes the switch shaft and wipers of the selector to be restored to normal position in the well-known Strowger manner. As the switch shaft drops from the dialed trunk bank level, N. P. spring set 176 returns to normal position, and the circuit of release magnet 125 is opened at spring 128 of V. O. N. spring set 126 as the switch shaft reaches its normal position.

What is claimed is:

1. In a telephone system, a group of switches, a group of trunks accessible to said switches, means for causing any one of said switches to select the last trunk of said trunk group, a relay operated in response to the selection of said last trunk by one of said switches, means for locking said operated relay when said one switch selects said last trunk at a time said last trunk is in a busy position, and means responsive to the locking of said operated relay for preventing further selective action of said one switch and for causing busy tone to be connected to said one switch.

2. The telephone system as claimed in claim 1 together with means for causing said one switch to seize said last trunk when said one switch selects said last trunk at a time said last trunk is in a free position, the operation of said last means also disabling said relay.

3. In a telephone system, a station having a dial, a switch, two groups of trunks, means for causing said switch to select and seize a free trunk in one of said groups when a single digit code is dialed at said station, means for causing said switch to select the first trunk of said other group when a two digit code is dialed at said station, means for automatically causing said switch to by-pass the first and intermediate trunks of said other group when said first and intermediate trunks are busy at a time said switch selects said first trunk, relay means responsive to the selection of the last trunk of said other group by said switch for stopping said switch on said last trunk, and means responsive to said stopping of said switch for causing said switch to seize said last trunk.

4. In a telephone system, a group of switches, a group of trunks accessible to said switches, means for causing any one of said switches to select the last trunk of said trunk group, a relay partially operated responsive to the selection of said last trunk by one of said switches, means responsive to said partial operation of said relay for fully operating said relay when said one switch selects said last trunk at a time said last trunk is in a busy condition, means responsive to said full operation of said relay for preventing further selective action of said one switch, and means also responsive to said full operation of said relay for causing busy tone to be applied to said switch.

5. In a telephone system, a group of switches, a group of trunks accessible to said switches, means for causing one of said switches to select the last trunk of said trunk group, a relay operated responsive to said selection of said last trunk for stopping said switch on said selected last trunk, means for locking said operated relay when said stopping of said switch occurs at a time said last trunk is in a busy condition, and means including contacts of said locked relay for preventing further selective action of said one switch and for completing a busy tone circuit.

6. In a telephone system, a station having a dial, a switch, two groups of trunks, means for causing said switch to select a free trunk in one of said groups when a single digit code is dialed at said station, means for causing said switch to select the first trunk of said other group when a two digit code is dialed at said station, means for causing said switch to pass over the first and intermediate trunks of said other group when said first and intermediate trunks of said other group are busy at a time said switch selects said first trunk, a first relay partially

operated responsive to the selection of the last trunk of said other groups, a second relay partially operated responsive to said selection of said last trunk of said other groups, means responsive to said partial operation of either of said two relays for stopping said switch on said last trunk of said other groups, means responsive to said partial operation of said first relay for fully operating said first relay, means controlled by said full operation of said first relay for holding said stop switch on said last trunk of said other group, and means controlled by said full operation of said first relay for causing the restoration of said partially operated second relay.

7. In a telephone system, a group of switches, a group of trunks accessible to said switches, means for causing one of said switches to select the last trunk of said group, a relay partially operated in response to said selection of said last trunk of said group irrespective of whether said selection is made at the time said selected trunk is in a busy condition or in a free condition, means controlled by said partially operated relay for holding said one switch on said selected trunk, means responsive to said partial operation of said relay occurring at a time said selected trunk is in a busy condition for fully operating said relay, said holding means controlled by said operated relay for further holding said one switch on said selected trunk, means responsive to said full operation of said relay for causing busy tone to be applied to said one switch, a second relay operated in response to said selection of said last

trunk of said group occurring at a time said selected trunk is in a free condition, means independent of said one partially operated relay and controlled by said operation of said second relay for holding said one switch on said selected trunk, and means controlled by said operation of said second relay for causing said one partially operated relay to restore thereby to prevent an application of busy tone to said one switch.

8. In a telephone system, a switch, a group of trunks accessible to said switch, means for causing said switch to select the last trunk of said group at a time said last trunk is in a free condition, two relays operated responsive to said selection of said last trunk, means controlled by said operations of said relays for stopping said switch on said selected trunk, means controlled by one of said operated relays independent of said other operated relay for holding said stopped switch on said selected trunk, and means controlled by said one operated relay for causing said other operated relay to restore.

HARVEY W. BALZER.

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