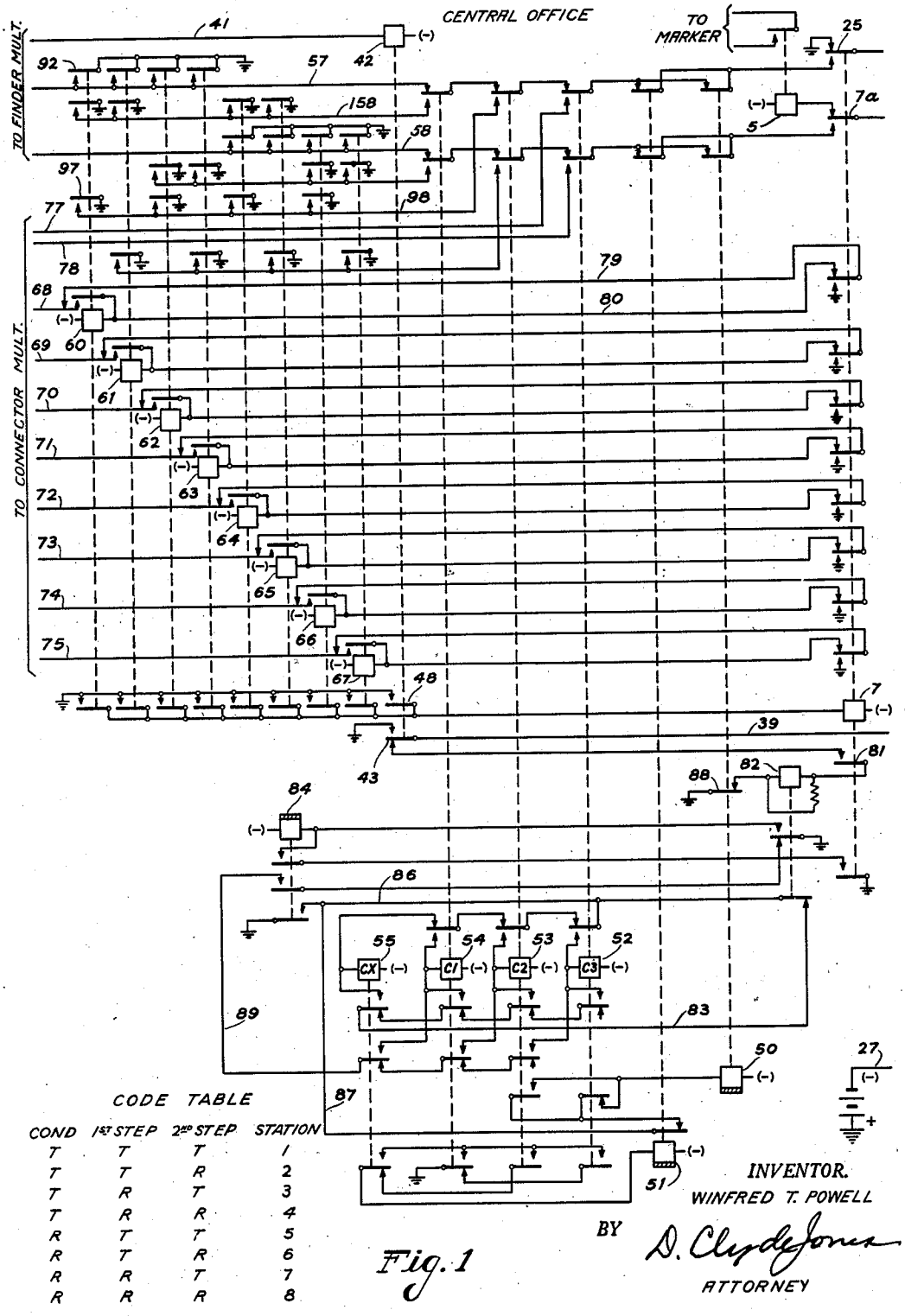
June 18, 1946. W. T. POWELL 2,402,446

TELEPHONE SYSTEM

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CODE TABLE

COND	1ST STEP	2ND STEP	STATION
T	T	T	1
T	T	R	2
T	R	T	3
T	R	R	4
R	T	T	5
R	T	R	6
R	R	T	7
R	R	R	8

Fig. 1

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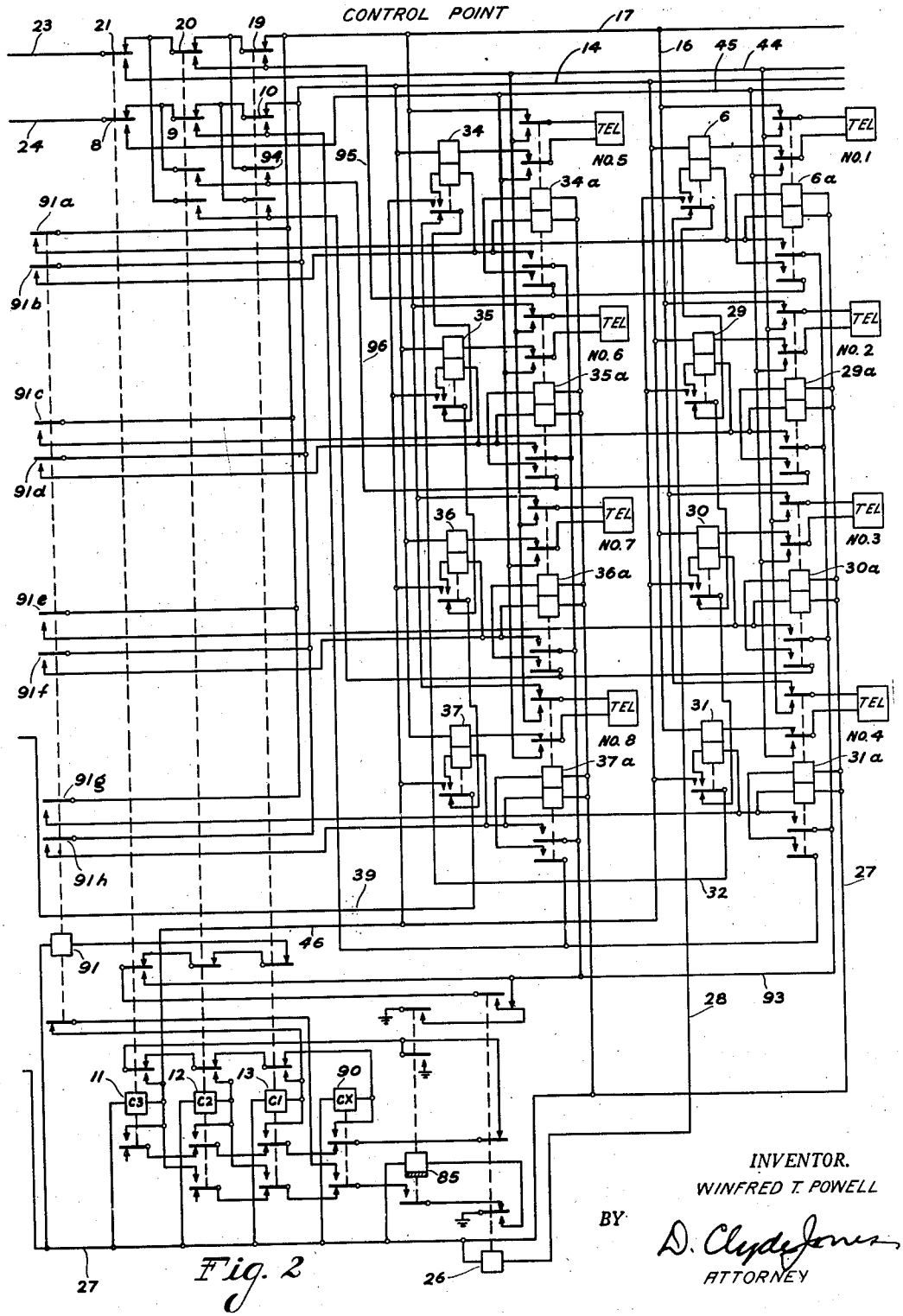


Fig. 2

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UNITED STATES PATENT OFFICE

2,402,446

TELEPHONE SYSTEM

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Application August 24, 1944, Serial No. 551,005

8 Claims. (Cl. 179—17)

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This invention relates to telephone systems of either the manual or automatic type.

In the operation of telephone systems it is frequently desirable to provide telephone service to a small group or community of remotely located subscribers. Due to the remoteness of this group from the exchange, it is expensive to extend individual lines to said subscribers. While multi-party lines have been used in such situations, multi-party service has real limitations, such as lack of secrecy, and when more than four subscribers are assigned to a given line, the resulting service frequently becomes most unsatisfactory.

In accordance with the main feature of the present invention, there is provided a secret service arrangement whereby a small group or community of subscribers remotely located with respect to the central exchange can be served over a single telephone line.

The drawings comprising Figs. 1 and 2, when arranged side by side in the order named, diagrammatically illustrate a portion of a telephone system incorporating the present invention. Fig. 1, which shows the portion of the system located at the central office, illustrates in its upper portion, the finder multiple of a multistation telephone line, the connector multiple of this line with a sleeve conductor and cut-off relay for each station on the line as well as the code conductors associated with the line. In the lower left-hand portion of Fig. 1, there is shown a code table giving the combinations of pulses respectively applied to the tip and ring conductors of the telephone line to effect the selection of stations thereon. In the lower right-hand portion of Fig. 1, there is illustrated a primary counting relay chain and control relays cyclically operating the relay chain to apply code conditions from the code conductors to the respective tip and ring conductors of the telephone line. Fig. 2, which shows the portion of the system located at the remote control point, illustrates eight telephone stations of the mentioned multistation line, as well as sets of line relays and of the stations relays, a line relay and a stations relay of a set being individual to each telephone station. In the lower part of Fig. 2, there is shown a secondary chain of counting relays and associated control relays for operating these counting relays in step-by-step relation with the corresponding counting relays of the primary chain at the central office.

It is believed that the operation of the system will best be understood by describing the extension of an originating call from one of the substations of the group or community of subscribers and then by describing the extension of a call from the remote exchange to one of the stations of the group.

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Let it be assumed that the subscriber at station #1 removes his receiver from its switch-hook to initiate a call. This is effective to energize a line relay 5 (Fig. 1) and the line relay 6 individual to the calling substation (Fig. 2). This circuit extends from a negative pole of battery, winding of the line relay 5, back contact and armature 7a of the common cut-off relay 7, armatures 8, 9 and 10 and back contacts of the secondary counting relays 11, 12 and 13 respectively, conductor 14, upper winding of the relay 6, back contact and armature of the first stations relay 6a, ring side of the calling line and through the substation, thence over the tip side of the calling line, armature and back contact of relay 6a, conductors 16 and 17, armatures 19, 20 and 21 and the back contacts of relays 13, 12 and 11, tip side 23 of the telephone line extending from the community to the distant exchange, armature 25 and back contact of the common cut-off relay 7, to the positive side of battery. The operation of the line relay 5 is effective to cause an idle trunk to be connected to the calling line. In the present instance, the switching means comprises a finder (not shown) which is controlled by certain marker relays (not shown) in the manner illustrated in the Powell Patent 2,325,877, granted August 3, 1943, to seize the calling line. The operation of the line relay 6 at the community is effective to interrupt a series circuit and a step line with its relay 26 (Fig. 2), to be described. This series circuit extends from the negative pole of battery at the remote exchange (Fig. 1), conductor 27, winding of the relay 26, conductor 28, back contacts and lower armatures of the relays 6, 29, 30 and 31, conductor 32, back contacts and armatures of relays 34, 35, 36, 37, conductor 39 herein referred to as the step line which extends to the remote office where this circuit will be completed to the positive pole of battery in the further course of extending connection. As has been mentioned, the relay 6 at its lower armature and back contact interrupts this series circuit. When the finder switching means at the remote office seizes the calling line, ground potential is applied to the sleeve conductor 41 which effects the operation of the relay 42. Relay 42 at its armature 43 and front contact applies positive potential to the step line including the conductor 39. This is effective to complete a locking

circuit for the line relay 6 (Fig. 2), the circuit being completed from the positive pole of battery at the armature 43, conductor 39, armatures and back contacts of relays 37, 36, 35 and 34, conductor 32, armature and back contacts of relays 31, 30 and 29, armature, front contact and lower winding of relay 6, lower winding of station relay 6a, conductor 27 to the negative pole of battery. When the station relay 6a operates, it extends the calling line over the talking conductors 44 and 45, to the armatures 21 and 8 of the relay 11. Relay 11 is operated from the negative pole of battery, winding of this relay, conductor 46, front contact and armature of relay 6, back contacts and armatures of relays 29, 30 and 31, conductor 32, back contacts and armatures of relays 34, 35, 36 and 37, step line conductor 39, armature 43 and front contact, to ground. With the relay 11 thus operated, the talking conductors 44 and 45 of the line are extended through the front contacts and armatures 8 and 21 to the telephone line including the conductors 23 and 24 which extend to the remote or central office. When the relay 42 (Fig. 1) operates over the sleeve conductor 41, it closes a circuit for the common cut-off relay 7, through the armature 48 and front contact of relay 42, to the positive pole of battery. The common cut-off relay 7 on operating extends the calling line through its armatures 25 and 7a and front contacts, and thence through the armatures and back contacts of either or both relays 50 and 51, armatures and back contacts of the primary counting relays 52, 53 and 54, and conductors 57 and 58 to the finder multiple. The common cut-off relay 7 interrupts the circuits of the cut-off relays 60, 61, 62, 63, 64, 65, 66 and 67 of the eight numbers used for terminating calls to the eight stations of the community group. At the same time, the relay 7 applies ground potential to the sleeve conductors, such as 68, 69, 70, 71, 72, 73, 74 and 75 of all these terminals in the connector multiple so that these terminals are rendered busy to incoming calls.

Dial tone may be extended to the calling line when the finder extends an idle link circuit to this line. On hearing the dial tone, the calling subscriber may proceed to dial the wanted number of the line terminating at the remote exchange, this portion of the operation of the system being effective in the manner well-known. It should be understood that the operation of any line relay, such as 6, 29, 30, 31, 34, 35, 36 and 37 causes the circuits to function in the manner above described for extending the associated line to the common tip and ring conductors 44 and 45 by operating the associated stations relay, such as 6a, 29a, 30a, 31a, 34a, 35a, 36a and 37a. These station relays correspond somewhat to cut-off relays since there is one for each subscriber's station serving to disconnect the associated line relay winding. For example, the stations relay 6a of the calling line, under consideration, at its inner upper armature and back contact disconnects its associated line relay 6 from the line. These station relays also function to connect its individual line whether it is calling or whether it is being called, through to the common talking line circuit including the conductors 44 and 45 which in turn lead to the central or remote office. Further, these station relays are selectively operated in the case of a terminating call to select the wanted station.

At the termination of the connection from the central exchange, ground potential is removed

from the sleeve conductor 41 which is effective to release the relay 42. The relay 42 in turn at its armature 48 interrupts the maintaining circuit of the cut-off relay 7 which releases. The release of the relay 42 is also effective at its armature 43 to remove positive potential from the step line including conductor 39. This is effective to release the operated line relay 6 and the operated stations relay 6a, as well as the secondary counting relay 11. The release of these relays restores the system to its normal condition.

Let it be assumed that a subscriber's line, not shown, but located at the central exchange, desires to establish a telephone connection to the station #1 of the group or community. That calling subscriber's line is extended by usual switching means to the connector tip and ring multiple 77, 78 and the sleeve terminal 68. It should be pointed out that any of the illustrated stations 1 to 8 may be assigned any number desired in the central office but it is necessary to connect the sleeve conductors of the connector multiple of these numbers to the sleeve conductors, such as 68 to 75 inclusive at the left of Fig. 1. This means that the tip and ring conductors, such as 77 and 78 of all these numbers are connected together but that individual sleeve conductors are provided for this line. Since the wanted subscriber is assumed to be at station #1, ground potential will be applied to the sleeve conductor 68 of this line, the ground potential being applied through the connector at the central office. This ground potential is applied in a circuit through the make-before-break contacts of the cut-off relay 60, conductor 79, armature and back contact of the cut-off relay 7, conductor 80, winding of the cut-off relay 60, to the negative pole of battery. Relay 60 on operating closes a locking circuit for itself through its inner armature and front contact and sleeve conductor 68. It will be noted that the common cut-off relay 7 at its armatures and back contacts opens up the possible operating circuits of cut-off relays 60 to 67 inclusive. Relay 7 at its front contacts and armatures applies ground potential to the sleeve conductors 69 to 75 inclusive for making these lines busy. The common cut-off relay 7 at its armature 81 and front contact closes a circuit from positive pole of battery, armature and back contact of the relay 50, winding of relay 82, armature 81 and front contact of cut-off relay 7, back contact and armature 43, step line conductor 39 and thence through the armatures and back contacts of relays 37, 36, 35 and 34, conductor 32, armature and back contacts of relays 31, 30, 29 and 6, conductor 28, winding of relay 26, conductor 27, to the negative pole of battery. This circuit is effective to operate the relay 82 at the central office and the relay 26 at the control point. The relay 82 completes an obvious circuit for the slow to operate relay 84. Likewise, the relay 26 closes an obvious circuit for the slow releasing relay 85. The relay 84 locks itself operated as long as the common cut-off relay 7 is operated. Relay 84 closes a circuit for operating the relay 55, which circuit is traceable from the negative pole of battery, winding of this relay, back contacts and armatures of relays 54, 53 and 52, conductor 86, front contact and armature of relay 84, to the positive pole of battery. The slow releasing relay 50 is also operated at this time from the negative pole of battery, winding of this relay, back contact and armature of relay 52, back contact and armature of relay 51, conductor 87, front con-

tact and armature of relay 84, to the positive pole of battery. As soon as the relay 50 operates its armature 88, it opens up the step line circuit previously described which causes the relays 82 and 26 to release. When the relay 82 releases, the relay 55 is held operated, from the negative pole of battery, winding of this relay, its inner front contact and armature, conductor 83, back contact and armature of relay 82, conductor 86, to the positive pole of battery at the front contact and armature of relay 84. Relay 82 also closes a circuit for operating the relay 54 which circuit extends from the negative pole of battery, winding of relay 54, front contact and armature of relay 55, conductor 89, front contact and armature of relay 84, back contact and armature of relay 82 to the positive pole of battery. Relay 54 locks itself operated through its front contact and armature over conductor 86. When relay 54 operates, it closes an energizing circuit for relay 51 from the negative pole of battery, winding of relay 51, armature and front contact of the relay 55, front contact and armature of the relay 54, to the positive pole of battery. When relay 51 operates, it opens the energizing circuit of the relay 50, previously described. Relay 50 on releasing closes its armature 88 and back contact to complete the step line for operating the relays 82 and 26 connected in series therewith. When relay 82 operates, it effects the release of relay 55. The operation of relay 26 effects the release of the relay 90 which was operated as soon as the slow releasing relay 85 was operated. Likewise, relay 13 at the control point was operated by the release of relay 26. The release of relay 55 effects the release of the relay 51 and relay 51 in turn again completes a circuit for operating the relay 50. Relay 50 opens up the step line including the conductor 39, thereby releasing the relays 82 and 26. The release of the relay 82 causes the operation of the relay 53. Relay 53 locks itself operated through its upper front contact and armature over conductor 86. As soon as the relay 53 operates, it closes a circuit for operating the slow releasing relay 51. This circuit now extends from the negative pole of battery, winding of this relay, armature and back contact of relay 55, armatures and front contact of relays 53 and 54 to the positive pole of battery. When relay 51 operates, it again interrupts the operating circuit of the slow releasing relay 50 and this relay at its armature 88 and back contact again energizes the step line 39 and the relays 82 and 26 in series therewith. When the relay 82 energizes, it effects the release of the relay 54. This relay at its lowermost armature and front contact interrupts the energizing circuit for the relay 51, which releases. This in turn closes the circuit for again operating the relay 50 which at its armature 88 and back contact interrupts the step line 39. When the step line is interrupted, the relays 82 and 26 are released. This effects the operation of the relay 52 at the central station and the relay 11 at the remote control point. The circuit of the relay 52 is traceable from the negative pole of battery, winding of relay 52, front contact and armature of relay 53, back contacts and armatures of relays 54 and 55, conductor 89, front contact and armature of relay 84, back contact and armature of relay 82 to the positive pole of battery. Relay 52, on operating, locks itself operated through its upper front contact and armature, conductor 86, front contact and armature of relay 84, to the positive pole of battery. The relay 11 at the remote control point has its operating circuit completed from the negative pole of battery, winding of relay 11, front contact and armature of relay 12, back contact and armatures of relays 13 and 90, front contact and armature of relay 85, back contact and armature of relay 26, to positive pole of battery. Relay 52 closes a circuit for operating relay 51. This circuit extends from the negative pole of battery, winding of relay 51, armature and back contact of relay 55, armature and front contact of relay 53, front contact and armature of relay 52, back contact and armature of relay 54 to positive pole of battery. Relay 51 again interrupts the operating circuit of the relay 50 which again releases. This again energizes the step line 39 which includes in series therewith the relays 82 and 26. The operation of the relay 82 opens conductor 86 which has been maintaining the relay 53 operated. Also, when the relay 26 at the control point operates, it effects the release of the relay 12. When the relay 53 releases, it causes the release of the relay 51 but the relay 50 is not energized at this time because its operating circuit is interrupted due to the fact that the relay 53 has released and the relay 52 is operated.

From the foregoing, it will be understood that the operation of the relays 82, 50 and 51 at the central office passed through a cycle of operations in which the primary counting relays 55, 54, 53 and 52 operate generally in the manner of the counting relay system disclosed in the mentioned Powell patent. Similarly, at the control point, the relay 26 has a cycle of operations similar to that just described at the central office. During the course of this cycle, the relays 90, 13, 12 and 11 operate in sequence in the order named, also, generally in the manner of the counting relay chain of the patent.

While the cycle of operations just referred to is taking place, station selection to select the station #1, is also being effected. It will be recalled that the relay 85 at the control point was operated at the beginning of the cycle of operations. As soon as the relay 85 operated, it closed a circuit for operating the conditioning relay 91, in a circuit extending from the negative pole of battery, winding of this relay, back contacts and armatures of relays 13, 12 and 11, armature and make-before-break contacts of relay 26, front contact and armature of relay 85 to the positive pole of battery. The conditioning relay 91 connects the tip and ring conductors 23 and 24 through its armatures 91*a*, 91*b*, 91*c*, 91*d*, 91*e*, 91*f*, 91*g*, 91*h* to the stations relay 6*a*, 29*a*, 30*a*, 31*a*, 34*a*, 35*a*, 36*a* and 37*a* but only four of these eight station relays will be operated depending on which one of the tip and ring conductors 14 and 17 is grounded at the central office as a result of the operation of the cut-off relay of the wanted station. In the present instance, the station #1 is desired, cut-off relay 60, therefore, is operated and this relay at its armature 92 and front contact applies positive potential through the back contacts and armatures of relays 54, 53, 52, 51 and 50, conductor 23, armatures 21, 20, 19 and back contacts, and thence through the armatures 91*a*, 91*c*, 91*e*, 91*g* to operate stations relays 6*a*, 29*a*, 30*a* and 31*a*. It will be understood that the four station relays just described will be operated when any one of the first four cut-off relays 60 to 63 inclusive at the central station is operated. In like man-

ner if any one of the last four cut-off relays, namely 64 to 67 inclusive in the central office is operated, the ring conductor 58 is grounded for operating the second half of the station relays at the control point, namely, relays 34*a* to 37*a* inclusive. When the relay 26 is released at the end of the conditioning impulse, the conditioning relay 91 is released and does not operate again during the cycle. It has been mentioned that the first four station relays were operated by the conditioning impulse. It is now necessary to release all of these operated stations relays except station relay 6*a* related to the station #1, which relay must be maintained operated for selecting the #1 station. Station #1 is indicated as the wanted station by the operation of the cut-off relay 60 at the central station. When the relay 26, at the control point, releases at the end of the conditioning impulse, a circuit is closed for locking the first four station relays. This circuit is traceable from ground, armature and front contact of relay 85, continuity spring and back contact of relay 26, conductor 93, armature and front contact and lower winding of the relay 31*a*, conductor 27 to grounded battery. Similarly, the relays 30*a*, 29*a* and 6*a* are lock operated in multiple through their armatures, front contacts and lower windings in the same manner as relay 31.

At the beginning of the first impulse following the conditioning impulse, during which relay 91 was operated, the relay 26 is again operated and at its continuity spring and back contact it opens the locking circuit just described for the four stations relays. However, a selecting locking circuit is closed for the stations relays 6*a*, 29*a* for preventing the release of these relays. This circuit extends from ground on the tip line conductor 158 applied through the front contact and armature of the relay 54, back contacts and armatures of relays 53, 52, 51 and 50, front contact and armature 25, conductor 23, armature 21 and back contact, armature 20 and back contact, armature 19 and front contact, conductor 95, lower armature, front contact and upper winding of relay 6*a*, conductor 27 to grounded battery. Also, this ground is extended through the armature 94 and front contact of relay 13, conductor 96, lower armature, front contact and upper winding of relay 29*a*, conductor 27, to grounded battery. The #1 and #2 station relays 6*a* and 29*a* are held operated in this circuit but no similar holding circuit is provided for the stations relays 30*a* and 31*a* so that these last named relays release. When in the course of the cycle, relay 26 releases at the end of the first impulse period, the locking circuit including the lower windings of relays 6*a* and 29*a* is completed for these relays. At the beginning of the second impulse, the operation of the relay 26 opens the locking circuit including the lower windings of relays 6*a* and 29*a*. The #2 station relay 29*a* releases because no circuit is completed at this time for its upper winding since the relay 13, which previously completed the circuit for relay 29*a* at the armature 94 and front contact, is released. However, relay 12 is now operated and at its armature 20 completes a circuit for maintaining the #1 stations relay 6*a* operated during the second impulse period. This circuit extends from the positive pole of battery, armature 97 of the cut-off relay 60, conductor 98, front contact and armature of relay 53 now operated, back contact and armatures of relays 52, 51 and 50, tip conductor 23, armature 21 and back contact of relay 11, armature 20 and front contact of relay 12, conductor 95, lower armature and front contact and upper winding of relay 6*a*, conductor 27 to the negative pole of battery. The potential applied at the armature 97 of cut-off relay 60 is ineffective to affect the #3 stations relay 30*a* and the #7 stations relay 36*a*, both of which are released at this time.

When the relay 26 is released at the end of the second impulse period, a locking circuit is completed for the #1 stations relay 6*a* from ground at the armature and front contact of relay 85, continuity spring and back contact of relay 26, thence over conductor 93, lower armature, front contact and lower winding of relay 6*a*, conductor 27 to grounded battery. Also, when the relay 26 is operated at the beginning of the last impulse to continuously energize the step line 39, the #1 stations relay 6*a* is maintained energized from grounded battery, conductor 27, lower winding of relay 6*a*, its front contact and armature, conductor 93, front contact and armature of relay 11, armature and continuity spring of relay 26, front contact and armature of relay 85 to ground. As a result of the cycle of operations, including the transmission of impulses over the step line in the manner just described, the relay 6*a* is selected and maintained operated. Relay 6*a* at its upper armatures and front contacts extends the tip and ring conductors of the calling line to the conductors 44 and 45 and thence through front contacts and armatures 18 and 21 of relay 11, conductors 24 and 23, armatures and front contacts of the common cut-off relay 7, armatures and back contacts of relays 50 and 51, armatures and front contacts of relays 52, tip and ring conductors 77 and 78 which terminate in the connector switch. On the seizure of the called line, ringing current is applied to the called line to actuate the straight line ringer provided thereafter.

It is believed unnecessary to explain the operation in detail for selecting any one of the eight other lines illustrated. It will be sufficient to point out that the cut-off relay of each line applies ground in various combinations to conductors which are associated with the tip and ring side of the line during the various steps in the cycle. By referring to the code table shown in the lower left-hand corner of Fig. 1, it will be seen how in the case of the first station, ground is applied to the tip conductor during the conditioning period, ground is also applied over the tip conductor during the first and second steps to select station #1. However, in order to select station #2, ground is applied to the tip conductor during the conditioning step and during the first step. However, during the second step ground is applied to the ring conductor to select the #2 station. These various combinations, as indicated by the code table, and which are determined by the operation of the cut-off relay of the called line, selectively operate the stations relay of the called line to effect the selection.

The release of the connection at the central office removes ground from the sleeve conductor 68 to effect the release of the cut-off relay 60 individual to the station and the common cut-off relay 7. The release of the relay 7 at its armature 81 opens up the step line 39 to effect the release of relays 32 and 26. These last named relays cause the release of the slow releasing relays 84 and 85. These relays in turn effect the release

of relays 52 and 11 so that the equipment is in its normal condition.

What I claim is:

1. In a telephone system, a telephone exchange, a plurality of telephone lines terminating at said exchange, one of said telephone lines extending to a remote control point and having a plurality of stations thereon at said point, means for interconnecting said telephone lines, a plurality of sleeve conductors at said exchange, one sleeve conductor being provided for each station associated with said multi-station line, a group of selectively operable relays at the remote point effective to connect a wanted station to said multi-station line to the exclusion of other stations thereon, and means responsive to the seizure of the sleeve circuit individual to a wanted station on said line for selectively operating said relays to connect the wanted station telephonically to said multi-station line.

2. In a telephone system, a telephone exchange, a plurality of telephone lines terminating at said exchange, a multi-station telephone line terminating in a plurality of outlets at the exchange and extending to a remote control point where it is provided with a station corresponding to each outlet, means for interconnecting said telephone lines, a group of selectively operable relays at the remote point effective to connect a wanted substation to said multi-station line to the exclusion of other stations thereon, and means responsive to the extension of a telephone line to a selected outlet of the multi-station line for selectively operating said relays to connect telephonically to said multi-station line, the station thereon corresponding to said selected outlet, to the exclusion of other stations thereon.

3. In a telephone system, a telephone exchange, a plurality of telephone lines terminating at said exchange, a multi-station telephone line terminating at the exchange and extending to a remote control point where it is provided with a plurality of stations, said multi-station telephone line between said exchange and said control point comprising only two talking conductors and a control conductor, a plurality of sleeve conductors local to the exchange, one sleeve conductor for each station associated with said multi-station line, means for interconnecting said telephone lines, a group of relays at the remote point selectively operable in response to various series of code signals and effective to connect a wanted substation telephonically to said multi-station line to the exclusion of other stations thereon, means responsive to the seizure of the sleeve circuit individual to a wanted station on said line for predetermining a series of code impulses distinctive of said last-mentioned station, and means governed over said control conductor for effecting the transmission over said talking conductors to said relays of said predetermined series of code impulses.

4. In a telephone system, a telephone exchange, a plurality of telephone lines terminating at said exchange, a multi-station telephone line terminating at the exchange and extending to a remote control point where it is provided with a plurality of stations, a plurality of sleeve conductors at said exchange, one sleeve conductor being provided for each station associated with said multi-station line, means for interconnecting said telephone lines, a group of selectively operable relays at the remote control point, code conductors also associated with the multi-station line at the exchange, means responsive to the seizure of the sleeve conductor of a wanted station on the multi-station line for establishing a code condition on certain of said code conductors distinctive of said wanted station, and means responsive to the established code condition for selectively operating said relays to connect the wanted station telephonically to said multi-station line to the exclusion of other stations thereon.

5. In a telephone system, a telephone exchange, a plurality of telephone lines terminating at said exchange, a multi-station telephone line terminating at the exchange and extending to a remote control point where it is provided with a plurality of stations, a plurality of sleeve conductors and cut-off relays at said exchange, one sleeve conductor and a cut-off relay electrically connected thereto for each station associated with said multi-station line, means for interconnecting said telephone lines, a group of selectively operable relays at the remote point, code conductors also associated with the multi-station line, means responsive to the seizure of the sleeve conductor and the operation of its connected cut-off relay individual to the wanted station for establishing a code condition on said code conductors distinctive of said wanted station, and means responsive to the established code condition for selectively operating said relays to connect the wanted station telephonically to said multi-station line to the exclusion of other stations thereon.

6. In a telephone system, a telephone exchange, a plurality of telephone lines terminating at said exchange, a multi-station telephone line terminating at the exchange and extending to a remote control point where it is provided with a plurality of stations, a plurality of sleeve conductors and cut-off relays at said exchange, one sleeve conductor and a cut-off relay electrically connected thereto for each station associated with said multi-station line, means for interconnecting said telephone lines, a group of selectively operable relays at the remote point, code conductors also associated with the multi-station line, means responsive to the seizure of the sleeve conductor and the operation of its connected cut-off relay individual to the wanted station for establishing a code condition on said code conductors distinctive of said wanted station, means responsive to the seizure of the sleeve conductor and the operation of its connected cut-off relay individual to the wanted station for establishing code conditions on said code conductors distinctive of said wanted station, a sender set into operation by the seizure of any one of said sleeve conductors, said sender operating to transmit said code conditions to the control point, and means responsive to the transmitted code conditions for selectively operating said relays to connect the wanted station telephonically to said multi-station line to the exclusion of other stations thereon.

7. In a telephone system, a telephone exchange, a plurality of telephone lines terminating at said exchange, a multi-station telephone line terminating at the exchange in a plurality of outlets and extending to a remote control point where it is provided with a station individual to each outlet, a plurality of sleeve conductors and cut-off relays at said exchange, one sleeve conductor and a cut-off relay electrically connected thereto associated with each outlet, a group of selectively operable relays at the remote point, code conductors also associated with the multi-station line at the exchange, means responsive to

the seizure of the sleeve conductor and the operation of its connected cut-off relay individual to the wanted station for establishing code conditions on said code conductors distinctive of said wanted station, a sender started into operation by the seizure of any one of said sleeve conductors, said sender including a chain of primary counting relays operating in sequence to transmit said code conditions to the control point, and means including a secondary chain of counting relays operating in step-by-step relation with said primary chain of counting relays, said secondary chain of counting relays operating to apply the transmitted code conditions for selectively operating said relays to connect the wanted station telephonically to said multi-station line to the exclusion of other stations thereon.

8. In a telephone system, a telephone exchange, a plurality of telephone lines terminating at said exchange, a multi-station telephone line terminating at the exchange in a plurality of outlets and extending to a remote control point where it is provided with a station individual to each outlet, a plurality of sleeve conductors and cut-off relays at said exchange, one sleeve conductor and a cut-off relay electrically connected thereto associated with each outlet, code conductors also associated with the multi-station line at the exchange, a common line relay at the exchange for all of said stations, a line relay and a station relay for each station on said multi-station line, each station relay when operated serving to connect its station telephonically to the multi-station line, means responsive to the initiation of a call from any of said stations for operating its line relay and said common line relay, means responsive to the operation of the common line relay for extending the multi-station line in the direction of a wanted telephone, means responsive to the extension of the multi-station line for completing a locking circuit for the operated line relay, said locking circuit being serially completed at all of the other line relays, said locking circuit being also effective to operate the station relay of the calling station, means responsive to the seizure of the sleeve conductor individual to a wanted station of the multi-station line on the extension of a telephone line thereto for operating the cut-off relay of the wanted station, said operated cut-off relay operating to apply to said code conductors code conditions distinctive of said wanted station, means responsive to said code conditions for selectively controlling the station relays to operate the station relay of the wanted station to the exclusion of the other station relays.

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