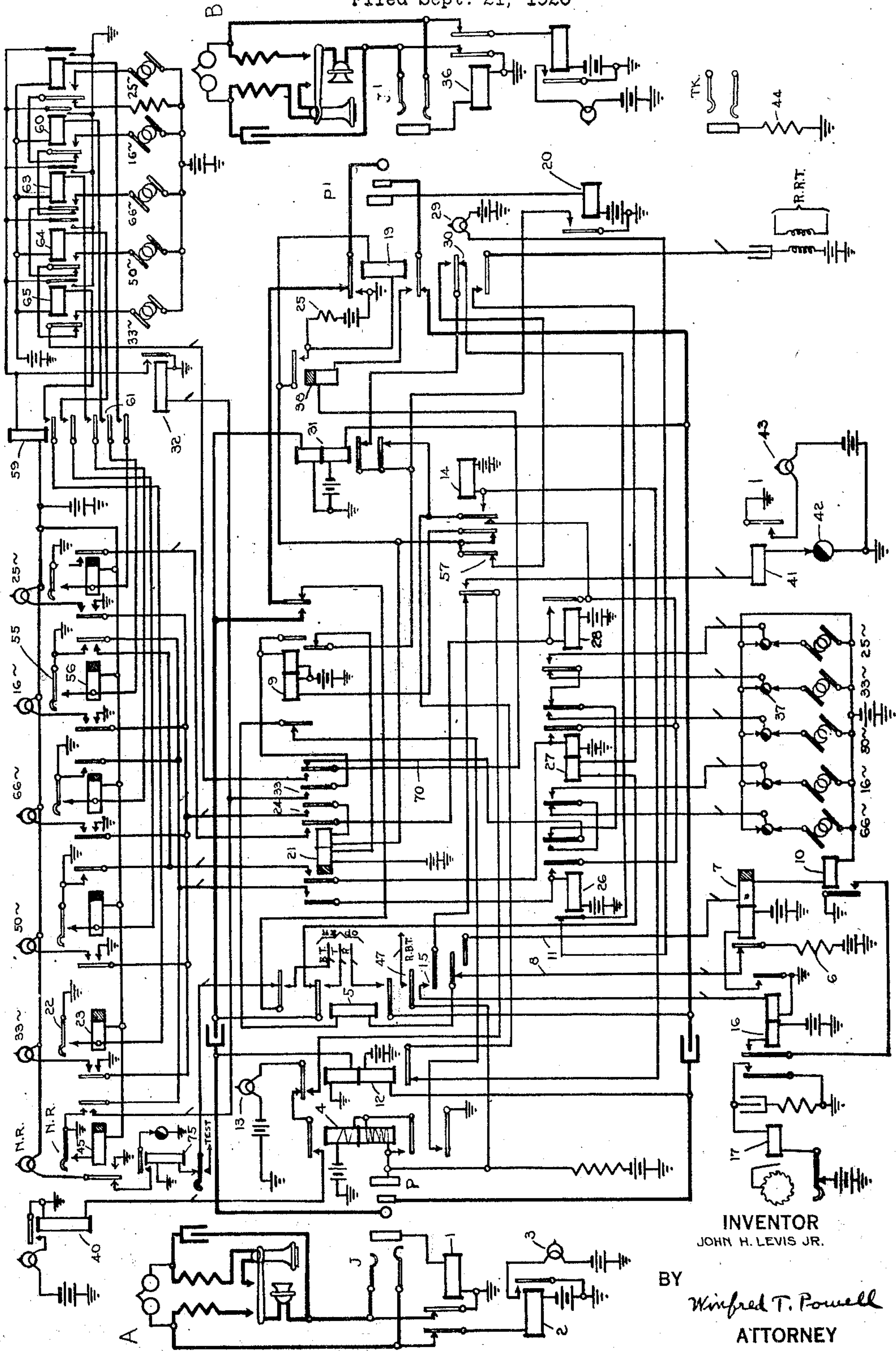


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MANUAL TELEPHONE SYSTEM

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MANUAL TELEPHONE SYSTEM.

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This invention relates to telephone systems and more particularly to manual telephone systems being specifically directed to improvements in so called "feature" cord circuits for use in manual telephone systems.

In such systems wherein "feature" cord circuits are used, it has been customary to so arrange the circuits that certain features are automatically taken care of, such as associating the operator's telephone set with the cord circuit by means of a relay or relays, thus eliminating the usual listening key. This, as well as other circuit arrangements such as "advance plugging in", "operator's bar", "operator's listening indication", "flash recall", "operator's ringing control", "calling subscriber ringing control", "dark key board", "operator's cut in retard", etc., are features of this invention and will be described.

Another feature of this invention consists in arranging the circuits in such a way that reverting calls or calls for wanted subscribers on the same lines as calling subscribers are handled in the following manner: The operator answers an incoming call and finds that a party on the same line is desired, after which she instructs the calling party to hang up the receiver and again remove it when the bell rings. The operator then substitutes the calling cord for the answering cord and depresses the proper ringing button corresponding to the called party's station and after ringing this station she operates the ringing button corresponding to the calling party's station. After this operation she depresses a "non-ring" key which disconnects the common manual ringing relays from the circuit. When both subscribers remove their receivers, talking battery is furnished over the line through the calling cord which remains in the jack until disconnection.

With the above explanation of the features disclosed in the accompanying drawing, it is believed that the invention will best be understood by describing the method of establishing a telephone connection from a calling substation such as A to a wanted substation such as B. When the subscriber at A initiates a call by removing his receiver from the switch-hook, a circuit is completed from ground, inner back contact of cut-off relay 1, over the line and substation circuits in series, outer back contact of cut-off relay 1 and

winding of line relay 2 to grounded battery. Relay 2 is operated in this circuit and closes a circuit for lighting line lamp 3 which is an indication to the operator to insert the answering plug P into the jack J associated with the calling line, which operation is effective to close a circuit for operating cut-off relay 1 and sleeve relay 4, said circuit extending from grounded battery, upper low resistance winding of relay 4, lower high resistance winding of relay 4, sleeve contacts of the plug and jack and winding of cut-off relay 1 to ground. The operation of relay 4 is effective to short-circuit its high resistance winding, after which sufficient current flows in the sleeve circuit for operating cut-off relay 1. The operation of relay 1 disconnects ground and grounded battery from the line conductors of the calling line and opens the circuit of and releases relay 2, which extinguishes the line lamp.

It will be understood that in case another operator had inserted the plug of an answering cord into the jack of this calling line before plug P was inserted in the jack of this line as above described, relay 4 of the cord circuit used by the first mentioned operator, would have been energized and the circuit to grounded battery on the sleeve of the jack J would have been connected through the low resistance winding of relay 4. Then when the second operator endeavored to answer this same call when plug P was inserted into jack J, the low resistance circuit to battery would be effective to prevent the operation of relay 4 of the second operator's cord circuit, thus preventing the simultaneous connection of two operators' circuits to one calling line. This is known as the operator's bar feature.

Also when sleeve relay 4 is operated, a circuit is closed for operator's cut-in relay 5, extending from grounded battery, common resistance coil 6, back contact of common relay 7, conductor 8, back contact and winding of relay 5, back contact of "clearing" relay 9 and lower make contact of relay 4 to ground. This circuit is effective to operate relay 5 which closes a locking circuit for itself extending from grounded battery, winding of common relay 10, right hand winding of common relay 7, conductor 11, make contact and winding of relay 5, over the previously described circuit, to ground

at the lower make contact of relay 4. This last described circuit operates relays 7 and 10, relay 7 disconnecting the circuit previously described extending to grounded battery, through the common resistance coil 6, thus removing battery from the operating circuit of all other relays similar to 5 of other cord circuits at this particular position, the purpose of which is to prevent any other cord circuit being connected to the operator's circuit during the time this particular cord circuit is connected as above described. Since the operating circuits of all other relays 5 extend by way of conductors similar to 8 to battery through the normally closed contact of relay 7, it will be seen that when relay 7 is energized, thus opening the circuit to battery, through coil 6, no other relay similar to 5 can be operated.

The insertion of plug P into jack J in addition to closing a circuit for operating relay 4 extends the calling line circuit to ground and grounded battery through the windings of supervisory relay 12 and this relay is operated over the two sides of the line. A circuit is now closed from grounded battery, answering supervisory lamp 13, upper make contact of relay 12, outer left hand back contact of flash recall relay 14, contact 15 of relay 5 and right hand winding of common relay 16 to ground. Sufficient current flows over this circuit to cause lamp 13 to be dimly lighted as an indication to the operator, that her telephone set is connected to this particular cord circuit. This feature is known as the operator's listening indication, since the dim answering supervisory lamp indicates the cord to which the operator's telephone set is connected.

With relay 16 energized a circuit is closed for operating position register 17, which register is for the purpose of recording the number of connections established at this particular position. Relay 16 is now locked in its operated position, from ground, make contact of relay 10, inner left hand make contact and left hand winding of relay 16 to grounded battery. Relay 16 establishes a circuit for holding relay 7 in its energized position through the left hand winding of relay 7.

Relay 5 extends the tip T and ring R conductors leading to the common operator's set to the upper and lower sides of the talking circuit, respectively, and the operator now requests the desired number. At the upper make contact of relay 5, the tip of the calling cord is connected to the common busy test circuit BT, so that this circuit is effective to indicate to the operator in the well known manner when the tip of plug P' is connected to the sleeve of jack J' whether or not the called line is busy. If it is busy the operator will hear a click in her receiver and will so inform the calling subscriber, but if the line is idle the operator will insert the plug P'

into the jack J' associated with the called station B.

In addition to the above mentioned circuits which have been above discussed, the operation of relay 5 closes a break-point in the common revertive busy tone circuit RBT to the sleeve of the answering plug P. This tone corresponding to the tone source 14 of White Patent #1,352,568 is therefore temporarily associated (through contacts of a relay similar to 16 of said patent and functioning in the same manner) with the jack of the calling line during a portion of the time that the operator's telephone set is connected to this cord circuit, and in the event that the called party is located on the same line with the calling party, when the busy test is made as above pointed out, this special tone will be extended from the jack of the calling line to which the tip of plug P' will be in connection and thence by way of the upper back contact of sleeve relay 19, right hand back contact of relay 9 and upper make contact of relay 5 to the common busy test circuit. When the operator hears this particular revertive busy tone she will understand that the called party is located on the same line with the calling party, in which event she will inform the calling subscriber to hang up the receiver and wait until the bell at his substation rings. This is known as a revert-ing call and the operation will be described later.

Assuming that the called line is idle when the test of the jack associated with substation B is made, the operator will insert the plug P' into jack J' and operate some one of the common ringing selecting buttons, shown in the upper portion of the drawing. A circuit is now closed from ground, winding of cut-off relay 36 associated with the called line, sleeve contacts of the jack J' and plug P' and winding of relay 20 to grounded battery. Relay 36 is operated in this circuit to remove the battery bridge from the called line and relay 20 is operated closing a circuit from ground, make contact of relay 20, continuity spring and back contact of relay 9 and left hand winding of relay 21 to grounded battery. Relay 21 is operated in this circuit and functions to connect the common frequency selecting keys and relays to the particular cord circuit, which is in use in connection with this call.

Assuming that 33 cycle ringing generator is required for operating the bell of the wanted substation, the operator will depress ringing key 22, which is effective to close a circuit for momentarily operating relay 23. The operation of relay 23 closes a circuit for lighting the 33 cycle ringing lamp, which serves as an indication to the operator that this particular frequency is connected to the cord circuit. The operation of relay 23 also extends a circuit from ground through its

make contact, contact 24 of relay 21, right hand winding of relay 21, winding of relay 19 and winding of resistance coil 25 to grounded battery. Relay 19 is operated in the above described circuit and prepares a ringing circuit for ringing the substation on the wanted line. Relay 19 when operated closes a locking circuit for itself from grounded battery, resistance 25, winding of relay 19, armature and contact 57 of relay 14, middle front contact and armature of relay 19, inner back contact and armature of relay 31, front contact and armature of relay 20, to ground.

The above traced circuit for operating relay 19 is also effective to operate relay 9 and may be traced from a point on the wire which leads from the right hand winding of relay 21 to relay 19 by way of middle back contact of relay 14 and left hand winding of relay 9 to grounded battery. Relay 9 is locked in its operated position from grounded battery, right hand winding of relay 9, make contact and continuity spring of relay 9 and make contact of relay 20 to ground. The operation of relay 9 is effective to open at its back contact and continuity spring, the operating circuit of relay 21 and this last mentioned relay deenergizes shortly after the ringing key 22 is released, which is effective to release relay 23 and remove the locking ground from the right hand winding of relay 21.

The operation of relay 9 closes at its outer right hand make contact, a portion of the tip side of the talking circuit, which at this time is open at the upper back contact of relay 19, but which will be completed when the called party removes the receiver. Relay 9 is effective to open at its left hand back contact, the circuit of operator's cut-in relay 5 and this relay deenergizes to disconnect the operator's set from this cord circuit.

Ringing selecting relays 26, 27 and 28 associated with the cord circuit are all in their normal positions for selecting 33 cycle ringing current and the circuit for ringing the called bell is now traced from the 33 cycle generator, shown in the lower portion of the drawing, ringing interrupter 37, left hand back contact of relay 28, right hand back contact of relay 27, right hand back contact of relay 26, right hand back contact of relay 21, winding of trip relay 38, inner lower make contact of relay 19, ring conductors of the plug P' and jack J', over the line and substation circuits in series, tip contacts of the jack J' and plug P' and upper make contact of relay 19 to ground.

When the called subscriber removes the receiver from its switch-hook, the closed circuit across the called line is effective to operate trip relay 38, which is in the above described ringing circuit and this relay at its make contact short-circuits the winding of relay 19

causing this latter relay to deenergize and extend the talking conductors through the cord circuit. Talking current is supplied to the called subscriber's line through the windings of relay 31. Talking current is supplied to the calling subscriber's line through the windings of relay 12 and the two lines are connected for conversation, by means of the heavy line condensers shown in the talking circuit.

With the called substation across the line, the closed circuit is effective to operate relay 31, which opens at its inner back contact the circuit of supervisory lamp 29. Relay 31 by means of its lower back contact disconnects the locking ground extending to relays 26, 27, 28 and 14 for releasing these relays in case they should have been operated during the process of this connection. Since the circuit of calling supervisory lamp 29 is open at contact 30 of relay 19 during the ringing condition this lamp will be extinguished and this is the dark key board feature of this particular circuit. In other circuits the calling supervisory lamp is lighted during the ringing intervals and is only extinguished when the called subscriber takes off the receiver.

Circuits may be readily traced from the 5 frequency ringing generators indicated in the lower portion of this drawing for selecting any of these frequencies by means of relays 26, 27, and 28 in their different operated and non-operated positions. These relays are operated in combination over circuits extending through contacts of relay 21 to the common frequency selecting relays and keys shown in the upper portion of the drawing. During the ringing of the called substation a reverberative ringing tone, indicated by RRT in the lower right hand portion of the drawing, is connected by way of the lower-most make contact of relay 19, left hand winding of relay 27, inner, upper back contact of relay 5 and through the condenser in the upper side of the talking circuit to the calling line. This tone gives the calling subscriber an indication that the circuit is in ringing condition and that the called bell is being operated.

At the close of the conversation, when the calling subscriber replaces the receiver upon its switch-hook, relay 12 deenergizes and closes a circuit for lighting lamp 13 to its full brilliancy, said circuit being traced from grounded battery, lamp 13, upper back contact of relay 12, upper make contact of relay 4 and winding of low resistance pilot relay 40 to ground. The pilot relay is operated and at its make contact closes a circuit for lighting the common pilot lamp associated therewith. When the called subscriber replaces the receiver upon its switch-hook, relay 31 deenergizes and closes a circuit for lighting the calling supervisory lamp 29, which may be traced from grounded battery, lamp 29, back contact of relay 26, contact 30 of relay 19,

inner back contact of relay 31 and make contact of relay 20 to ground. The operator then removes both plugs from their associated jacks, which places the circuit in condition for a succeeding call.

In the event that the calling subscriber at substation A desires to initiate a recall before the connection has been taken down, he does so by temporarily opening the hook-switch contacts by moving the hook-switch down and up. This is effective to open momentarily the energizing circuit of relay 12 which retracts its armatures and thereby closes a circuit for the flash recall relay 14, extending from grounded battery, winding of relay 14, lower back contact of relay 12, lower back contact of relay 31 and make contact of relay 20 to ground, relay 20 being energized due to the fact that plug P' is still in association with jack J'. Relay 14 on operating closes a locking circuit for itself through its inner left hand make contact, lower back contact of relay 31 and make contact of relay 20 to ground. This last described locking circuit is independent of the control of the relay 12 and when the calling subscriber's line circuit is closed, relay 12 is actuated, which is effective to establish a circuit from grounded battery, lamp 13, upper make contact of relay 12, outer left hand make contact of relay 14, flashing interrupter relay 41 and common flashing interrupter 42 to ground. This circuit causes lamp 13 to flash and by the operation of relay 41 also flashes common lamp 43 to call the attention of the operator to lamp 13, which is an indication for her to remove the plug P' from the jack J' and ascertain the number that the calling subscriber now desires. This is known as the flashing recall feature.

Since this drawing represents an A operator's cord circuit and associated apparatus, the operation of the system will now be explained in connection with trunk calls or calls to a distant office. It is proposed to operate such trunk calls by means of the so-called straight forward trunking scheme, that is the A operator simply places plug P' into the jack associated with a trunk leading to a distant office and operates the non-ring key NR appearing in the upper left hand portion of the drawing. In this system it is not necessary to make use of order wires for ordering up trunk connections.

When plug P' is connected to a trunk jack TK as shown in the lower right hand portion of the drawing, a circuit is closed from ground, resistance 44, which corresponds to a cut-off relay, sleeve contacts of the jack and plug P' and winding of relay 20 to grounded battery. The tip and ring conductors of the calling end of the cord circuit are now in connection with the tip and ring trunk conductors and since the signalling on this class of a call is done by means of the battery fed over

the trunk through windings of relay 31, it is not necessary to ring over the trunk. In fact it is necessary to disable the ringing apparatus on a connection of this kind.

The operation of non-ring key NR closes a circuit for operating relay 45 associated with this key and this relay in turn closes a circuit for lighting the non-ring lamp NR as an indication that this relay is in its operated position. A circuit is also closed from ground, right hand make contact of relay 45, outer left hand make contact of relay 21 and winding of relay 26 to grounded battery. Since none of the frequency selecting keys are operated on this class of call, the circuit through contact 24 and right hand winding of relay 21 is not effective with the result that relay 19 will not be operated. Relay 9 is operated in a circuit extending from grounded battery, right hand winding of relay 9, contact 33 of relay 21 and right hand make contact of relay 45 to ground. Relay 9 is then locked in its operated position through its right hand winding to ground at the contact of relay 20. It will thus be seen that the talking circuit is not interrupted on a trunk connection.

When relay 9 operates, the circuit of relay 21 is immediately opened and it deenergizes, opening the circuits which were closed by make contacts of this relay. Relay 26, however, is locked in its operated position in a circuit extending from grounded battery, winding of relay 26, inner right hand make contact of relay 26, inner back contact of relay 14, lower back contact of relay 31 and make contact of relay 20 to ground. At the left hand back contact of relay 26, the circuit of the calling supervisory lamp 29 is opened and when the called subscriber in the distant office responds, a low resistance circuit is connected across the trunk conductors in the well known manner, which is effective to operate relay 31, which opens the above traced locking circuit for relay 26 allowing this relay to deenergize and establish a break point in the circuit of the calling supervisory lamp 29, but this lamp is not lighted at this time because relay 31 is energized. When the calling subscriber at the distant end replaces the receiver on its switch-hook, relay 31 deenergizes and closes the circuit for lighting lamp 29. It will thus be seen that by means of the left hand back contact of relay 26, the dark keyboard feature is retained on trunk connections.

The operation of the circuit will now be described in connection with a reverting call, that is a call from a subscriber such as substation A, assumed to have a 33 cycle bell, to another subscriber on this same line, assumed to have a 16 cycle bell. Line lamp 3 is operated in the manner above described and the call is answered in the same manner as in the preceding case and with relay 5 operated for connecting the operator's set

to the cord circuit the common revertive busy tone circuit RBT is connected by way of contact 47 of relay 5 to the sleeve terminals of plug P and jack J in the manner previously outlined. When the operator touches the tip of plug P' to this jack for testing the called line, the revertive busy tone is applied to her telephone set as an indication that the called party is located on the same line with the calling party. The operator now instructs the calling party to hang up the receiver and wait until his bell rings. She then substitutes plug P' for plug P, which is effective to operate relay 20.

A circuit is now closed for lighting calling supervisory lamp 29 extending from grounded battery, lamp 29, left hand back contact of relay 26, contact 30 of relay 19, inner back contact of relay 31 and make contact of relay 20 to ground. A circuit is also now closed for operating relay 14 extending from grounded battery, winding of relay 14, lower back contact of relay 12, lower back contact of relay 31 and make contact of relay 20 to ground. Relay 14 is locked in its operated position by way of its inner make contact, lower back contact of relay 31 and make contact of relay 20 to ground. A circuit is also closed for operating relay 21 extending from grounded battery, left hand winding of relay 21, back contact and continuity spring of relay 9 and make contact of relay 20 to ground.

At this time relay 9 is not operated, since its operating circuit is open at the middle back contact of relay 14. The operator now depresses ringing key 55 which is effective to apply 16 cycle ringing current to the line, since it has been assumed that the called station is signalled by this frequency. The operation of this key closes a circuit for operating relay 56 and this relay in turn closes a circuit for operating relay 19 extending from grounded battery, resistance coil 25, winding of relay 19, right hand winding of relay 21, contact 24 of relay 21, left hand make contact of relay 56 to ground. Relay 19 is not locked at this time, since its locking circuit is open at contact 57 of relay 14.

A circuit is now effective for operating high resistance relay 32 extending from ground, winding of relay 32, contact 33 of relay 21 and right hand winding of relay 9 to grounded battery. Relay 32 is of sufficiently high resistance, for example 5000 ohms, to prevent the operation of relay 9 in the above described circuit and when relay 32 attracts its armature, a circuit is closed for operating relay 59. This latter relay establishes a circuit for operating relay 60 extending from grounded battery, winding of relay 60, contact 61 of relay 59, and key contact 55 to ground.

Uninterrupted 16 cycle generator current is now applied to the called line extending from

this generator, left hand make contact of relay 60, left hand back contact of relays 63, 64 and 65, outer right hand make contact of relay 21, winding of relay 38, inner, lower make contact of relay 19, ring conductors of the plug P' and jack J over the line and substitution circuits in series, tip conductors of jack J and plug P' and upper make contact of relay 19 to ground. Upon the release of key 55, relays 56 and 60 are deenergized, thus resulting in the application of ringing current to signal the called station only during the time that the ringing key is depressed. In other words on a connection of this class the ringing is manual instead of automatic.

The circuits to the interrupted generator leads appearing in the lower portion of this drawing are not effective at this time, since ringing current is only applied to the called line, while the key is held in its operated position and at this time relay 21 is energized which maintains conductor 70, over which interrupted generator is applied to the cord circuit, in its open condition.

The operator now depresses key 22, since it is assumed that the calling station is signalled by 33 cycle generator current. The operation of this key operates relay 23 and this relay in turn again operates relay 19 over the circuit above described, except that at this time the current is applied at the left hand contact of relay 23, instead of relay 56. Relays 32 and 59 remain energized and a circuit is now closed from ground, contact of key 22, inner make contact of relay 59 and winding of relay 65, to grounded battery. Relay 65 operates and connects uninterrupted 33 cycle generator by way of its left hand make contact over the circuit previously described for ringing over the called line. This signals the calling station. It will be noted that relay 9 is maintained in its normal position and in order to operate this relay and cause the circuit to function as required it is necessary for the operator to depress non-ringing key NR, which is effective to close a circuit for operating relay 45 and this relay in turn operates relay 9 over a circuit extending from grounded battery, right hand winding of relay 9, contact 33 of relay 21 and right hand make contact of relay 45 to ground. Relay 9 is locked in its energized position to the ground at make contact of relay 20 and at the back contact and continuity spring of relay 9, the circuit of relay 21 is opened and this latter relay deenergizes. The circuit is now in condition waiting for the response of the called and calling subscribers.

When either the calling or wanted station removes the receiver from its switch-hook, a circuit is closed for operating relay 31, which circuit is the same as was described for a regular call and the operation of this relay opens at its inner back contact, the calling

supervisory lamp circuit, which is effective to extinguish this lamp. Relay 31 opens at its lower back contact the circuit which locks relay 14 in its energized position and this relay now deenergizes. In this type of connection talking battery is fed to the line for both calling and called parties through the windings of relay 31 and when both of these subscribers have replaced their receivers on their switch-hooks, this relay deenergizes and closes the circuit for lighting supervisory lamp 29 as above described and the lighting of this lamp is an indication to the operator to remove plug P' from jack J, after which the circuit is restored to normal condition.

It sometimes happens on a revertive call that the operator fails to operate non-ring key NR, in which case the circuit would not be in proper condition and would not function properly. In this case relay 9 would not have been operated and when one of the subscribers removes the receiver from its switch-hook, a circuit is closed from grounded battery, lower winding of relay 31, inner back contact of relay 19, ring contacts of plug P' and jack J over the line and substation circuits in series, tip contacts of the jack J and plug P', upper back contact of relay 19, outer right hand back contact of relay 9, upper back contact of relay 5, back contact of common test key and winding of relay 75 to ground. This is effective to operate relay 75 and connect the common flashing interrupter by way of a make contact of relay 75 and a back contact of relay 45, through lamp NR to grounded battery. This lamp is flashed over the above described circuit and since it is associated with non-ring key NR, it is an indication to the operator to depress this key, after which the circuit will function properly as above described.

It sometimes happens that it is desirable to test a multiple jack when the operator's telephone set is not connected to the cord circuit, in which case relay 5 would be in its normal position and in such an instance it is only necessary for the operator to depress the common test key shown just below relay 75, which is effective to extend the tip of the plug P' to the common test circuit.

Referring back to the time when ringing current was applied to the called line, it will now be explained how the feature "calling subscriber ringing control" is provided. This feature consists in the provision of means whereby the ringing current is disconnected from the called line if the calling subscriber hangs up the receiver during the ringing interval.

It will be remembered that relay 19 is locked energized at the time ringing current is applied to the called line and in the event that the calling subscriber disconnects at this time, the locking circuit of relay 19 is opened at the armature and contact 57 of relay 14, since this last named relay has its energizing

circuit closed at the lower back contact and armature of the answering supervisory relay 12 when the calling subscriber opens his line circuit by hanging up his receiver. This results in the disconnection of the ringing current from the called line by the deenergization of relay 19.

It will be seen from the above description that a cord circuit and associated apparatus have been provided, by which it is possible to render extremely efficient and rapid service in a manual telephone system with a minimum number of operations required by the operator.

I claim:

1. In a telephone system, a plurality of telephone lines, each of certain of said telephone lines being provided with a plurality of substations, means including a plurality of cord circuits for telephonically interconnecting said substations by two different methods, sources of interrupted ringing current of different characteristics for selectively signalling said substations, sources of uninterrupted ringing current of different characteristics, a single key for each source of said interrupted ringing current, said keys being common to said cord circuits, means including said keys for selecting and associating a source of interrupted ringing current with a cord circuit taken for use in one method of interconnection, and means including said keys for associating a source of uninterrupted ringing current instead of said interrupted ringing current with a cord circuit taken for use in the other method of interconnection.

2. In a telephone system, a plurality of telephone lines, each of certain of said telephone lines being provided with a plurality of substations, means including a plurality of cord circuits for interconnecting said substations in pairs, sources of interrupted ringing current of different characteristics for selectively signalling said substations, sources of uninterrupted ringing current of different characteristics, a single key for each source of interrupted ringing current, said keys being common to said cord circuits, means including said keys for associating a source of interrupted ringing current with a cord circuit taken for use to signal the called substation only, and means including said keys for associating sources of uninterrupted ringing current with a cord circuit taken for use to signal the calling and called substations of a connection.

3. In a telephone system, a plurality of telephone lines, each of certain of said telephone lines being provided with a plurality of substations, means including a plurality of cord circuits for telephonically interconnecting said substations by two different methods, an operators' telephone set common to said cord circuits, means responsive to the connection of

a cord circuit to a calling telephone line for connecting said operator's telephone set to said cord circuit, sources of interrupted ringing current of different characteristics for selectively signalling said substations, sources of uninterrupted ringing current of different characteristics, a single key for each source of interrupted ringing current, said keys being common to said cord circuits, means including said keys for associating said interrupted ringing current with a cord circuit taken for use in one method of interconnection, and means including said keys for associating said uninterrupted ringing current with a cord circuit taken for use in the other method of interconnection.

4. In a telephone system, a plurality of telephone lines, certain of which are party lines, means including a plurality of cord circuits for interconnecting said telephone lines, a supervisory signal associated with each cord circuit, sources of interrupted ringing current of different characteristics for selectively signalling said party lines, sources of uninterrupted ringing current of different characteristics, a single key for each source of interrupted ringing current, said keys being common to said cord circuits, means including said keys for associating said interrupted ringing current with a cord circuit taken for use on a call of one class, means including said keys for associating said uninterrupted ringing current with a cord circuit taken for use on a call of another class, and means responsive to the initiation of a recall on a call of said first class for distinctively operating said supervisory signal.

5. In a telephone system, a plurality of telephone lines, certain of which are party lines, means including a cord circuit for interconnecting a pair of said telephone lines, means including said cord circuit for establishing a revertive connection, a source of interrupted ringing current for selectively signalling a called line of said pair, a source of uninterrupted ringing current for signalling a called line on said revertive connection, a single key for said source of interrupted ringing current, said key being common to a plurality of cord circuits, means including said key for associating said interrupted ringing current with said cord circuit when used for interconnecting said pair of telephone lines, and means including said key for associating said uninterrupted ringing current with said cord circuit when used on said revertive connection.

6. In a telephone system, a plurality of party lines, means including a plurality of cord circuits for interconnecting said lines, sources of interrupted ringing current of different characteristics for selecting and automatically signalling stations on said lines, sources of uninterrupted ringing current of different characteristics for selecting and manually signalling stations on said lines, a

single key common to said cord circuits, means effective upon the establishment of a connection between a plurality of said party lines, whereby said key associates said interrupted ringing current with one of said cord circuits, and means effective upon the establishment of a connection to a single one of said party lines, whereby said key associates said uninterrupted ringing current with one of said cord circuits.

7. In a telephone system, a plurality of telephone lines, certain of which are party lines, means including a plurality of cord circuits for interconnecting said telephone lines, a supervisory signal associated with each cord circuit, sources of interrupted ringing current of different characteristics for selectively signalling said party lines, sources of uninterrupted ringing current of different characteristics, a single key for each source of interrupted ringing current, said keys being common to said cord circuits means including said keys for associating said interrupted ringing current with a cord circuit taken for use on a call of one class, means including said keys for associating said uninterrupted ringing current with a cord circuit taken for use on a call of another class, and means responsive to the initiation of a recall for distinctively operating said supervisory signal.

8. In a telephone system, a plurality of party lines, a plurality of operators' positions, a plurality of cord circuits at each of said positions for interconnecting said lines and for establishing revertive connections, an operator's telephone set common to said cord circuits at each position, means responsive to the connection of a cord circuit at a plurality of said positions to one of said lines for associating one operator's telephone set with said line to the exclusion of other operator's telephone sets, sources of interrupted ringing current of different characteristics for selectively signalling said party lines, sources of uninterrupted ringing current of different characteristics, a single key for each source of interrupted ringing current, said keys being common to said cord circuits, means including said keys for associating said interrupted ringing current with a cord circuit taken for use in interconnecting a pair of telephone lines, and means including said keys for associating said uninterrupted ringing current with a cord circuit taken for use in a revertive connection.

9. In a telephone system, a plurality of party lines, an operator's position, a plurality of cord circuits at said position for interconnecting said lines and for establishing revertive connections, an operator's telephone set common to said cord circuits, means responsive to the connection of a plurality of said cord circuits of a position to a plurality of said lines for connecting said operator's telephone set to one of said lines to the exclusion

of other lines, sources of interrupted ringing current of different characteristics for selectively signalling said party lines, sources of uninterrupted current of different characteristics, a single key for each source of interrupted ringing current, said keys being common to said cord circuits, means including said keys for associating said interrupted ringing current with a cord circuit taken for use in interconnecting a pair of telephone lines, and means including said keys for associating said uninterrupted ringing current with a cord circuit taken for use in a revertive connection.

10. In a telephone system, a plurality of telephone lines, certain of which are party lines, means including a plurality of cord circuits for interconnecting said telephone lines, a supervisory signal associated with each cord circuit, an operator's telephone set common to said cord circuit, means responsive to the connection of a cord circuit to a calling telephone line for connecting said operator's telephone set to said cord circuit and for displaying said signal in one manner, sources of interrupted ringing current of different characteristics for selectively signalling said party lines, sources of uninterrupted ringing current of different characteristics, a single key for each source of interrupted ringing current, said keys being common to said cord circuits, means including said keys for associating said interrupted ringing current with a cord circuit taken for use on a call of one class, means including said keys for associating said uninterrupted ringing current with a cord circuit taken for use on a call of another class, and means for displaying said signal in a different manner as a disconnect signal.

11. In a telephone system, a calling line and a called line, means including a plurality of cord circuits for interconnecting said lines, each cord circuit having an answering portion and calling portion, a source of interrupted ringing current for selectively signalling said called line, a source of uninterrupted ringing current, a key for said source of interrupted ringing current, said key being common to said cord circuits, means including said key for associating said interrupted ringing current with one of said cord circuits only when said cord circuit is interconnecting a calling line and a called line, and means including said key for associating said uninterrupted ringing current with said cord circuit when only the calling portion of said cord circuit is connected to a calling line.

12. In a telephone system, a plurality of telephone lines, certain of which are party lines, means including a cord circuit for establishing a connection between a calling station on one line and a called station on another line, means including said cord circuit

for establishing a revertive connection between stations on the same line, sources of interrupted ringing current for signalling on said first connection, sources of uninterrupted ringing current for signalling on said revertive connection, means including a single key common to a plurality of cord circuits for associating a source of said interrupted ringing current with said cord circuit, means for disconnecting said source of interrupted ringing current from said cord circuit upon the response of said called station, means including a single key for associating a source of said uninterrupted ringing current with said cord circuit, and manual means common to a plurality of cord circuits for disconnecting said source of uninterrupted ringing current from said cord circuit.

13. In a telephone system, a plurality of telephone lines, certain of which are party lines, means including a cord circuit for establishing a connection between a calling station on one line and a called station on another line, means including said cord circuit for establishing a revertive connection between stations on the same line, sources of interrupted ringing current for signalling on said first connection, sources of uninterrupted ringing current for signalling on said revertive connection, means including a single key common to a plurality of cord circuits for associating a source of said interrupted ringing current with said cord circuit, means for disconnecting said source of interrupted ringing current from said cord circuit upon the response of said called station, means including a single key for associating a source of said uninterrupted ringing current with said cord circuit, and a non-ring key common to a plurality of cord circuits for disconnecting said source of uninterrupted ringing current from said cord circuit.

14. In a telephone system, a plurality of telephone lines, certain of which are party lines, means including a cord circuit for establishing a connection between a calling station on one line and a called station on another line, means including said cord circuit for establishing a revertive connection between stations on the same line, sources of interrupted ringing current for signalling on said first connection, sources of uninterrupted ringing current for signalling on said revertive connection, means including a single key common to a plurality of cord circuits for associating a source of said interrupted ringing current with said cord circuit, means for disconnecting said source of interrupted ringing current from said cord circuit upon the response of said called station, means including a single key common to a plurality of cord circuits for associating a source of said uninterrupted ringing current with said cord circuit, a non-ring key common to a plurality of cord circuits for disconnecting said source

of uninterrupted ringing current from said cord circuit, and means for indicating to the operator that said non-ring key must be operated.

15. In a telephone system, a plurality of telephone lines, certain of which are party lines, means including a cord circuit for establishing a connection between a calling station on one line and a called station on another line, means including said cord circuit for establishing a revertive connection between stations on the same line, sources of interrupted ringing current for signalling on said first connection, sources of uninterrupted ringing current for signalling on said revertive connection, means including a single key common to a plurality of cord circuits for associating a source of said interrupted ringing current with said cord circuit, means for disconnecting said source of interrupted ringing current from said cord circuit upon the response of said called station, means including a single key for associating a source of said uninterrupted ringing current with said cord circuit, a non-ring key common to a plurality of cord circuits for disconnecting said source of uninterrupted ringing current from said cord circuit, and means common to a plurality of said cord circuits for indicating to the operator that said non-ring key must be operated.

16. In a telephone system, a plurality of telephone lines, certain of which are party lines, means including a plurality of cord circuits for interconnecting said telephone lines, each cord circuit being provided with an answering plug and a calling plug, sources of interrupted signaling current of different characteristics, a single key common to said cord circuits for each source of interrupted signaling current, each of said keys being individual to one of said sources of uninterrupted signaling current, means including one of said keys for associating one of said sources of interrupted ringing current with a cord circuit taken for use in interconnecting one telephone line with a second telephone line, and means controlled by the connection of the calling plug of a selected link circuit to the calling telephone line for placing said sources of uninterrupted signaling current under the control of said ringing keys to signal said last mentioned telephone line.

17. In a telephone system having telephone lines each provided with substations responsive to signaling current of different

frequencies, link circuits for interconnecting said telephone lines, sources of ringing current of different frequencies to signal the substations on said party lines, and a single ringing key common to said link circuits for each source of ringing current, the method of signaling said telephone lines which consists in using said keys to select interrupted signaling current of the proper frequency to signal the wanted station when two telephone lines are interconnected, and in utilizing said ringing keys to apply at will uninterrupted ringing currents of the proper frequencies to signal the calling and called substations of a telephone line.

18. In a telephone system, a plurality of telephone lines, certain of which are party lines, means including a plurality of cord circuits for interconnecting said telephone lines, an answering supervisory relay associated with each cord circuit, sources of interrupted ringing current of different characteristics for selectively signaling said party lines, sources of uninterrupted ringing current of different characteristics, a single key for each source of interrupted ringing current, said keys being common to said cord circuits, and means controlled by the condition of said answering supervisory relay for placing said interrupted or said uninterrupted sources of ringing current under the control of said keys.

19. In a telephone system, a plurality of telephone lines, certain of which are party lines, means including a plurality of cord circuits for interconnecting said telephone lines, an answering supervisory relay and a calling supervisory relay associated with each cord circuit, sources of interrupted ringing current of different characteristic for selectively signaling said party lines, sources of uninterrupted ringing current of different characteristics, a single key for each source of interrupted ringing current, said keys being common to said cord circuits, a relay associated with each cord circuit for determining whether said interrupted sources of ringing current or said uninterrupted source of ringing current shall be employed in signaling a telephone line, and a circuit for said relay controlled at back contacts of said answering and calling supervisory relays.

In witness whereof, I hereunto subscribe my name this 18 day of September A. D. 1926.

JOHN H. LEVIS, JR.