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TELEPHONE SYSTEM

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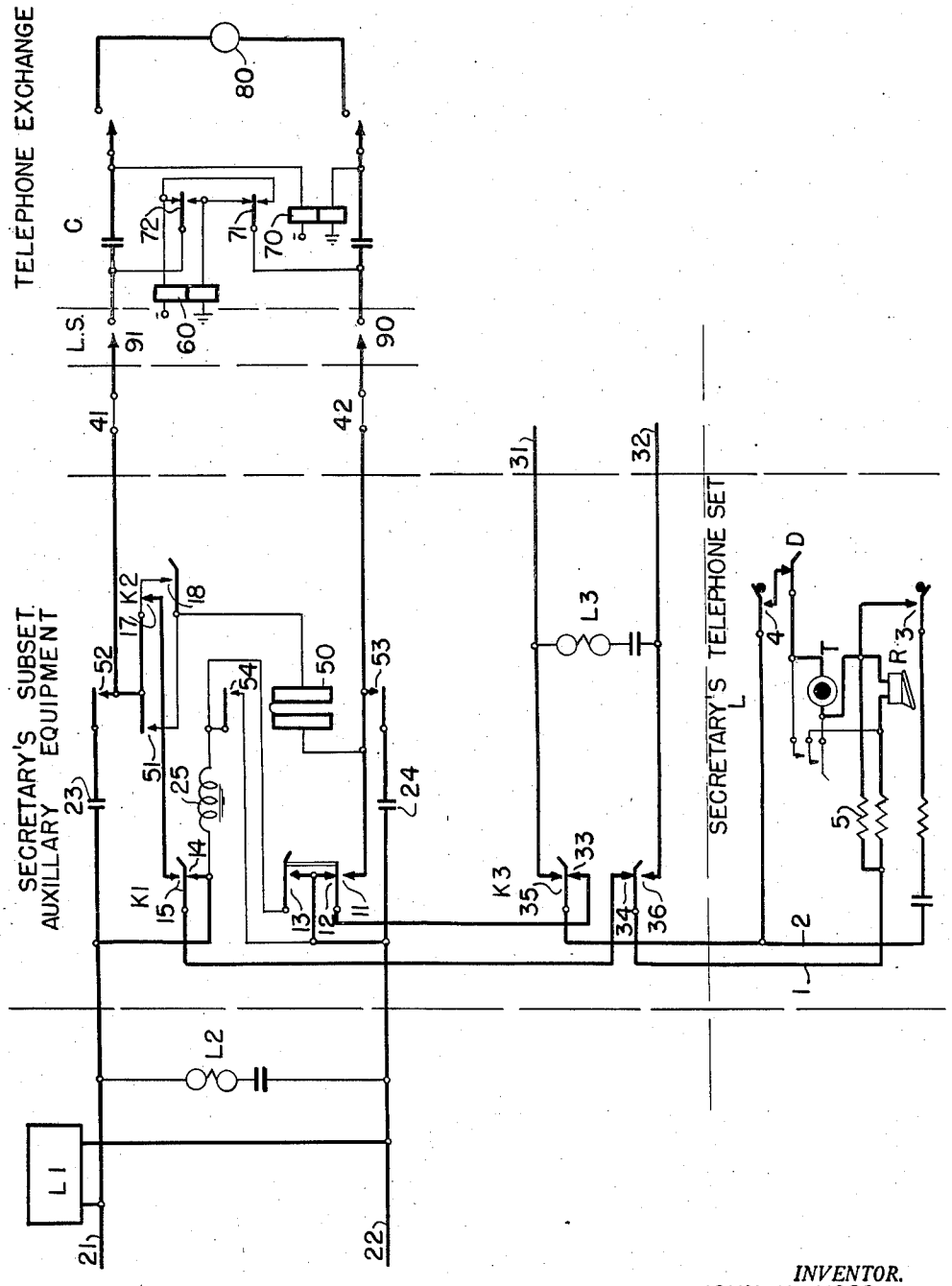

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TELEPHONE SYSTEM

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This invention relates to improvements in telephone systems in general, but is more particularly concerned with improvements in secretary telephone service.

In business offices and the like, various arrangements have been employed whereby calls intended for an executive are answered by a secretary, who arranges for the called executive to pick up the call, by operating a line selecting key or other devices associated with his answering telephone. However, these arrangements have not included a means to extend a call to an executive who is not at a location served by the associated intercommunication system or house wiring plan, thus requiring that a new call be initiated by the calling subscriber.

The object of this improvement is to provide complete means, in a telephone substation set, for a secretary to use her telephone set, temporarily, for answering a telephone call on an absent executive's regular line and arranging to extend the said call to the executive, when she has located him over a second and separate line leading to a telephone exchange. This may require the secretary to initiate a number of calls through the telephone exchange, before a call is extended to the executive. If the executive desires, the secretary can then connect him with his regular line, where the calling party has been waiting. It is not necessary for the secretary to remain with the connection, as the release of the interconnection is under the control of the called executive. This permits the secretary to restore her telephone instrument to the telephone switchhook or to use it for telephone service over her individual telephone line.

A feature of the improvement is that no special telephone exchange equipment is necessary for the secretary to interconnect two telephone exchange lines, on which telephone connections have been established, as all the necessary means are located in the secretary's substation set.

Another feature of improvement is that the secretary can originate independent telephone connections to other telephone exchange subscribers over two independent telephone lines and interconnect the said two telephone lines, and a regular telephone station bridged across one of the said lines permits a third party to enter the connection, thus establishing a conference circuit between three individual telephone exchange stations. These features, together with other features not specifically mentioned, and the operation, will be described in detail with the aid of the accompanying drawing.

The drawing shows a secretary substation equipment as a conventional dial telephone set L, and auxiliary equipment consisting of three keys K1, K2 and K3, relay 50, impedance coil 25, condensers 23 and 24. The secretary's telephone set is connected to the auxiliary equipment by conductors 1 and 2. Three telephone exchange lines are shown as follows: One line, a conventional telephone exchange substation, consists of conductors 21, 22, subset L1, and ringer L2, with conductors 21 and 22 having a multiple termination on the secretary substation equipment, at K1 and condensers 23 and 24. Another line, a conventional one way telephone line from said secretary substation equipment, consists of conductors 41 and 42 terminating on an automatic dial type exchange, shown as line equipment LS and connector C. Only two relays are shown at connector C illustrating the means of supplying direct current over conductors 41 and 42, and reversing said current when a called station, shown as 80, answers a call, and operates relay 70. This arrangement is well known and is found in most of the step by step dial telephone exchanges. The third line, a conventional key answered telephone exchange line, consists of conductors 31 and 32, and ringer L3, terminating at key K3 on said substation equipment.

For explanatory purposes, it is assumed that the ringer L3, relay 50, impedance coil 25, condensers 23 and 24, and the keys are mounted in the base of the secretary subset. Further, the keys are self locking, but mechanically interlocked with the switchhook lever in a manner similar to that shown in Patent No. 1,783,310.

The conductors 1 and 2 are normally connected to the line conductors 21 and 22 through the back contacts 14 and 12 of K1 and 33 and 34 of K3. Therefore, the secretary need not operate a key to answer or originate telephone calls over line conductors 21 and 22. The connecting telephone exchange operation is well known and is not covered by this description; it is controllable from any bridge that will permit direct current to flow between the line conductors. The secretary can answer a call to substation L1 on conductors 21 and 22 by removing the handset in substation set L from the switchhook, which closes the telephone circuit through switchhook springs 3 and 4, transmitter T, receiver R, and induction coil 5, over conductors 1 and 2 and 21 and 22. The bridged circuit for operating the calling telephone exchange equipment is through contacts 4, trans-

mitter T, induction coil 5, conductors 1 and 2, K3, K1 to conductors 21 and 22. If the call is to be extended the secretary requests the calling party on line conductors 21 and 22 to wait and operates K1. Contacts 13 bridge the impedance coil 25 across conductors 21 and 22 before the contacts 12 and 14 are opened, which holds the calling line in the answered condition. When K1 is completely operated contacts 12 and 14 are opened, contacts 11 and 15 are closed, and substation set L is now bridged across the telephone exchange line conductors 41 and 42 as follows: conductor 41, contacts 17, 15, 34, induction coil 5, transmitter T, dial contacts D, switchhook contacts 4, contacts 33 and 11, conductor 42. The telephone exchange equipment associated with line 41, 42 is controllable from said bridged telephone substation set L and extends the line from conductor 41 through LS 91, contacts 72, relay coil 60 to negative (—) main battery and conductor 42 through LS 90, contacts 71, relay coil 60 to ground.

The means for extending a call through an automatic exchange to connector C, and for line relay 60 thereof, responsive to substation set L, to extend the call to another station, such as 80, is well known and is not included in this description. Relay 70, responsive when station 80 answers a call, operates contacts 71 and 72 which reverse the direction of current from relay 60, over conductors 41 and 42.

If the party at station 80 will accept the call waiting on conductors 21 and 22, the secretary operates K2 which closes the circuit to relay 50 at contacts 18 and disconnects her substation set at contacts 17. Relay 50, bridged across the line conductors 41 and 42 holds relay 60 operated. Relay 50 is polarized to be responsive to the reverse current condition previously established over conductors 41 and 42 when relay 70 operated. Relay 50 operates contacts 52 and 53 which complete the telephone circuit between conductors 21 and 41 and 22 and 42, and operates contacts 51 and 54. Contacts 54 are a multiple of contacts 13, thus the holding bridge circuit, through impedance coil 25, is maintained across conductors 21 and 22 independent of key contacts 13. Contacts 51 are a multiple of key contacts 18, and maintain the circuit, through relay 50, to conductors 41 and 42, independent of key contacts 18. Substation set L is now free for answering or originating calls over conductors 31 and 32 by operating K3. Substation set L handset may be restored to the cradle without interfering with the established telephone interconnection between conductors 21 and 41 and 22 and 42.

Assume that the secretary disconnects by restoring handset L to the switchhook, which opens the substation telephone circuit at contacts 4, then K2 and K1, responsive to the lever action from the switchhook, release and open contacts 18, 15 and 13. The telephone connection between conductors 21 and 41 and 22 and 42 is maintained by relay 50 in the operated position as previously described. When the called station 80 disconnects, relay 70 releases and restores contacts 71 and 72 to normal. Contacts 71 and 72, in the normal position, restore the battery condition on conductors 41 and 42 to normal. Relay 50, responsive to the stated normal battery condition, releases, opens the circuit between conductors 21 and 41 and 22 and 42 at contacts 52 and 53, and opens contacts 51 and 54. Contacts 51 remove the holding bridge through relay 50 to telephone exchange relay 60. Relay 60 releases and causes the associated telephone exchange switches to restore to normal. Contacts 54 open the holding bridge, impedance 25, from conductors 21 and 22. If the calling party on conductors 21 and 22 should disconnect first and the associated telephone exchange equipment release, the impedance coil 25 bridged across conductors 21 and 22 at contacts 54 operates the exchange line equipment that is associated with line conductors 21 and 22 which will hold the line in a busy condition until the called station 80 disconnects, releasing relays 70, 50 and 60 as previously described.

This described operation relates to the secretary's answering a call intended for the executive, and extending said call to another telephone at a distant location. It is obvious that the secretary can originate a call, over conductors 21 and 22, to a telephone exchange station and then originate an independent call over conductors 41 and 42, as the operation is the same as the previous detailed description. A brief summary of the stated operation is as follows: Secretary removes handset from switchhook, extends a call over conductors 21, 22, through the telephone exchange to another station, then operates K1 to close contacts 13 which bridge impedance 25 across conductors 21 and 22 to hold the connection, and then transfer subset L to conductors 41 and 42. The secretary extends a separate call over conductors 41 and 42 and through the public exchange to a second party, such as station 80. After station 80 answers and operates relay 70, the current is reversed over the line conductors 41 and 42. If the call is to be extended to the call held on conductors 21 and 22, K2 is operated closing relay 50 which operates over the reverse current line condition and interconnects line conductors 21 and 41 and 22 and 42. In either case it is obvious that an executive at subset L1 can enter an interconnection at lines 21 and 22 or the secretary can re-enter said interconnection by restoring K1 to normal which restores handset L to conductors 21 and 22.

This description is based on automatic exchange equipment for lines 41 and 42, but it is obvious that said terminating equipment may be any switch or relay equipment arranged to reverse battery over conductors 41 and 42 when the called station answers.

What is thought to be new and is desired to have protected by Letters Patent will be pointed out in the appended claims:

What is claimed is:

1. In a telephone exchange system, a main telephone line having substation equipment, a line leading to the exchange, means in said substation equipment for seizing said exchange line and extending a connection thereover, means in said substation equipment for connecting a holding means to said extended connection to hold the same independent of said seizing means, said holding means operated over said extended connection to complete a connection from the extended connection to the main line.

2. A telephone exchange system as set forth as in claim 1 in which said holding means is later operated over said extended connection to release the said connection between the exchange line and main line.

3. In a telephone exchange system, a main telephone line having substation equipment, a line leading to the exchange, a key in said equipment

for seizing said line, means for extending a connection over said seized line, a relay in said equipment, another key for connecting said relay to the extended connection to hold the same, said relay controlled over said extended connection to complete the connection between the extended connection and main line and hold same independent of said keys.

4. In a telephone system, having a main subscriber telephone line, and an auxiliary telephone line, in which different connections have been extended to both of said lines, an auxiliary substation equipment associated with said extended telephone connections, means in said auxiliary substation equipment controlled over said extended connection to the said auxiliary line to interconnect the extended connection to said auxiliary line with the extended connection to the main line.

5. In a telephone exchange system, a main subscriber line having a connection established therewith, a second line leading to the exchange over which a second connection has been extended from said main line, means for establishing a current flow of a certain character over said second line when the second connection is established, means for changing the character of said current flow when a release of said extended connection is desired, means individual to said main subscriber line responsive to said change in current flow to control the release of the extended second connection.

6. In a telephone exchange system, a main subscribers line having substation equipment, a second line leading to the exchange, an auxiliary substation set associated with said main and second lines, means controlled from said auxiliary substation set for extending a connection from the main line over the said second line and establishing a current flow thereover, means for reversing said current flow when the release of said connection is desired, and means individual to said main line responsive to said reverse current to release said extended connection.

7. In a call forwarding system, an executive line having substation equipment thereon, a secretary substation linked to the executive line, a line extending to an exchange, means controlled from the secretary substation for seizing said exchange line and extending a connection thereover, a relay in the secretary substation controlled over the extended connection to complete a connection between the executive line and the extended connection and means in the secretary substation operated to disconnect the secretary substation therefrom, said relay having means to control the release of the connection independent of secretary substation.

8. A call forwarding system as set forth in claim 7 in which there is a separate exchange line for the secretary and means whereby the secretary may extend a connection over said separate line without interfering with said extended connection.

9. In a secretary telephone system, a calling line, a called line, means for extending a telephone connection between said lines, an auxiliary substation set associated with said called line, an auxiliary line, means for connecting said auxiliary substation set with said auxiliary line, means controlled from said auxiliary substation set for extending a connection over said auxiliary line to another called line and establishing a current flow thereover, means controlled over said other called line for reversing said current flow, means in said auxiliary substation responsive to said reversal of current to interconnect said last connection with said first connection to establish a conference connection between said calling said first called line and said other called line, and means of connecting said auxiliary substation to said interconnection as a fourth party to said conference.

10. In a telephone system, a main subscriber line, an auxiliary subscribers line, an extension line, subscribers substation equipment for the main and auxiliary lines, means controlled from said auxiliary line for extending a connection to a called subscriber line over said extension line and for connecting said extended connection on the extension line to the main subscriber line.

11. In a telephone system, a main subscriber line, an auxiliary subscriber line and an extension line, subscriber's substation equipment for the main and auxiliary lines, means controlled over the auxiliary line from the substation equipment thereon for extending a connection over said extension line, means in said substation equipment controlled over the extended connection for connecting said extension line connection with the main subscribers line.

12. In a telephone system, a main subscriber line, an extension line, a main and auxiliary substation equipment associated with said lines, equipment linking said main and extension lines, means controlled from the auxiliary substation equipment for extending a connection over said extension line, and means in said linking equipment for connecting the main subscriber line with the extended connection.

13. In a telephone system, a main subscriber line, an extension line, a main and an auxiliary substation equipment associated with said lines, equipment linking said main and extension lines, means controlled from the auxiliary substation equipment for extending a connection over said extension line and establishing a current flow thereover, means for changing said current flow over said extension line when said connection is completed and means in said linking equipment responsive to said change in current flow to connect the main subscriber line with the extended connection.

14. In a telephone system, a telephone exchange, a substation, auxiliary equipment, a first line connecting said telephone exchange with said auxiliary equipment, a second line connecting said substation with said auxiliary equipment, a third line including substation equipment connected to said substation thru said auxiliary equipment, means in said auxiliary equipment operated to disconnect said substation from said third line and to connect it to said first line, means controlled from said substation for extending a connection over said first line, means in said auxiliary equipment for connecting a holding means to said extended connection, said holding means operated over said first line to hold same independent of said substation and said connecting means and to extend said connection to said third line, and means in said telephone exchange for operating said holding means to release said connection and to disconnect said connection from said third line.

15. In a telephone system, a telephone exchange, a substation, auxiliary equipment at said substation, a line connecting said exchange with said auxiliary equipment, a line connecting said substation with said auxiliary equipment, means in said auxiliary equipment for connecting said

substation line with said exchange line, means in said substation for controlling the extension of a connection over said exchange line, means in said auxiliary equipment for connecting a holding means to said connection, said holding means operated over said exchange line to hold same independent of said substation and said connecting means and to connect said exchange line with said substation line, and means in said exchange for operating said holding means over said exchange line to disconnect said exchange line from said substation line and to release said connection.

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